Development of the Respect for People model for lean implementation in the South African context

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People will forget what you said, people will forget what you did but people will never forget how you made them feel

– Maya Angelou

ABSTRACT

This thesis is premised on the understanding that production management includes both technological and human elements. The advent of the Toyota Production System during the 1970's constituted a landmark event in the evolution of production management, as it was founded on the conceptual pillars of *Continuous Improvement* and *Respect for People*, thus emphasising in particular the importance of the human aspect of production management. Over time, the lean philosophy that was developed from the Toyota Production System gained global popularity. Successful lean implementation, however, is often hindered by a lack of understanding of the original meaning and intent associated with the human aspect of lean, resulting in lean tools being used without sufficient understanding of Respect for People.

This study responds to the need for a balanced lean implementation approach, focusing on both the *Continuous Improvement* and *Respect for People* pillars of the Toyota Way model in the South African context. Utilising the elaborated action design research method, within the design science research paradigm, a lean implementation model that centres on the Respect for People pillar was developed.

The elaborated action design research continuum was entered at the Problem diagnosing stage, after which four iterative Concept design stages were completed: (1) A systematic literature review was followed to determine the meaning of Respect for People. The findings were synthesised in the Respect for People (RFP) framework and the first conceptual RFP lean implementation framework. (2) An applied thematic analysis was conducted to determine the understanding of the RFP principles in the South African context and their applicability to this context. (3) The design requirements were developed during the third iteration. (4) The fourth and final concept design iteration was used to develop and evaluate the Respect for People model for lean implementation. Verification was done by means of the Delphi technique, a design requirement checklist and a review of the design intent, while a gap analysis, a research validation matrix and the Delphi technique confirmed the research validity.

The RFP model consists of two value streams — the traditional product value stream as well as the people value stream. These two value streams are connected by means of a specific problem-solving process, used to bring problems to the surface and help develop individuals who can solve these problems. The benefits of the lean philosophy can only be achieved through a comprehensive, all-inclusive approach, with buy-in and cooperation at all levels of an organisation. Leadership buy-in is required to provide direction to and enablement of employees, while employee buy-in is required to help access the valuable input acquired from

employees' performance of daily tasks. It was concluded that only by valuing employees' knowledge, experience and insight, and developing their skills, can an effective and sustainable lean implementation occur. *An improved people value stream will naturally lead to an improved product value stream.*

This study contributes to the field by providing a new solution for a known problem. Industrial Engineering literature has been enriched through a framework which explains the meaning of RFP, as well as through a novel, balanced model for lean implementation. The RFP model contributes towards organisational success by providing a practical means to include people during the lean implementation process, thereby contributing to improved lean implementation.

Key words

Lean manufacturing, Toyota Way, Respect for People, Systematic literature review, Design science research, Action design research, Applied thematic analysis, Plan-Do-Study-Act, Delphi technique,

PREFACE

This thesis was compiled and presented in **article format** in accordance with the academic rules of the North-West University (approved on 21 September 2017). Rule A.5.10.5 states:

> *"Where a candidate is allowed to submit the research product in the form of research articles, such research product must be presented for examination purposes as an integrated unit, supplemented with a problem statement, an introduction and a synoptic conclusion as prescribed by faculty rules and the manuscript submission guidelines, or the url link to the manuscript guidelines of the journal or journals concerned."*

Rule A.5.10.8. states:

> *"Where any research article, manuscript or internationally examined patent to which the candidate for a doctoral degree and other authors or inventors have contributed is submitted as the research product of a doctoral degree programme, the candidate must obtain a written statement from each co-author and co-inventor in which it is stated that such co-author or co-inventor grants permission for the research product to be used for the stated purpose, and in which it is further indicated what each co-author's or co-inventor's share in the research product concerned was."*

Rule A.5.10.9. states:

> *"Where co-authors or co-inventors as contemplated in rule 5.10.8 were involved in the development of the research product, the candidate must mention this fact in the preface, and must include the statement of each co-author or co-inventor in the thesis, mini-thesis or research report immediately following the preface to the research product."*

The following journal articles have been submitted, reviewed and published over the course of this research study:

- R. Coetzee, K. R. Van der Merwe and L. Van Dyk, Lean implementation strategies: How are the Toyota Way principles addressed? South African Journal of Industrial Engineering, Vol 27(3), pp 79-91
- R. Coetzee, K. R. Van der Merwe and L. Van Dyk. Towards addressing Respect for People during lean implementation. International Journal of Lean Six Sigma. (DOI 10.1108/IJLSS-07-2017-0081)

An additional article was submitted for publication:

- R. Coetzee, C. S. Jonker, K. R. Van der Merwe and L. Van Dyk. The South African perspective on the lean manufacturing Respect for People principles. South African Journal of Industrial Psychology

The thesis is a compilation of these research outputs and an additional narrative to contextualise each output to create a coherent whole.

Figure 1 provides an overview of each chapter of the thesis. The three above-mentioned articles are presented in Chapter 4, 5 and 6. More information is available in Section 1.8 (Chapter division) and Chapter 3 (Research design).

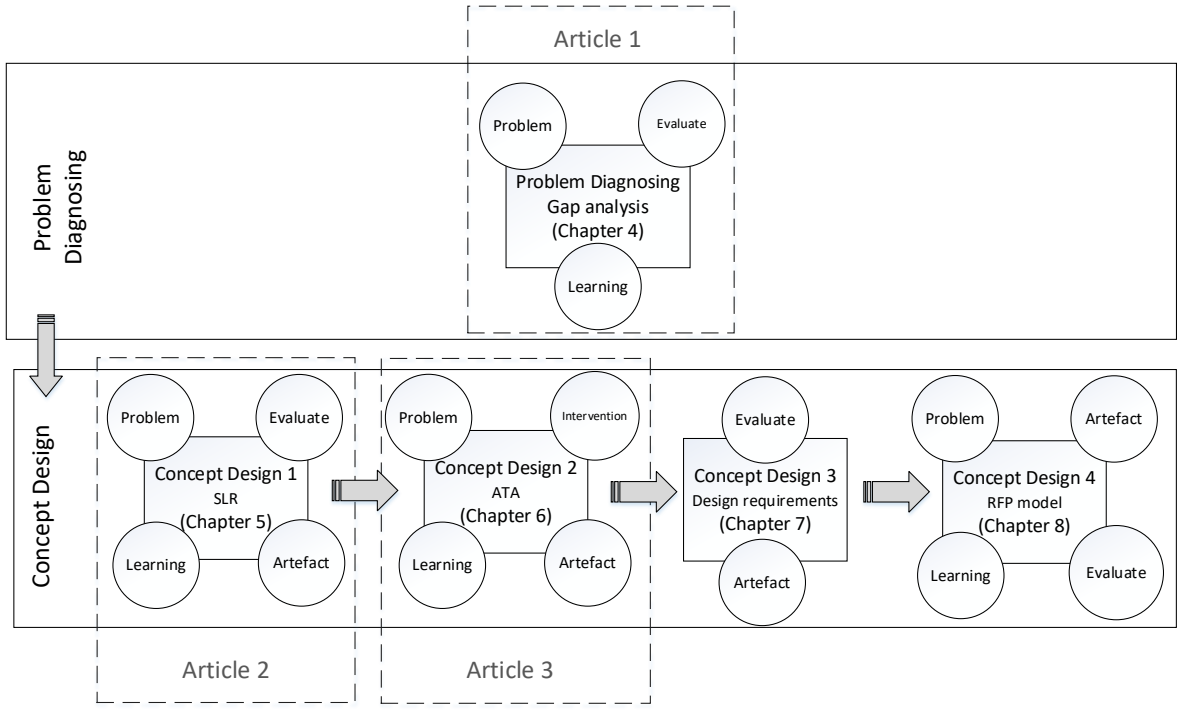

Figure 1: Compilation of research thesis

LAY-OUT, NUMBERING AND REFERENCING

The manuscripts that have been submitted and/or published did adhere to the author guidelines as stipulated by the editor of each journal on submission and they may appear in a different format to what is presented in this thesis. The headings and original technical content of the manuscripts have not been modified. The page numbers of the thesis are interrupted where manuscripts have been inserted.

Statement of co-authors

To whom it may concern,

The listed co-authors hereby give consent that **Rojanette Coetzee** may submit the manuscript(s) as part of her thesis titled, **"Development of the Respect for People model for lean implementation in the South African context"** for the degree *Philosophiae Doctor in Industrial Engineering*, at the North-West University:

(This letter of consent complies with rules ***A5.10.8 and A.5.10.9*** of the academic rules, as stipulated by the North-West University)

Signed at Potchefstroom

Liezl van Dyk — Date: 2018/11/20

Cara Jonker — Date: 16/11/2018.

Signed at Port Elizabeth

Karl van der Merwe — Date: 15 Nov 2018

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I am grateful for a loving and supporting grandmother, who could not see the completion of this thesis — **Nellie Brown** (20 October 1931 – 20 July 2018)

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LIST OF ACRONYMS

ADR	-	Action design research
ATA	-	Applied thematic analysis
CI	-	Continuous Improvement
DSR	-	Design science research
eADR	-	Elaborated action design research
JIT	-	Just in time
KPI	-	Key performance indicator
M-PDSA	-	Measure-Plan-Do-Study-Act
PDSA	-	Plan-Do-Study-Act
RFP	-	Respect for People
SLR	-	Systematic literature review
TOC	-	Theory of Constraints
TLL	-	Transition to lean
TPS	-	Toyota Production System
TQM	-	Total Quality Management

JAPANESE TERMINOLOGY

Toyota caught the world's attention in the 1980s when it became apparent that there was something exceptional about Japanese motor manufacturing. Outside of Toyota, the Toyota Production System is known as lean or lean production (Liker, 2004). The terms were made popular in the books by Womack et al. (1990) and Womack and Jones (2003). These authors translated most of the work from Japanese into English, but some Japanese terms could not be translated into English successfully. The following are examples of Japanese terminology that are still used today (Liker, 2004):

Andon cord - A visual control device that gives the current status of the production system and alerts team members to emerging problems. A visual signalling system to indicate where help is needed in solving a quality problem.

Gemba - The actual place where the real value-adding work is done. The first step of any problem-solving process, development of a new product, or evaluation of an associate's performance is grasping the actual situation, which requires going to the "*gemba*". Similar to the term *Gemba.*

Genchi Genbutsu - Go and see for yourself (in order to solve the problem). *Genchi* means the actual location and *genbutsu* means the actual material or products. Similar to the term Gemba, Genchi Genbutsu means going to the place to see the actual situation for understanding.

Heijunka - Levelling of production by smoothing out the volume and mix of items produced so there is little variation in the production from day to day. Levelling out the schedule is a foundation for flow and pull systems and for minimising inventory in the supply chain.

Jidoka - A machine that automatically stops working as soon as a problem/defect is detected (Intelligent automation or automation with a human touch).

Kaizen - The process of continuously making incremental improvements.

Kanban - *Kanban* means sign, but more broadly a signal of some kind. A Kanban system is an organised system of inventory buffers that are used to signal to the previous step when a part has to be replenished. Thus, creating a “pull” that will continuously cascade backwards to the beginning of the manufacturing cycle.

Poka-yoka - A mistake-proofing device or procedure to prevent defects during order-taking or manufacturing.

CHAPTER 1
INTRODUCTION TO THE STUDY

Chapter 1 explains the research problem and states the purpose of the study, together with the objectives and research questions.

1.1 Introduction

Increasing difficulties in the competitive global market, such as shifts in customer demands, a greater variety of products, more demand and perfect quality (Anand and Kodali, 2010a) are putting organisations under pressure to implement and adopt new continuous improvement approaches to improve their efficiency and competitiveness (Kwahk and Lee, 2008; Losonci et al., 2011; Nordin et al., 2012).

During the 1980s it became apparent that Japanese cars were lasting longer than American cars and required less maintenance (Liker, 2004). The production system used by Toyota was appropriately named the Toyota Production System (TPS). Liker (2004) describes it as "a unique approach to manufacturing" and Toyota's "manufacturing philosophy". Outside of Toyota, the TPS is known as "lean" or "lean production" (Liker, 2004). The lean production movement continued to dominate manufacturing trends (along with Six Sigma) for decades.

Since the 1980s, lean manufacturing has been adopted by many organisations across the globe, from production organisation to service delivery organisations, to facilitate the continuous improvement change that is required (Losonci et al., 2011).

As early as 1988, Taiichi Ohno, recognised this approach as part of the field of industrial engineering by stating that industrial engineers apply engineering knowledge and techniques to study, improve, plan and implement a) methods and systems; b) qualitative and quantitative planning; and c) the measurement of actual results that are below the standards to take suitable action (Ohno, 1988). This is all done to exercise better management with special consideration of employee welfare. Implementing lean manufacturing while considering employee welfare can thus be considered as part of the field of industrial engineering.

According to Liker (2004), the consistency of Toyota's performance is a direct result of operational excellence, something they have turned into a strategic weapon. Toyota made several tools and quality improvement methods popular in the manufacturing world. Examples include methods such as just-in-time, "kaizen", one-piece-flow, "jidoka[1]" and "heijunka[2]". These tools later contributed to the lean manufacturing revolution. However, tools and techniques alone cannot serve as secret weapons for transforming a business – The human factors also need to be taken into consideration.

[1] A machine that automatically stops working as soon as a problem/defect is detected
[2] Levelling of production by both volume and product mix.

Liker (2004) clearly states in this regards:

> *Toyota's continued success at implementing these tools stems from a deeper business philosophy based on its understanding of people and human motivation. (Liker, 2004)*

According to Tsutsui (1998), production management includes both technological and human elements. According to him, the TPS is a monument to the history of production management, since it suggests a new method of analysing both elements simultaneously.

Tachii Ohno (1988), the developer of the TPS, emphasised this when he stated that respect for humanity and the reduction of waste (in order to increase productivity) are the foundations of the TPS. In the foreword of his book (Toyota Production System: Beyond large scale production), the publishers give him credit for his great contribution: "He has shown us… (to) also, take an important look at how we as people work in a factory".

Similarly, Fujio Cho, Toyota's former chairman, emphasises the focus on people with his famous statement: "First we build people, then we build cars" (Liker, 2004). Eiji Toyoda, president and later chairman of the Toyota Motor Corporation and the person mainly responsible for bringing Toyota to profitability and worldwide prominence (Liker and Hoseus, 2008), also supports these views:

> *People are the most important asset of Toyota and the determinant of the rise and fall of Toyota.*

The Toyota Way and the TPS are the double helix of Toyota's DNA. They define the company's management style and what is unique about the company (Liker, 2004), but they are not the same thing:

> *TPS is the most systematic and highly developed example of what the principles of the Toyota Way can accomplish. The Toyota Way consists of the foundational principles of the Toyota Culture, which allows the TPS to function so effectively.*

The Toyota Way is centred on two pillars: "Continuous improvement" and "Respect for people" (RFP). Although RFP is one of the pillars of the Toyota Way, the phrase is often used without a full appreciation of the original meaning and intention. Stewart (2012) and Liker (2004) warn that a misunderstanding of this term could have a negative effect on an organisation.

1.2 Research problem

Despite the popularity of lean manufacturing and Toyota's success, the success rate for lean implementation outside of Toyota remains relatively low (Liker and Franz, 2011; Bhasin, 2012a). Not all organisations are able to use lean manufacturing principles as a continuous improvement philosophy to grow into smooth-flow, high-quality organisations that can be recognised as world-class companies (Anand and Kodali, 2010a; Nordin et al., 2012). Liker and Franz (2011) claim that they had not seen any successful continuous improvement outside of Japan after they had visited hundreds of companies over a 10-year period.

It is evident that the road of transformation to lean is associated with discouraging challenges. Even those that implement it with the best intentions are often destined to fail at some point during their transformation journey (Nordin et al., 2012).

When Taiichi Ohno was asked what was unique about Toyota's success, he answered (Liker, 2004):

> *The key to the Toyota Way and what makes Toyota stand out is not any of the individual elements…but what is important is having ALL the elements together as a system.*

It seems that one of the elements that is often missing, is the human factor. Prominent among the reasons cited for the low success rate of lean implementation is the intense focus on lean tools and techniques at the expense of the human side of lean management (Miller et al., n.d.; Nordin et al., 2011; Bhasin, 2012a; Jadhav et al., 2014; Pakdil and Leonard, 2014; Cardon and Bribiescas, 2015; Gao and Low, 2015; Coetzee et al., 2016). Employees often do not feel valued, even though they are the ones who are in the best position to offer suggestions for improving the efficiency of the work that they do (Sim and Rogers, 2008).

Also, as Toyota expanded their operations across the world, they encountered cultural challenges, since the Toyota Way is deeply rooted in Japanese culture (Liker and Hoseus, 2008). There are differences in the ways people think in the east and the west (Liker and Hoseus, 2008). People in the west tend to see lean (incorrectly) as a tool kit that can help control the work place in order to achieve specific measurable objectives:

> *Essentially what is happening is, the western world is objectifying the workplace and seeing simple cause and effect relationships while losing sight of the people and the complex dynamics of the environment (Liker and Hoseus, 2008).*

Contrary to this western approach, when a Toyota sensei looks at improving the workplace, they do not see independent variables that can be manipulated. They rather see people who work together in a process that is filled with waste (Liker and Hoseus, 2008).

Thus, the research problem to be addressed, is the low lean implementation success rate in South Africa due to the intense focus on tools and techniques at the expense of the human element.

1.3 Research opportunity

The challenge for leaders is to comprehend what Respect for People truly means so that they can practise lean manufacturing correctly and improve business performance (Emiliani, 2006; Puvanasvaran et al., 2008). The involvement of employees in the continuous improvement process influences successful lean transformation. The success of a lean transformation therefore lies in the hands of the employees who are responsible for implementing the change (Stewart, 2012).

This serves as motivation for the development of a lean implementation framework that focusses on the human factor, in other words, a lean implementation framework that is upheld by both the Toyota Way pillars: Continuous Improvement and Respect for people. It implies an interaction between people and the technical side of lean. In addition, there is an opportunity to “translate” the Japanese lean principles into principles that are applicable to the South African context.

Such a framework for the South African context will allow managers to provide practical support to people undergoing change. It may prevent the inadvertent constraints on people that make their personal task of coping more difficult (Carnall, 1991). This will consequently increase the success rate of implementing lean manufacturing as a continuous improvement philosophy.

1.4 Research aim

The aim of the study is to develop a people-centred model for lean implementation for the South African context that simultaneously focuses on continuous improvement and the human element.

1.5 Field of research

The *Handbook of Industrial Engineering* (Salvendy, 2001) explains that the field of industrial engineering specialises in four basic areas: human factors engineering, manufacturing systems engineering, operations research and management systems engineering (Figure 2). Each of these four speciality areas coincide with basic knowledge areas and/or application areas such as statistics, psychology, mathematics, information sciences, accounting, economics and organisational behaviour.

This study was conducted in the field of *industrial engineering* with a focus on the bottom right-hand side of Figure 2, encompassing the speciality areas of *human factor engineering* and *management systems* and is supported by the basic knowledge areas of *psychology* and *organisational behaviour*.

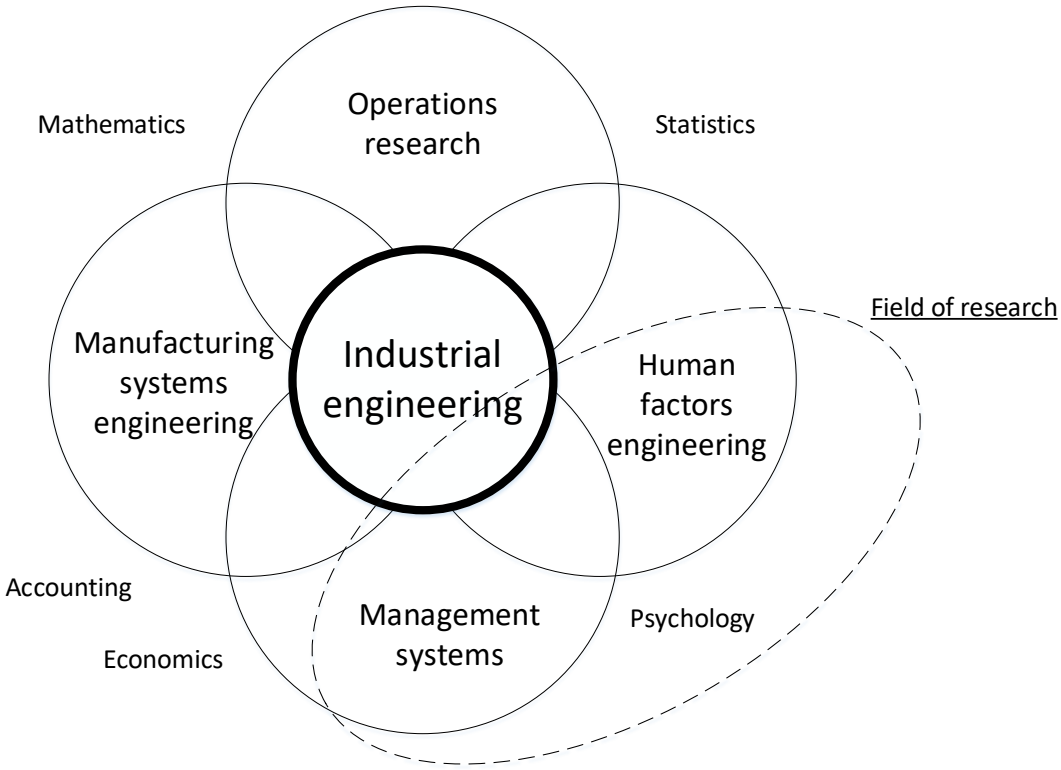

Figure 2: Domain definitions of the field of industrial engineering (Adapted from Salvendy 2001)

1.6 Research objectives

The aim of the study gives rise to the following research objectives (Table 1):

1. **Literature survey** — Investigate the lean implementation environment and clarify any ambiguous concepts and terminology.
2. **Empirical investigation (Japanese RFP themes)** — Develop an RFP framework that explains the true, original meanings as intended by the creators.
3. **Empirical investigation (South African context)** — Develop a thematic map of the South African interpretation of the RFP principles.
4. **Design** — Develop the design requirements for a people-centred model for lean implementation.
5. **Verification** — Verify that the model satisfies all the design requirements.
6. **Validation** — Confirm the validity of the research problem, the research design and the research output.

1.7 Research questions

The abovementioned aim and objectives raise a number of research questions that have to be addressed (Table 1):

1. Literature Survey

Research question 1.1 — What lean terminology is available?
Research question 1.2 — What are the barriers to lean implementation?
Research question 1.3 — What are the different research methods that can be used to address the research problem?

2. Empirical investigation (Japanese RFP themes)

Research question 2.1 — What was the true, original meaning of Respect for People as intended by the creators of the Toyota Way?
Research question 2.2 — What is the interaction between the different RFP principles?

3. **Empirical investigation (South African context)**

Research question 3.1 — Are all the Japanese RFP principles applicable to the South African context?
Research question 3.2 — Are any additional RFP principles required for lean implementation to be successful in the South Africa context?

4. **Design**

Research question 4.1 — What are the design requirements for a people-centred lean implementation model?

5. **Verification**

Research question 5.1 — Does the model adhere to each of the specified design requirements?

6. **Validation**

Research question 6.1 — Has a valid research problem been identified?
Research question 6.2 — Was a valid research design followed?
Research question 6.3 — Does the research output address the research problem and the specific and general limitations of the study?

1.8 Chapter division

The abovementioned research questions and objectives are addresses as set out in Table 1

1.9 Conclusion

The purpose of this study was to develop a people-centred model for lean implementation for the South African context.

This chapter explained the rationale for the study and the research opportunity that arose from the current South African context in which it presents itself. The research aim, objectives and research questions were stated, to guide the study (Table 1).

Chapter 2 provides a literature survey explaining chosen literature relevant to this study, after which Chapter 3 explains the research design that was followed to achieve the aim of the study.

Table 1: Research questions and objectives according to chapters

Chapter		Research objectives	Research questions
1	Introduction		
2	Literature survey	1. Investigate the lean implementation environment and clarify any ambiguous concepts and terminology.	1.1. What lean terminology is available? 1.2. What are the barriers to lean implementation? 1.3. What are the different research methods that can be used to address the research problem?
3	Research design		
4	Gap analysis (Article 1)		
5	Systematic literature review (Article 2)	2. Develop an RFP framework that explains the true, original meanings as intended by the creators.	2.1. What was the true, original meaning of Respect for People as intended by the creators of the Toyota Way? 2.2. What is the interaction between the different RFP principles?
6	Applied thematic analysis (Article 3)	3. Develop a thematic map of the South African interpretation of the RFP principles.	3.1. Are all the Japanese RFP principles applicable to the South African context? 3.2. Are any additional RFP principles required for lean implementations to be successful in the South African context?
7	Design requirements	4. Develop the design requirements for a people-centred lean implementation model.	4.1. What are the design requirements for a people-centred lean implementation model?
8	The RFP model for lean implementation		
9	The Delphi process		

Chapter		Research objectives	Research questions
10	Verification	5. Verify that the model satisfies all the design requirements.	5.1. Does the model adhere to each of the specified design requirements?
11	Validation	6. Confirm the validity of the research problem, the research design and the research output.	6.1. Has a valid research problem been identified? 6.2. Was a valid research design followed? 6.3. Does the research output address the research problem and the specific and general limitations of the study?
12	Conclusion		

CHAPTER 2
LITERATURE SURVEY

This chapter addresses the following research questions by examining the literature relevant to this study:

Research question 1.1 — What lean terminology is available?

Research question 1.2 — What are the barriers to lean implementation?

Research question 1.3 — What are the different research methods that can be used to address the research problem?

2.1 Introduction

The objective of this chapter is to investigate the *lean philosophy*, different *human factors literature* and the different elements of the *research design* that was used to address the *research problem* (refer to Figure 3).

The literature relevant to his study is discussed in this chapter, but also in the research articles found in Chapters 4, 5 and 6. Figure 3 provides an outline of the available literature with a reference to where in this study the literature is discussed.

The lean philosophy section is divided into an overview, lean terminology, Japanese words, the Toyota Way, the PDSA method and the lean problem-solving process. While the human factors section includes topics such as change management theories, emotional transition phases during change, the coping cycle and motivation theories, the same motivation theories are also discussed in lean literature. They therefore fall in the overlap of the lean philosophy and human factors circles.

The research problem occurs where the lean philosophy overlaps with the human factors theory in the following sections: lean implementation strategies, the concept of Respect for People and barriers to change during lean implementation.

The discussion on the research design is divided into the following three sections:

- Investigate — Systematic literature review and applied thematic analysis.
- Design — Design science research, action design research and elaborated action design research.
- Evaluate — Delphi technique

The four areas of this literature review — the research problem, the research design, the lean philosophy and human factors literature — overlaps with the design of the novel Respect for People model for lean implementation.

Figure 3: Overview of relevant literature

2.2 Lean philosophy

Concepts of the lean philosophy that are relevant to this study are explained in the sections to follow.

2.2.1 Lean manufacturing overview

One of the world's most successful automotive manufacturers, Toyota, first caught the attention of the world in the 1980's when it became apparent that there was something special about Japanese quality and efficiency. Japanese cars were lasting longer than American cars and required less maintenance (Liker, 2004). The production system used by Toyota was suitably named the Toyota Production System (TPS). Liker (2004) describes it as "a unique approach to manufacturing" and Toyota's "manufacturing philosophy". The TPS was the next major evolution in the efficiency of business processes after the mass production system that was invented by Henry Ford.

In his book, *Toyota Production System: Beyond large scale production*, the creator of the TPS, Taiichi Ohno (1988), explains the TPS as follows:

> *All we are doing is looking at the time line from the moment the customer gives us an order to the point when we collect the cash. And we are reducing that time line by removing the non-value-adding wastes.*

Liker (2004) explains that a lean enterprise can be seen as the end result of applying the TPS to all areas of your business. Womack and Jones (2003) developed a five-step process to achieve such an enterprise in their book *Lean Thinking: Banish waste and create wealth in your organisation*:

1. **Define customer value** – Define value in terms of specific products with specific capabilities at specific prices through dialogue with specific customers.
2. **Identify the value stream** – Identify the entire value stream for each product (or family of products) and remove all waste from the process.
3. **Make it flow** – Make the remaining value-creating steps flow by fighting against departmentalised batch thinking. This shifts the focus from the organisation to the product and its need.
4. **Pull back from the customer** – Perform less forecasting and let the customer pull the product as it is needed, rather than pushing, often unwanted, products onto the customer.
5. **Striving for excellence** – There is no end to the process of reducing effort, time, space, cost, and mistakes while offering a product that is closer to what the customer really wants.

2.2.2 Lean terminology

The terms “continuous improvement”, “lean manufacturing”, “Toyota Production System”, and the “Toyota Way” are often used interchangeably without a full appreciation of the fundamental differences between them. Stewart (2012) and Liker (2004) warn that misunderstanding these terms could have a negative effect on an organisation.

Therefore, this section explains and clarifies these different terminologies.

2.2.2.1 Continuous improvement versus kaizen

Continuous Improvement (CI) is a philosophy that Deming describes as “improvement initiatives that increase success and reduce failures” (Bhuiyan and Baghel, 2005). Another definition of CI is “a company-wide process of focused and continuous incremental innovation” (Bessant et al., 2001). Examples of such CI initiatives or methodologies include Theory of Constraints (TOC), Six Sigma, Total Quality Management (TQM), Balanced Scorecard, and lean manufacturing (Bhuiyan and Baghel, 2005; Ras and Visser, 2015).

One of the principles *within* lean manufacturing is kaizen. The term, which literally means change (kai) for the better (zen), has been around for so long that most non-Japanese books no longer italicise it as a foreign word (Liker and Franz, 2011). The problem with it being around for so long is that the misconception has developed over time that kaizen and CI are synonyms and can be used interchangeably. However, this is not the case — kaizen is only the CI aspect within lean manufacturing (Bhuiyan and Baghel, 2005). To summarise, lean manufacturing is seen as one of many CI strategies, and kaizen is a fundamental part of lean manufacturing; but these concepts are not synonymous (Figure 4).

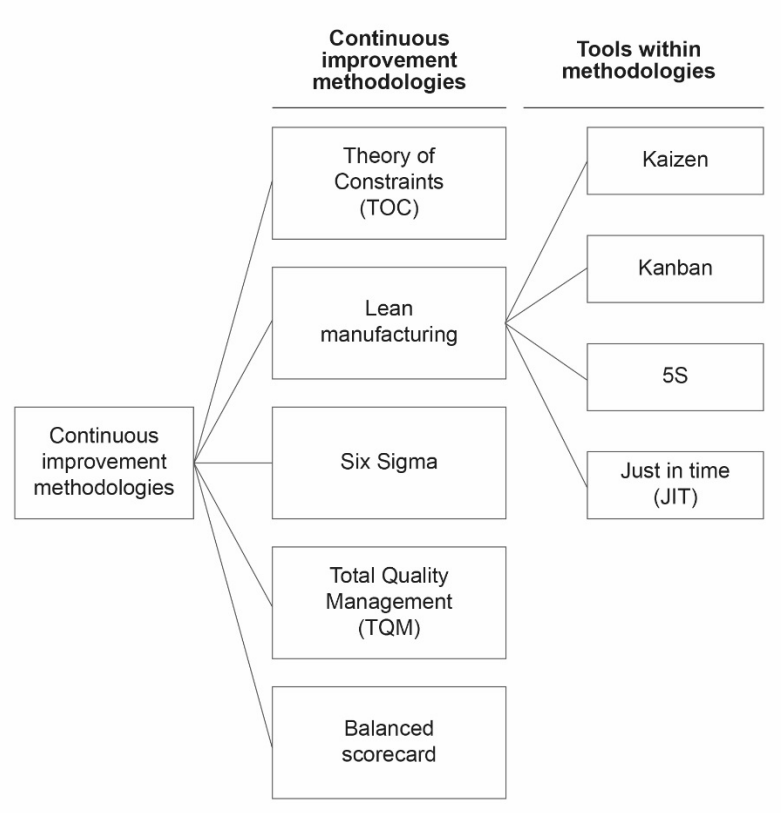

Figure 4: Schematic illustration of the differences between CI, lean manufacturing, and kaizen

2.2.2.2 Lean versus the Toyota Production System

The lean movement was launched when Womack and associates released the book, *The machine that changed the world* (Womack et al., 1990), in 1990. It was in this work that they labelled the new Toyota paradigm of manufacturing by doing more with less as "lean production" (Liker and Franz, 2011). It is noteworthy that the term "lean" was never used historically within Toyota (Womack et al., 1990; Liker and Hoseus, 2008).

Stewart (2012) explains the difference between lean manufacturing and the TPS as follows:

> *The difference between lean manufacturing and TPS is that in lean manufacturing the focus is on the tools, and with TPS the focus is on the system. There are many tools (just-in-time, cells, 5S, kanban, etc.) that can be utilised to implement the TPS, but not all are mandatory.*

However, the TPS should never be seen as a toolkit; it is a sophisticated production system in which all of the parts contribute to a whole. At its root, the TPS focuses on supporting and encouraging

people to continually improve the process they are working on (Liker, 2004; Stewart, 2012). Therefore, people are the centre of the "TPS house" (Figure 5a).

2.2.2.3 The Toyota Way versus the Toyota Production System

The Toyota Way (as opposed to the TPS) is not described as a system, process, or programme. Instead, it is a mindset that explains how thoughts and actions guide people to interact with each other and with processes every day. The Toyota Way is therefore an organisational culture. Fujio Cho, Toyota's former president, originally published the model he called the Toyota Way in 2001 when he realised that there was too much inconsistency among Toyota managers in their understanding of what made the company tick. According to Cho, the Toyota Way model (Figure 5b) is a basis for daily management that is centred on two principles: *Respect for people*, and *Continuous improvement* (Kaizen) (Saruta, 2006; Stewart, 2012). These two pillars summarise the model and indicate that Cho wanted to emphasise the important part that people play in the change process.

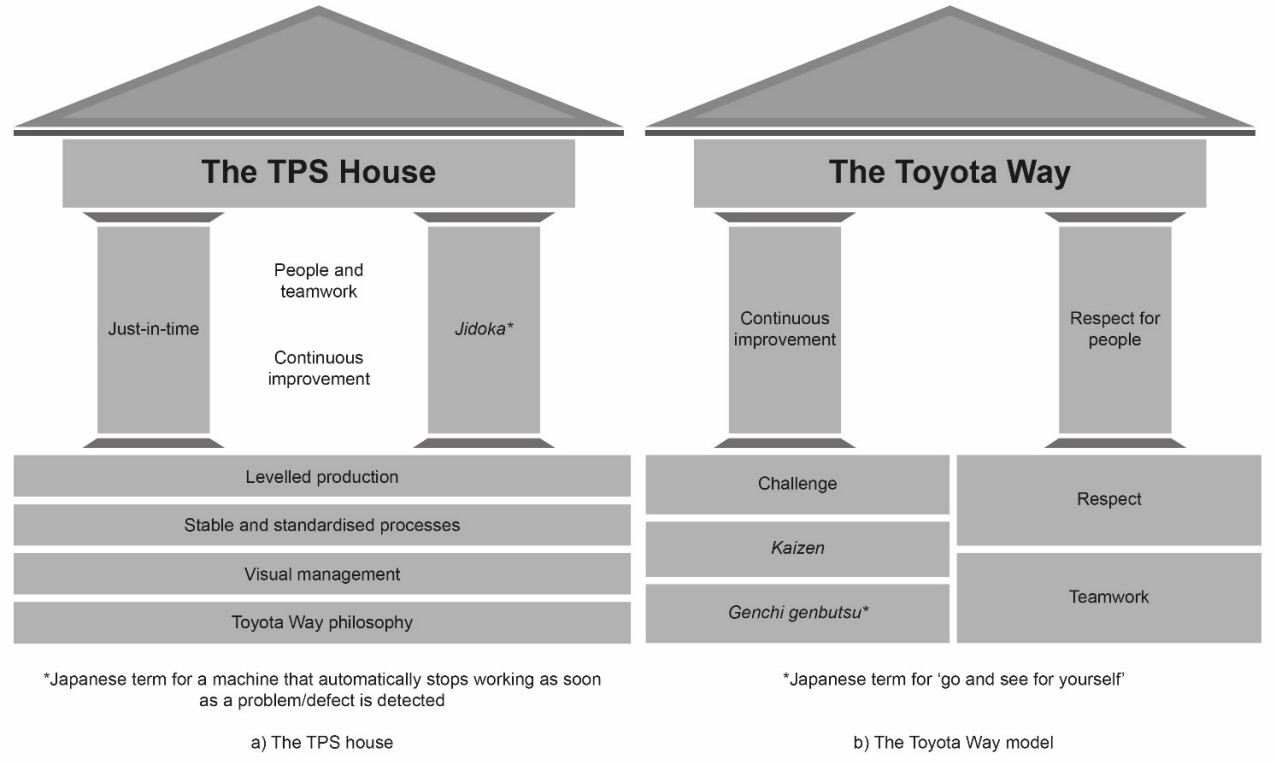

Figure 5: Illustration of the difference between the TPS house (adapted from Liker, 2004) and the Toyota Way 2001 model (adapted from Liker and Hoseus, 2008) in terms of their foundations and pillars

Figure 5 presents simplified versions of the TPS house and the Toyota Way, illustrating only the pillars and the foundations. It is evident that the Toyota Way model incorporates the TPS house and is quite different in emphasis. In the latter, the core pillars are just-in-time and jidoka[3] (intelligent autonomation[4]), which are both technical concepts. In contrast, the pillars of the Toyota Way focus on people: continuous improvement and respect for each other (Liker and Hoseus, 2008).

2.2.3 The Toyota Way

As previously stated, the Toyota Way is centred on two principles: Continuous Improvement and Respect for People, in turn built on three and two foundational blocks respectively, as shown in Figure 6.

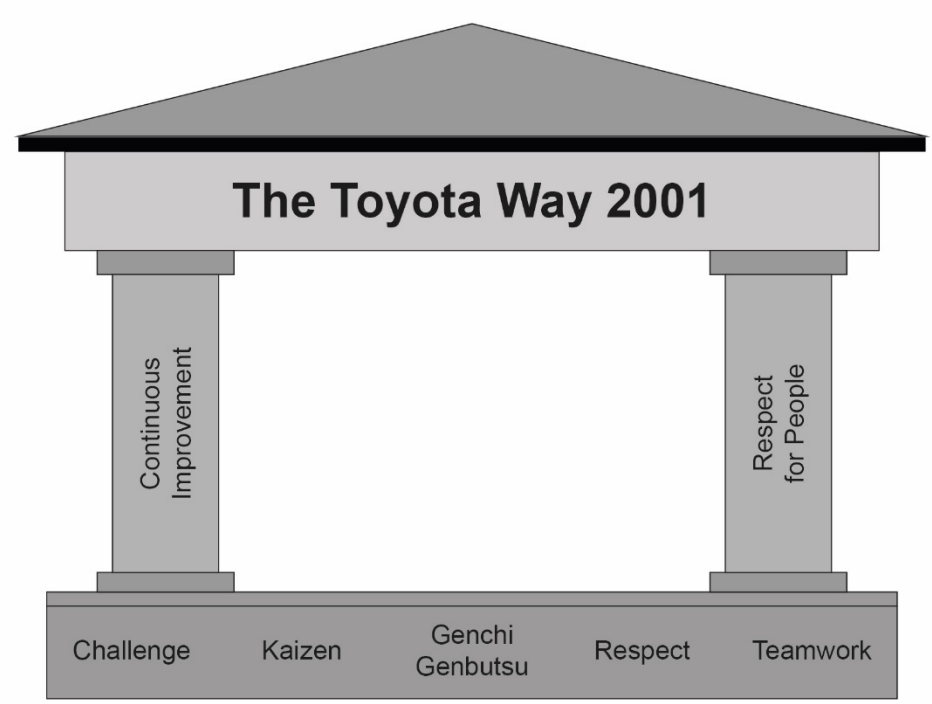

Figure 6: Toyota Way 2001 (Liker and Hoseus, 2008)

Continuous Improvement is built on (Liker and Hoseus, 2008):

- **Challenge**: Identify a long-term vision that meets challenges with courage and creativity to realise dreams.

[3] Japanese term for a machine that stops working as soon as a problem/defect is detected.
[4] It may be described as *intelligent automation* or *automation with a human touch*.

- **Kaizen**: Improve business operations continuously, always striving for innovation and evolution.
- **Genchi genbutsu**[5]: Go to the source to find the facts and to make correct decisions, build consensus, and achieve goals at the best speed.

Respect for People is built on (Liker and Hoseus, 2008):

- **Respect**: Respect each other, make every effort to understand each other, take responsibility, and build mutual trust.
- **Team work**: Stimulate personal and professional growth, share the opportunities of development, and maximise individual and team performance.

In 2004, Jeffrey Liker wrote The Toyota Way: 14 management principles (Liker, 2004), after spending 20 years working in Toyota factories in Japan and the United States. His work reveals the 14 foundational management principles behind the giant automaker's world-famous production system. Liker (2004) groups the 14 principles into four categories: philosophy, process, people and partners, and problem-solving, from here the name, 4P-model (Figure 7).

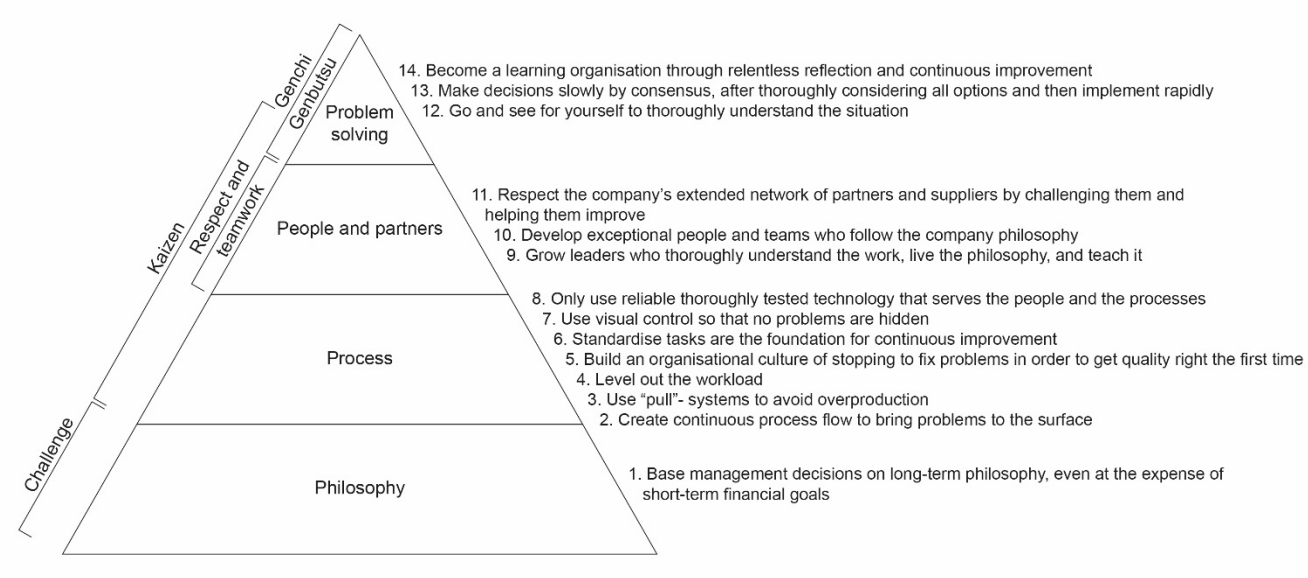

Figure 7: Liker's 4P model, including the 5 high-level principles from the Toyota Way 2001

At the same time that Liker (2004) wrote his book, Toyota released their own internal training document, the *Toyota Way 2001*. Until then, there was no written record of this concept. It was simply

[5] Japanese term for 'go and see for yourself' to truly understand the situation.

the way things were done in the organisation. New employees gradually became accustomed to the company's culture by means of on-the-job exposure and training (Saruta, 2006). It took almost 10 years of writing and rewriting before the *Toyota Way 2001* was released under the watchful eye of then president Fujio Cho (Liker and Hoseus, 2008). According to Emiliani (2006), the *Toyota Way 2001* is a 13-page document that provides detailed descriptions of the two pillars and reveals explicit and implicit beliefs that have long guided management thinking. Other than this document (which is not publicly available), very few publications give a detailed account of conditions for workers in Toyota's overseas factories. According to Saruta (2006), only introductory work has been attempted, in books such as: *Choosing sides: union and the team concept* (Parker and Slaughter, 1988), *Transplanting the Toyota culture* (Besser, 1996) and *Remade in America* (Liker et al., 1999).

	Toyota Way 2001		**The Toyota Way (Liker, 2004)**
	Two pillars	**Five foundational principles**	**Fourteen management principles**
The Toyota Way	Continuous Improvement	Challenge	1. Long-term philosophy
		Kaizen	2. Create flow
			3. Use a pull system
			4. Level out the workload
			5. Stop and fix the problem
			6. Standardise tasks
			7. Use visual control
			8. Use reliable, tested technology
			14. Continual organisational learning through kaizen
	Respect for people	Genchi genbutsu	12. Go and see for yourself to understand the situation
			13. Make decisions slowly by consensus
		Respect	9. Grow leaders who live the philosophy
			11. Respect, challenge and help your suppliers
		Teamwork	10. Respect, develop and challenge your people and teams

Figure 8: Summary of the 14 Toyota Way management principles with reference to the two pillars of the Toyota Way house and the five foundational principles

In conclusion, the Toyota Way can be explained and summarised by means of the two pillars (of the Toyota Way house), the five foundational principles (of the Toyota Way house), or by Liker's (2004) 14 management principles (Figure 8).

2.2.4 Plan-Do-Study-Act

Toyota took to heart the quality and productivity teaching of the American quality pioneer, Dr W. Edward Deming. Dr Deming encouraged the Japanese to adopt a systematic approach to problem-solving by means of the Plan-Do-Study-Act (PDSA) cycle. The PDSA cycle was presented by Dr Deming during his four-day seminars in the 1980s (Langley et al., 2009) and became a corner stone of continuous improvement at Toyota (Liker, 2004).

Note: Deming frequently warned audiences that the plan, do, *check* (as opposed to study), and act version is inaccurate because the English word "check" means "to hold back" (Langford et al., 2008).

The PDSA cycle, according to Deming, consists of the following phases:

Plan – Plan a change or test, aimed at improvement. This should include the who, where, when, what and how of the change.

Do – Carry out the change or test (preferably on a small scale). The key to successful implementation of a change is to be ready to learn from the unexpected results of the implementation as well as the planned ones.

Study – Study the results. What was learned? What went wrong? Summarise these findings. The word study implies that the focus in this phase is to create knowledge. It is not enough to determine that a change resulted in an improvement. One, should also learn enough to be able to predict in the future whether a change will lead to an improvement in different conditions.

Act – Adopt the change, abandon it, or run through the cycle again. Decide what actions are warranted based on what was learned from the implementation. The action might be to implement the change, refine the change or to abandon the change and look for other improvement ideas.

However, according to Liker (2004), groundwork should be done before the PDSA process is followed. A thorough understanding of the current situation, the values, expectations, policies, and the reason for the current situation, etc. is required. Once this groundwork has been done, the organisation is ready for the Deming cycle's steps. It seems like Langley et al. (2009) agreed with this way of thinking when they wrote, *The improvement guide: a practical guide to enhancing organisational performance*.

The model depicted in the book, combines the PDSA cycle and the following set of questions that drive all improvements (Langley et al., 2009):

- What are we trying to accomplish?
- How will we know that a change is an improvement?
- What change can we make that will result in improvement?

Together, these three questions and the PDSA cycle became known as the model for improvement (Figure 9).

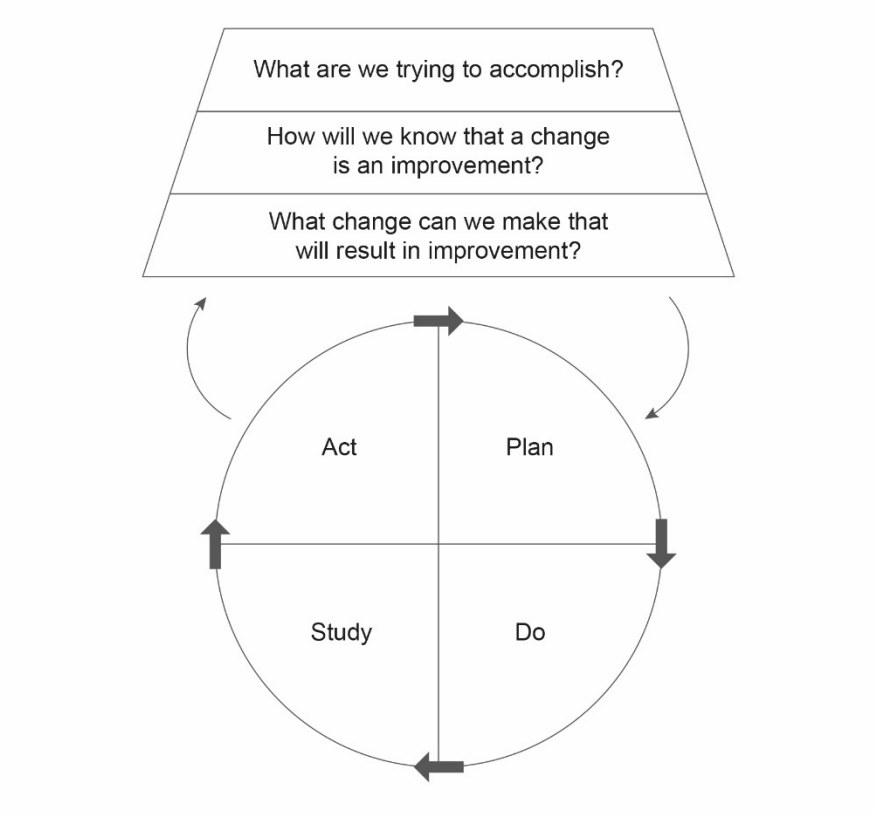

Figure 9: The improvement cycle (Langley et al., 2009)

There seems to be further correlation between the TPS and the PDSA cycle. Liker (2004) explains that the TPS itself "embodies the learning cycle of Plan-Do-Check-Act". It resembles creating one-piece flow, identifying problems, creating counter-measures and evaluating results. An effective learning organisation uses these methods to check if the counter measures have been effective and then reduces inventory for more problems to surface.

2.2.5 Respect for people

Achieving lean production is a long and essentially a constant process of change during which participants must continuously manage and undergo changes. The implementation is accompanied by radical changes from the beginning (Losonci et al., 2011). Despite a tacit understanding that the change will ultimately be beneficial, employees are often suspicious and hesitant in their behaviour towards the proposed change. The concern is, for example, that people must take on new tasks, develop new skills or are transferred, re-graded or retrained. Once the change emerges, these people must learn to cope as individuals (Carnall, 1991).

Taiichi Ohno (Ohno, 1988), the designer of the TPS, realised the importance of including people in achieving continuous improvement when he created "the second, and equally important pillar, namely *respect for people*" in his book, *Toyota Production System: beyond large-scale production*. Similarly, Fujio Cho, Toyota's former chairman, emphasises the focus on people in the following famous statement (Liker, 2004):

First, we build people, then we build cars.

Referring to the Toyota Way 2001 house, it is clear from the pillars of the house that 'Continuous Improvement' cannot be done without 'Respect for People'. It could be said that trying to implement lean manufacturing within an organisation without simultaneously focusing on both these pillars, will not produce the desired outcome. Trying to implement any continuous improvement initiative without incorporating aspects that show respect for the people who have to undergo the change, will simply not deliver the required results.

Oppenheim et al. (2011) summarise RFP as follows:

> *Respect is trust, honesty, empowerment, teamwork, stability, motivation, drive for excellence, and healthy hiring and promotion policies. It calls for a vision which draws and inspires the best people and promotes such excellent human relations. It promotes a learning environment. Finally, it calls for treating people as the most valued assets, not as commodities.*

2.2.6 Barriers to lean implementation

The available literature reveals barriers hindering the adoption of lean principles in an organisation, namely insufficient commitment from management (Sim and Rogers, 2008) and a lack of coaching (Sim and Rogers, 2008), communication and support from management (Sim and Rogers, 2008; Turesky and Connell, 2010; Losonci et al., 2011). Employees do not feel valued, although they are the ones who are in the best position to offer suggestions for improving the efficiency of the processes (Sim and Rogers, 2008). Employees furthermore feel that there is a lack of training and development support (Sim and Rogers, 2008; Turesky and Connell, 2010; Shang and Pheng, 2014). In general, workers have a lack of available time for the improvement, since they are busy with their day job (Melton, 2005). Employees are also sceptical about being adequately rewarded when they do support CI initiatives (Sim and Rogers, 2008). Managers, on the other hand, have concerns about the regulatory compliance such as safety, quality, etc. (Melton, 2005). But most importantly, companies are failing badly in providing job security for their employees. The workers are not convinced that their jobs are secured if they help or support the lean implementation programme (Sim and Rogers, 2008; Bhasin, 2012b). Organisations do not depict a homogeneous culture and there are usually various sub-cultures that emerge as a source of conflict when attempting to implement lean manufacturing (Bhasin, 2012b). There is also resistance to change due to the scepticism about the validity of the lean philosophy (Melton, 2005). Workers do not buy into the change because they see it as just another improvement initiative that will blow over: “We’ve seen this before” (Melton, 2005). The resistance to change is also increased by the fact that workers have been doing things in a certain way for long periods of time (Melton, 2005).

2.3 Human factors

Achieving lean production is a long and continuous process of change during which participants must continuously manage and undergo changes. Its implementation is accompanied by radical changes from the beginning (Losonci et al., 2011). This section discusses prevailing change management theories, Hayes and Hyde's (2014) model of the emotional transition phases during a change, Carnall's coping cycle during change and motivation theories.

2.3.1 Change management theories

According to Fritzenchaft (2013), Lewin's field theory states that any level of behaviour is maintained by a condition of quasi-stationary equilibrium, a force field comprising a balance of forces pushing for and resisting change. The level of behaviour can be changed by either increasing the forces pushing for change or by decreasing the forces opposing the change. Both approaches can result in change, but according to Lewin, the secondary effects associated with the approaches are different.

In the cases where change is induced by increasing the forces pushing for change, the result is an increase in tension. If this rises above a certain level, it may be accompanied by high aggressiveness (especially towards the source of the increased pressure for change), high emotionality and low levels of constructive behaviour. This can trigger a reactive sequence that challenges the change agent's intention. On the other hand, with a change brought on by a diminishing of the forces that oppose or resist change, the secondary effect is a state of relatively low tension.

Lewin's field theory led him to advocate for an approach to managing change that rather focusses on the importance of reducing the restraining forces (a pull strategy) instead of increasing the pushing forces (a push strategy). He argues that this approach is more likely to increase commitment and could result in a more permanent change.

Lewin suggests that successful change requires a three-step process that involves unfreezing, moving and refreezing. Unfreezing involves destabilising the balance of driving and restraining forces. The second phase, movement, is where the balance between the driving and restraining forces are modified to shift the equilibrium to a new level. Refreezing involves reinforcing new behaviour to maintain new levels of performance and avoid regression. The feedback that signals the effectiveness and consistency of new behaviours and incentives that reward new levels of performance can help embed new practices.

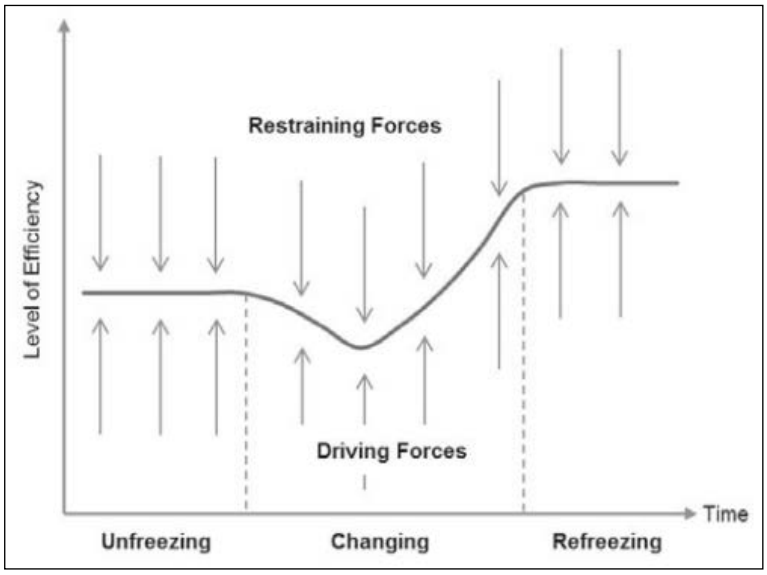

Figure 10: Lewin's three-step change model (Fritzenschaft, 2013)

In an attempt to help people cope with change, different change management models have been developed in addition to Lewin's model. These include commandments for executing change (Kanter et al., 1992), ADKAR (Hiatt, 2006), the eight-stage process for successful organisational transformation (Kotter, 1995), Luecke's seven steps (Luecke, 2003), key steps in the change process (Hayes, 2014), twelve success factors in the change process (Marit Gerkhardt and Fischer, 2008), and the four-phase model of planned change (Bullock and Batten, 1985).

These change management models are summarised in Table 2. The numbers in each column indicate the original order in which the model was developed. In the second column, the order of the steps is changed to compare the different models according to common themes.

Table 2 shows that the steps of the different change models can easily be grouped into the three steps of Lewin's model. Furthermore, there are specific steps that are included in at least five of the seven models (shaded in the table for easy recognition):

1. Analysing the need for change
2. Creating/defining the vision
3. Identifying leadership
4. Planning
5. Enabling people and structures
6. Incorporating changes

Table 2: Comparing change management strategies. Adapted from By (2005)

Lewin's 3-step process		Kanter et al.'s 10 commandments for executing change [5]	ADKAR [6]	Kotter's eight-stage process for successful organisational transformation [5]	Luecke's seven steps [5]	Hayes's key steps in the change process [7]	Gerkhardt's twelve success factors in change processes [8]	Bullock and Batten's four-phase model of planned change [5]
Unfreezing	Analysing	1. Analyse the organisation and its need for change	1.Awareness		1. Mobilise energy and commitment through joint identification of business problems and their solutions	1. Recognising the need to change and starting the change process	1. Shared problem awareness 2. Comprehensive diagnosis	1. Exploration – verifying the need for change and securing the required resources
	Vision	2. Create a vision and common direction 3. Separate from the past		3. Creating a vision	2. Develop a shared vision of how to organise and manage for competitiveness	2. Diagnosing what needs to be changed and formulating the vision of a preferred future state	4. Defining the vision and objectives	
	Urgency	4. Create a sense of urgency	2.Desire	1. Establish a sense of urgency				

Movement	**Leadership**	5. Support a strong leader role 6. Line up political sponsorship		2. Forming a powerful guiding coalition	3. Identify the leadership	6. Leading and managing the people issues	3. Management coalition 5. Project organisation and responsibilities	
	Planning	7. Craft an implementation plan		6. Planning for and creating short-term wins		3. Planning how to intervene in order to achieve the desired change.	6. Time management	2. Planning - done by key decision makers and technical experts and signed off by management.
	Implementation				5. Start change at the periphery, then let it spread to other units without pushing it from the top	4. Implementing plans and reviewing progress		3. Actions - carried out according to the plan from the previous phase with feedback mechanisms for re-planning as required
	Enabling	8. Develop enabling structures	4.Ability 3.Knowledge	5. Empowering others to act on the vision		7. Learning	7. Helping people to help themselves, training and resources	

	Communication	9. Communicate, involve people and be honest		4.Communicating the vision			8. Communication	
Refreezing	**Monitoring**				7. Monitor and adjust strategies in response to problems in the change process		9. Monitoring	
	Incorporating	10. Reinforce and institutionalise change	5.Reinforcement	7. Consolidating improvements and producing more change 8.Institutionalising new approaches	6. Institutionalise success through formal policies, systems and structures	5. Sustaining the change	12. Cementing the change 11. Flexibility in the process	4. Incorporating – e.g. in company policies.
	Misc.				4. Focus on results, not on activities		10. Initial success and motivation	

2.3.2 Emotional transition phases during change

One of the key points for a successful change is the understanding of how people and organisations perceive changes when exposed to a transitional environment (McAllaster, 2004). Carnell already mentioned in 1991 that “when implementing a change, the real barriers are within the individual’s perceptions, skills and capacity to tolerate ambiguity”. When these factors are not taken into consideration, people become resistant to the change, which makes implementing continuous improvement projects – such as lean manufacturing - very challenging. Carnell (1991) also states that effective change leaders understand the way that individuals react to change and use it to ease the process.

Lean implementation is considered a continuous improvement philosophy and therefore depends heavily on people’s continuous flexibility and involvement (Biazzo and Panizzolo, 2000). The assessment of the success of a lean implementation is usually restricted to measuring operational and financial performances. What employees actually perceive, think and feel – the human aspect – has received less attention (Melton, 2005).

The psychological impact of implementing a change such as lean manufacturing is well-known. Established theories describe the journey through different emotions; from anxiety, uncertainty, resistance, stress and eventually acceptance (Lewin, 1951; Kotter, 1995; Todnem By, 2005; Marit Gerkhardt and Fischer, 2008; Hayes, 2014). Even the people managing the change or people who are fully committed to the change may experience negative emotions, such as stress (Carnall, 1991).

Salovey and Mayer (2009) view emotions as "organised responses, crossing the boundaries of many psychological subsystems, including physiological, cognitive, motivational and experiential systems". Emotions typically arise in response to an event, either internal or external, that has a positive or negative valence meaning for the individual".

Hayes and Hyde’s (2014) model explains the different emotional phases that people go through when introduced to a change and how this influences their self-efficacy (Figure 11).

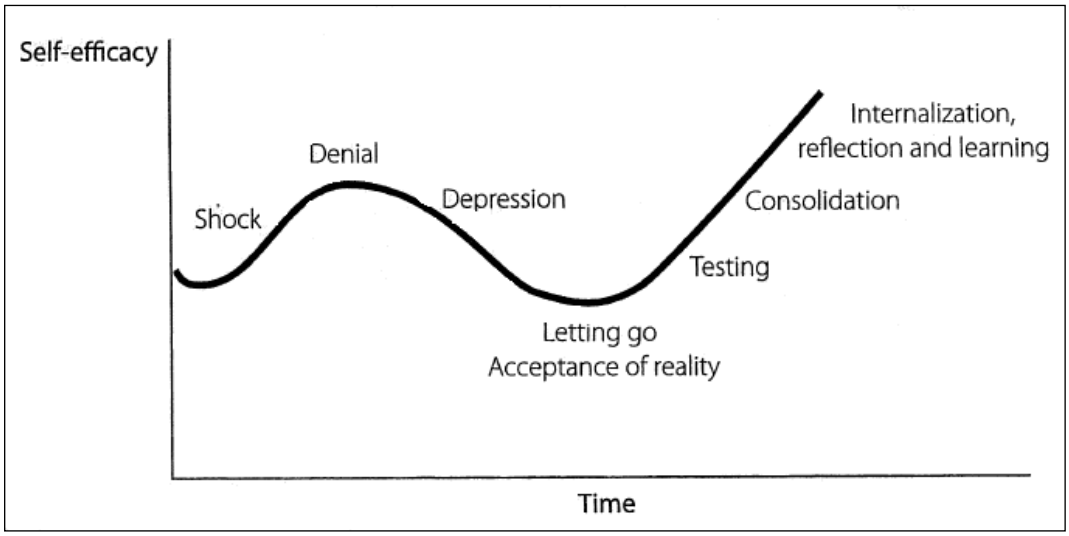

Figure 11: Transitions phases (Hayes, 2014)

When people are introduced to a change with little warning, they often experience the first phase as *shock* and they might even feel overwhelmed and paralysed, combined with feelings of anxiety and panic. Once people have moved passed the initial shock phase, they move to the phase of *denial* by retreating from the change. All energy and activities are devoted to the familiar by clinging to the past and refusing to consider the need for change. Resistance to change is the highest during this phase. The reality of the change becomes apparent and this provokes *depression*, characterised by anger, sadness, withdrawal and confusion. This depressed mood occurs even during voluntary changes whenever practical difficulties are experienced. During the next phase, there is a clear *letting go* of the past by accepting the reality for what it is. This is seen as the turning point of the tide. New ways of behaving are being tried and *tested* by becoming more active, creative and involved. If these new behaviours are not successful, feelings of anger and irritability may occur. If they are successful, the phase will gradually lead to the next one. Gradually, the new behaviour comes to be accepted as the norm. When this *consolidation* occurs, it involves reflection on the new experiences and using any learning to build on this. The change is complete when the changed behaviour has become the norm and happens subconsciously. This is called the *internalisation, reflection and learning* phase.

When implementing a change such as lean manufacturing, it is thus important to be aware of the emotions that workers will experience. According to Salovey and Mayer (1990), when people approach life tasks with emotional intelligence, they should be at an advantage for solving problems adaptively. Having framed a problem in the workplace, these individuals may be more creative and flexible in arriving at possible alternatives to problems. They will have a greater tendency to integrate

emotional considerations when choosing among alternatives. "Such an approach will lead to behaviours that are considered and *respectful* of the internal experience of themselves and others".

2.3.3 Coping cycle during change

The coping cycle (Figure 12) discussed by Carnall (1991) is very similar to that of Hayes and Hyde in Figure 11, but it also includes an indication of the worker's performance and self-esteem during these different phases of emotions that the worker experiences.

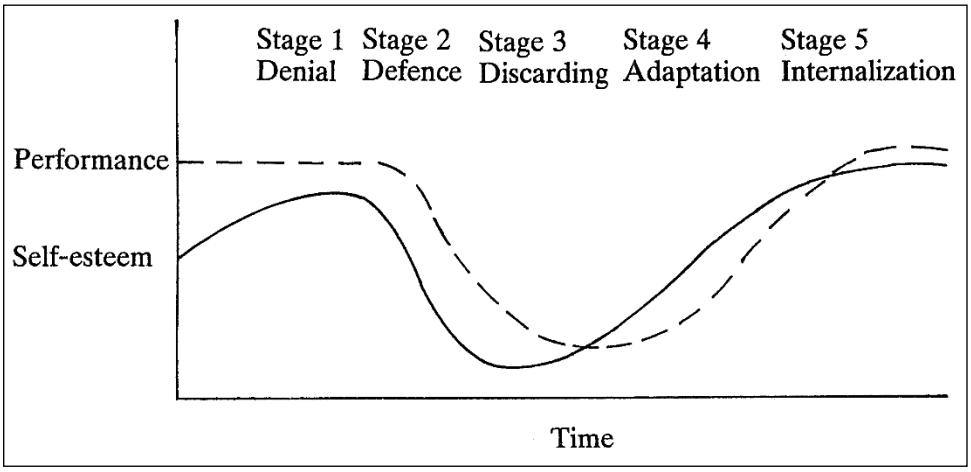

Figure 12: The coping cycle [2]

Self-esteem and performance vary during the process, initially declining, and then growing again. Carnall (1991) emphasises that people do not go through these stages neatly, nor do all go through them at the same time or at the same rate. Some may not even go beyond the denial of change.

The five stages of the coping cycle are briefly described as follows (Carnall, 1991):

- **Stage 1: Denial –** When people are faced with possible change, they will suddenly start defending the present circumstances, often the same situations that they have previously complained about. Even if self-esteem does increase, it is unlikely that performance will increase, either because there are systems in place that may hold back performance, or the discussions of the approaching change is absorbing energy.
- **Stage 2: Defence –** People will start to defend their job, the way they have been doing things and why the change is not possible for or applicable to them.
- **Stage 3: Discarding –** The previous stages were focussed on the past, but now a process of discarding arrives. People begin to let go of the past and look forward to the future. Only now

is it possible for optimistic feelings to emerge and people will start to talk openly and constructively about the new system. They will even ask questions, start solving problems, take initiative and demonstrate some leadership, all of which is an indication of acceptance. Thus, self-esteem starts to improve.

- **Stage 4: Adaptation –** During this phase a process of adaptation begins. Individuals will start to test the new situation and themselves, trying out new behaviours, working to different standards and working out ways to cope with the changes. Thus, the individual learns and adapts, they make progress while their self-esteem increases.
- **Stage 5: Internalisation –** During this phase the "new" behaviour is becoming the "normal" behaviour. The people involved have created a new system, process and organisation, together with new relationships. This is a cognitive process through which people make sense of what has happened while their self-esteem continuous to increase.

In a period of change, individuals' performance and self-esteem can be increased by providing the following [2]: (a) intelligible information in order to process the change, (b) new skills development for the new situation, (c) support to assist them with dealing with problems and to encourage them to try new systems, and most of all (d), people need to be treated with empathy.

Individuals can only go over to action once they have achieved the desired amount of self-esteem and knowledge (Figure 13).

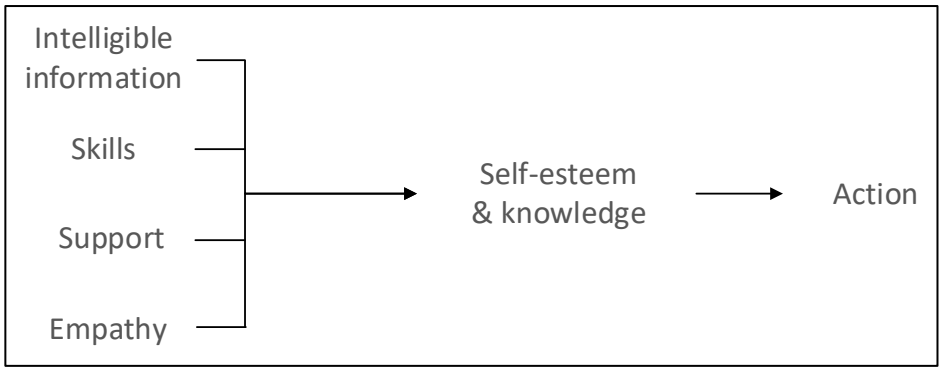

Figure 13: Rebuilding self-esteem [2]

2.3.4 Motivation theories

The Toyota Way incorporates different motivation theories to accommodate employees' different inherent preferences (Liker, 2014). Maslow's need hierarchy and Hertzberg' job enrichment theory assume people are primarily motivated internally – the intrinsic characteristics of the job itself

motivates them to work hard and do quality work. Taylor's scientific management, behaviour modification and goal setting assume that people are driven by external factors – rewards, punishment, and measurement towards goals. Both the internal and external motivation theories are briefly discussed:

2.3.4.1 Maslow's need hierarchy

When people's basic needs are satisfied, they are motivated (Maslow, 1954). Higher levels of motivation follow on the reinforcement of self-esteem (feeling good about oneself) and self-actualisation (doing things that improve oneself as a person). People can, however, only work on higher-level needs when their lower-level needs have been satisfied, for example physiological needs (having enough to eat), safety and security (feeling safe from harm) and social approval (feeling that one is accepted by people that one cares about).

According to Liker (2014), the Toyota Way addresses these needs by proving job security, safe working environment, challenging working situation to build self-confidence, etc.

2.3.4.2 Herzberg's job enrichment theory

The absence of fulfilment of lower level needs will cause dissatisfaction, but it is also true that providing a person with more and more of these will not motivate him/her in a positive way. If an employer really wants to motivate employees, they have to go beyond basic needs and enrich jobs so that the employees are "intrinsically" motivated. People who perform tasks therefore need feedback on how they are doing. They have to perform an entire piece of work so that they can identify with the product of their work. They also have a degree of independence. The Toyota Way provides production lines that improve job enrichment by including for example job rotation, various kinds of feedback, the andon systems and work group autonomy over tasks (Liker, 2014).

2.3.4.3 Taylor's scientific management

Taylorism is the ultimate form of external motivation. This view holds that people only come to work to make money. It follows that one motivates employees by providing them with clear standards, teaching them the most effective way to achieve these standards, and then giving them bonuses when they exceed the standards. These standards, however, should be set in terms of quantity, not quality (Bassett-Jones and Lloyd, 2005). The Toyota Way encourages standardisation of task, but also the continuous improvement of these standards (Liker, 2014)

2.3.4.4 Behaviour modification

This approach entails that rewards and punishments are used to motivate employees. There are many things that people find rewarding and punishing that are not connected to money. Examples are praise from a supervisor or winning an award. It is important that the positive or negative reinforcement comes as quickly as possible after the action has been completed (Liker, 2014). The TPS system of continuous flow and the andon system is ideal for behavioural modification since the feedback is so rapid (Liker, 2014)

2.3.4.5 Goal-setting

People are motivated by challenging, but attainable goals. They want to be judged according to their progress towards these goals. Visual management and policy deployment according to the Toyota Way mean that teams always know how they are doing and are working towards continuous improvement targets (Liker, 2014)

2.4 Research design

The research method chosen to conduct this research is embedded in the design science research paradigm. The elaborated action design research method was used, and the final artefact was verified and validated by means of the Delphi technique. These research methods are explained the section that follows.

2.4.1 Design science research

Design science research (DSR) is a problem-solving paradigm that seeks to enhance human knowledge by creating innovative artefacts (Hevner et al., 2004). DSR is also a prominent form of engaged scholarship in which multiple key stakeholders (researchers, users, practitioners, etc.) collaborate to understand and address an important, complex problem/opportunity (Van de Ven, 2007).

It is mandatory for researchers to gain knowledge that aids in the development and improvement of organisational excellence. It could be argued that acquiring such information involves two complementary but distinct paradigms — behaviour sciences and design sciences (March and Smith, 1995).

The behaviour sciences has its roots in natural science research methods (Hevner et al., 2004). It seeks to develop and justify theories (principles and laws) that explain or predict organisational and human phenomena surrounding the analysis, design, implementation, management, and use of information systems.

On the other hand, the design science paradigm has its roots in engineering and the sciences of the artificial (Simon, 1996). An artefact is seen as a human-made object or any object or process resulting from human activity. The word derives from the Latin words *ars* (skill) and *facio* (to make) (Walls et al., 2004).

Design science is fundamentally a problem-solving paradigm, seeking innovations that define the ideas, practices, technical capabilities, and products through which the analysis, design, implementation, management and use of systems can be effectively and efficiently accomplished (Hevner et al., 2004). However, such artefacts are not exempt from natural laws or behaviour theories. Their creation relies on existing *kernel theories* that are applied, tested, modified and extended by the experience, creativity, intuition, and problem solving capabilities of the researcher (Markus et al., 2002; Hevner et al., 2004; Walls et al., 2004).

Hevner et al. (2004) argue that for research to make significant contributions, researchers should use the complimentary research cycle that design science and behavioural science share to address fundamental problems. Hevner et al. (2004) elaborate further by stating that truth (justifying theory) and utility (artefacts that are effective) are two sides of the same coin. Scientific research should therefore be evaluated in the light of the practical implications.

Design science research is a lens or set of synthetic and analytical techniques and perspectives (complementing positivist, interpretivist, and critical perspectives) for performing such research. Design science research consists of two primary activities, namely (1) the creation of new knowledge through design of novel or innovative artefacts; and (2) the analysis of the artefact's use and/or performance with reflection and abstraction (Kuechler and Vaishnavi, 2008)

The knowledge academic management research produces can be of a descriptive or prescriptive nature. In the first case, a given organisational phenomenon is described and possibly explained in terms of some independent variable. Generally, the development of descriptive knowledge is theory-driven, focussing on existing situations.

On the other hand, the development of prescriptive knowledge is rather field-driven and solution oriented, describing and analysing alternative courses of action in dealing with certain organisational problems (Van Aken, 2005). While natural and social science theories are descriptive, design theories are considered prescriptive (Walls et al., 2004). Gregor and Hevner (2013) summarise prescriptive knowledge as knowledge concerning artefacts designed by humans to improve the natural world.

The goal of scientific theory is to understand or predict natural phenomena. The purpose of design theory is to guide artefact creation. Natural science is concerned with explaining how and why things are, while design sciences are concerned with developing artefacts with a specific goal (March and Smith, 1995).

DSR differs from traditional research in that it focusses on learning through design, i.e. the construction of artefacts (Kuechler and Vaishnavi, 2008). The DSR paradigm constitutes a series of rigorous activities involved in designing, evaluating and communicating artefacts used to solve organisational problems (Hevner et al., 2004; Peffers et al., 2014).

Hevner et al. (2004) explain that in order to achieve a true understanding and appreciation of design science, an important dichotomy must be understood. Design is both a process (set of activities) and a product (artefact). It describes the world as acted upon (processes) and the world as sensed (artefacts). The perspective continually shifts between the design processes and designed artefacts

for the same complex problem. The design process is therefore a sequence of expert activities that produces an innovative product (the artefact). The artefact in turn provides feedback and a better understanding of the original problem. This feedback helps the researcher improve the quality of the artefact and the design process. This feedback loop (build / evaluate) is followed a number of times before the final design artefact is generated (Markus et al., 2002).

The designed artefact can fall into one of the following categories (Hevner et al., 2004): (1) constructs — providing the language in which problems and solutions are defined; (2) models — used to represent the real world problem and its solution space; (3) methods — used to define processes that provide guidance in how to solve problems and how to search the solution space; and (4) instantiations — demonstrating feasibility, enabling concrete assessment of an artefact's suitability to its intended purpose.

Figure 14 presents a research framework for executing and evaluating design science research, combining behaviour science and design science. Figure 14 also indicates the following three inherent research cycles (Hevner, 2007):

- **Relevance cycle** — Bridges the contextual environment of the research project with the design science activities.
- **Rigour cycle** — Connects the design science activities with the knowledge base of the scientific foundations, experiences and expertise that informs the research project.
- **Design cycle** — Iterates between the core activities of building and evaluating the design artefact and processes of the research.

The following sections elaborates further on each of the cycles.

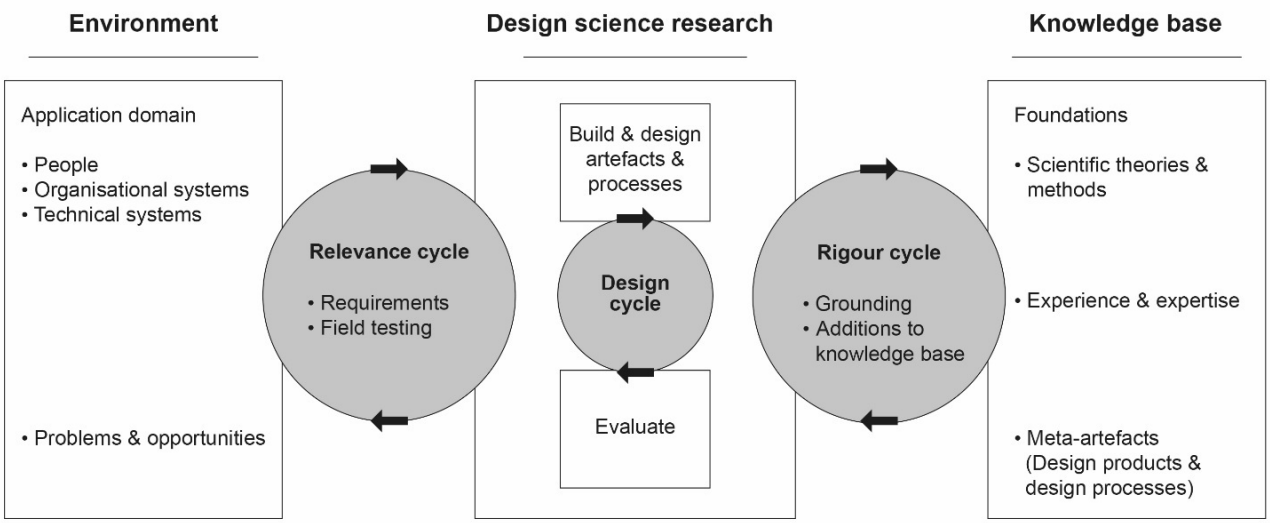

Figure 14: Design science research framework (Hevner, 2007)

2.4.1.1 The relevance cycle

The environment defines the problem space (Simon, 1996) in which the research question lies. The desire to improve this environment by means of new and innovative artefacts and processes is what drives DSR (Simon, 1996). This application domain consists of people, organisational systems and technical systems that interact with each other towards the goal. “Good design science often begins by identifying and representing opportunities and problems in an actual application environment” (Hevner, 2007).

Therefore, the relevance cycle initiates design science research with an application context that provides the requirements for research and the acceptance criteria for the research results.

The output of the DSR study should be returned to the relevance cycle for study and evaluation in the application domain (e.g. by means of a field testing). These results will determine whether additional iterations of the relevance cycle are needed (Hevner, 2007).

2.4.1.2 The rigour cycle

The rigour cycle provides past knowledge to the research project to ensure its innovation. This knowledge takes the form of experiences and expertise that define the state-of-the-art in the application domain and in existing artefacts and processes. The researchers are liable to thoroughly research and reference the knowledge base in order to prove that the designs are novel research contributions (as opposed to routine designs based on well-known processes).

Furthermore, Hevner (2007) explains that it is often difficult to find kernel theories for the creative activities of design research. He argues that to insist that design research must be grounded in descriptive theories is unrealistic and even harmful to the field. Hevner (2007) rather prefers the identification of different sources of ideas for the grounding of DSR, e.g. opportunities/problems from the relevance cycle, existing artefacts, analogies/metaphors and theories, as well as creative insights.

The output of this cycle (additions to the knowledge base) could include any extensions to the original theories and methods, new meta-artefacts (design products and processes), and all experiences gained from field-testing the artefact in the application environment (Hevner, 2007).

2.4.1.3 The design cycle

Hevner (2007) points out that the internal design cycle is the heart of any DSR project. The cycle iterates between the construction of the artefact, its evaluation and the feedback to refine the design further. As explained above, the relevance cycle provides the requirements, whereas the design and evaluation theories and methods are drawn from the rigour cycle. It is therefore important to understand the dependency of the design cycle on the other two cycles, while also realising its relative independence during the actual execution of the research.

2.4.2 Action design research (ADR)

Action design research (ADR) is a research method for generating prescriptive design knowledge by building and evaluating artefacts (Sein et al., 2011). The method addresses two challenges: (1) addressing a problem situation encountered in a specific organisational setting by intervening and evaluating; and (2) constructing and evaluating an artefact that addresses the class of problems typified by the encountered situation (Sein et al., 2011). This leads to the building, intervention and evaluation of an artefact that reflects the theoretical forerunners and intent of the researchers, as well as the influence of the users and ongoing use in the intended context (Sein et al., 2011).

ADR therefore aims at building innovative artefacts in an organisational context and learning from the intervention while addressing a problematic situation (Hevner et al., 2004; Sein et al., 2011). ADR furthermore stresses the influence of the relevance cycle (explained in Section 0) by providing guidance for combining building, intervention and evaluation in a concerted research effort (Sein et al., 2011). ADR is conducted in four phases (discussed below) that are founded in certain principles (Figure 15).

2.4.2.1 Stage 1 – Problem formulation

A problem perceived in practice or anticipated by researchers motivates the formulation of the research (Sein et al., 2011).

- **Principle 1: Practice-inspired research** — Field problems should be viewed as knowledge-creating opportunities.
- **Principle 2: Theory-ingrained artefacts** — The artefacts created and evaluated by the ADR method should be informed by theories.

2.4.2.2 Stage 2 – Building, intervention and evaluation

A platform for generating the initial design of the artefact is created by using the problem definition and theory developed in Stage 1. During this stage the building of the artefact, the intervention of the organisation, and the evaluation interlinks (Sein et al., 2011).

- **Principle 3: Reciprocal shaping** — The artefact and the organisational context should exert inseparable, equal forces.
- **Principle 4: Mutually influential roles** — Mutual learning should take place among the different project participants. Researchers provide knowledge of theory and technological advances, while practitioners bring practical hypotheses and knowledge of organisational work practices.
- **Principle 5: Authentic and concurrent evaluation** — Evaluation should not be a separate stage of the research process that follows the building stage, it should rather form part of the build stage.

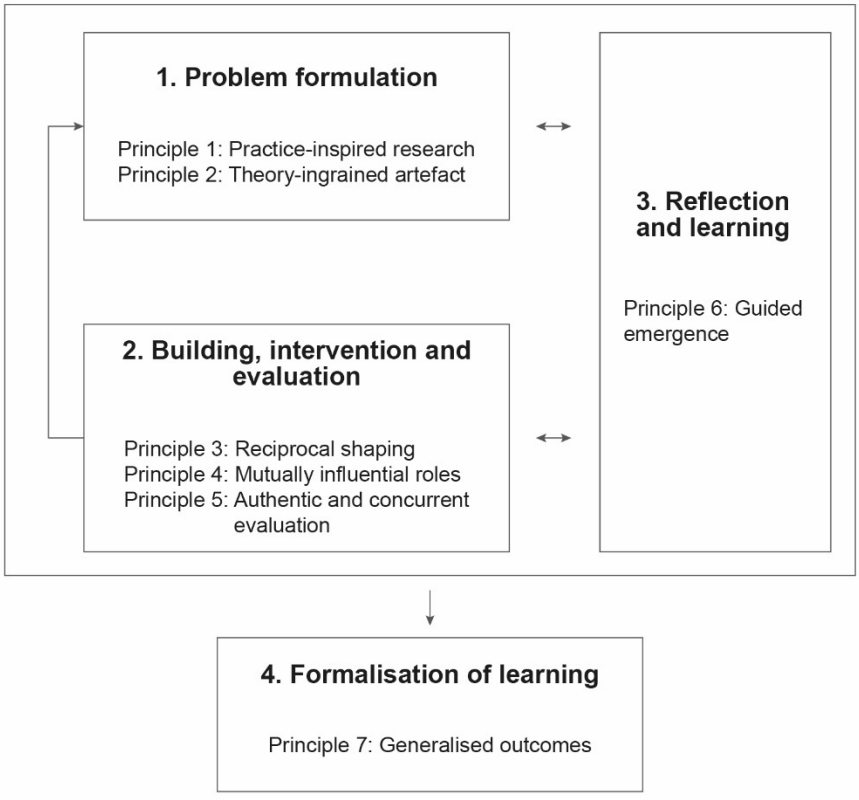

Figure 15: The action design research (ADR) method and principles (Sein et al., 2011)

2.4.2.3 Stage 3 – Reflection and learning

The lessons learnt during the building of the solution in the previous stage, is now applied to a broader class of problems. This continuous stage is parallel to the first two stages. The research process involves more than simply solving problems. Conscious reflection on the problem, theories chosen, and the emerging ensemble is critical to ensure that the solutions contribute to knowledge (Sein et al., 2011).

- **Principle 6: Guided emergence** — The collective artefact should not only reflect the primary design created by the researchers, but also its ongoing shaping through organisational use, perspectives, and participants.

2.4.2.4 Stage 4 – Formalisation of learning

The final stage of ADR is to formalise the learning by outlining the accomplishments and describing the organisational outcomes to formalise the learning (Sein et al., 2011).

- **Principle 7: Generalised outcomes** — Outcomes of the research should be generalised by including the organisational change that took place along with the implementation of the artefact. In other words, move from the specific-and-unique to the generic-and-abstract.

2.4.3 Elaborated action design research (eADR)

The action design research (ADR) method developed by Sein et al. (2011) explained above tends to suggest a single design science research entry point focused on an existing artefact, using an action research cycle from *Problem formulation* (Stage 1) to *Build, intervention and evaluation* (Stage 2) (Mullarkey and Hevner, 2015). However, in some research cases, the possibility exists that there is no artefact in the problem domain studied (Mullarkey and Hevner, 2015). Therefore Mullarkey and Hevner (2015) suggest an *elaborated action design research* (eADR) method that compliments the work of Sein et al. (2011).

In the original ADR method, the first stage consists of two principles, practice-inspired research and theory-ingrained artefact. It therefore assumes the presence of an artefact. However, when an artefact does not exist, an earlier entry point is required were the researcher identifies requisite theory and verifies with practitioners the need for an as yet undesigned innovative artefact (Mullarkey and Hevner, 2015). There is also a need to elaborate and evaluate the principles and features of a proposed artefact.

A second improvement to the original ADR method was to divide the Problem formulation stage into two different stages — *Problem diagnosing* (PD) and *Concept design* (CD) (Mullarkey and Hevner, 2015). There is an emphasis on the *Problem diagnosing and Concept design* processes steps prior to the *Building* and *Implementing* steps (Mullarkey and Hevner, 2015). The method therefore starts with demonstrating the rigorous *Problem diagnosing* stage informed by theory and an expressed need in practice, after which the (added) *Concept design* stage for the rigorous evaluation of design principles and features follows. All of this is required before the *Build* stage.

Furthermore, Mullarkey and Hevner (2015) conclude that *Intervention* and *Evaluation* should occur at every stage (as opposed to only in Stage 2 of the original ADR method). They also emphasise a disciplined reflection and evaluation cycle within the PD and CD stage before the artefact Build stage occurs. Therefore, each stage should have an *Intervention* (I) and an *Evaluation* (E) activity to ensure researcher-practitioner intervention *in situ* to avoid the development of any part of the artefact in isolation from the organisational problem setting (Mullarkey and Hevner, 2015).

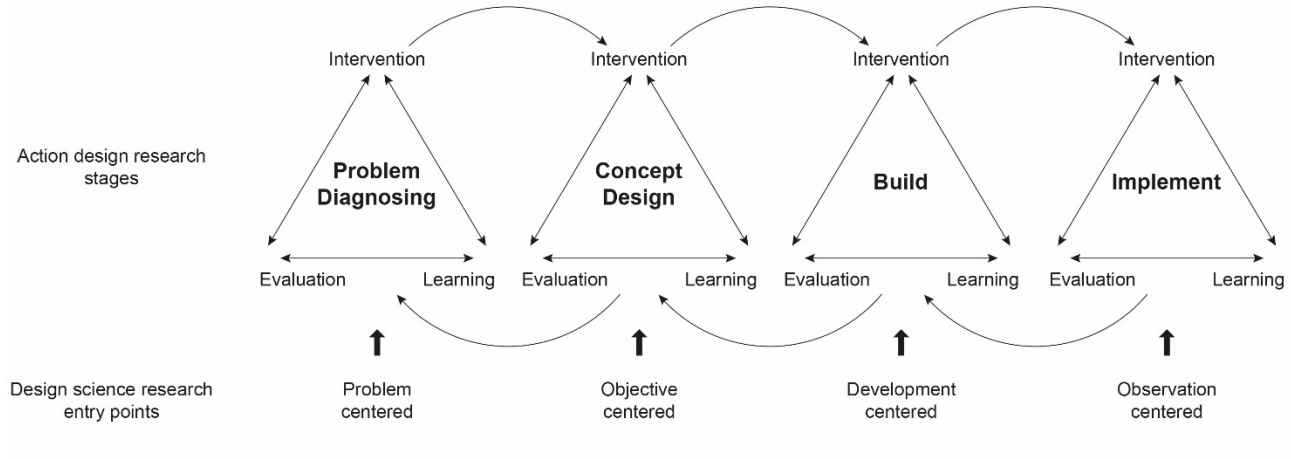

Figure 16: Elaborated ADR (eADR) method identifying DSR entry points (Mullarkey and Hevner, 2015)

Contrary to the model of Sein et al. (2011) where *Formalisation of learning* only occurs after Stages 1, 2, and 3, Mullarkey and Hevner (2015) believe that Learning (L) could also occur as a result of each stage of the ADR method. Learning that informs both researchers and practitioner should be the output from each stage in a robust application of ADR.

Figure 16 provides the elaborated ADR method, showing the iterative process within and between stages with entry points poisoned appropriately along the innovative artefact design continuum (Mullarkey and Hevner, 2015).

Given the additional stages that were added by Mullarkey and Hevner (2015), the eADR method provides researchers the opportunity to enter the research continuum at multiple points. Not every ADR research case, has to enter at the *Problem diagnosing* stage and end at the *Implementation* stage. Researchers and practitioners will inevitably start somewhere along the continuum, often dictated by the realities of the intervention environment, the existing state of the problem domain and the existing paradigm of a given solution class (Mullarkey and Hevner, 2015). They believe that the eADR method can be effective at the earliest possible entry point in the design science research paradigm and proves its value to an iterative, practice-inspired, theory ingrained artefact with research contributions at every stage in the process (Mullarkey and Hevner, 2015).

The goal of the DSR research paradigm is the production of an innovative artefact. The artefact may be the output of any one of the stages described. When performed in adherence to the ADR method, the artefact will be structured as a function of researcher-practitioner intervention in the problem space and be relevant to the problem at that point on the research continuum (Mullarkey and Hevner, 2015). The lessons learned from the iterative evaluation and reflection through intervention can inform both researchers and practitioners and provide a meaningful contribution to both: an artefact that was constructed by means of a rigorous method (Mullarkey and Hevner, 2015).

2.4.4 Delphi technique

Validation is a process during which a judgement is made as to whether a tool is fit for purpose (Nordin et al., 2012). Inglis (2008) suggests six different methods for validating a framework: Review the research and the literature, seek input from an expert panel, undertake empirical research, undertake survey research, conduct pilot projects or draw on case studies.

For the purpose of the research, the input was obtained from a panel of experts by means of the Delphi technique (Linestone and Turoff, 1975), drawing from a validation study done by Nordin et al. (2012). The Delphi method has its origins in the American business community, but has since been widely accepted throughout the world in other industry sectors such as healthcare, defence, education, information technology and engineering (Skulmoski et al., 2007).

The Delphi technique validates the proposed framework by asking a panel of experts to describe what they would do in particular circumstances (Nordin et al., 2012).

> *Delphi may be characterised as a method for structuring a group communication process so that the process is effective in allowing a group of individuals, as a whole, to deal with a complex problem (Linestone and Turoff, 1975).*

It is an iterative process used to collect and distil the judgements of experts using a series of questionnaires interspersed with feedback (Linestone and Turoff, 1975; Skulmoski et al., 2007). Each subsequent questionnaire is developed based on the results from the previous questionnaire. The process stops when the research question is answered, for example when consensus is reached (Skulmoski et al., 2007). Consensus is defined as an agreement between the experts in rating a particular item within a specific round. The minimum percentage of agreement on a particular item is considered as 75% (Nordin et al., 2012).

The number of iteration rounds therefore differs for different studies and depend on when consensus can be reached. According to Skulmonski (2007), two or three rounds are sufficient for most research. However, for a heterogeneous group, three or more rounds might be required.

The method can be applied to problems that do not lend themselves to precise analytical techniques, but could rather benefit from the subjective judgement of individuals on a collective basis and to focus their collective human intelligence on the problem statement (Linestone and Turoff, 1975; Skulmoski et al., 2007).

The Delphi method was chosen for validation based on the following positive characteristics of the technique.

- Although it is similar to a brainstorming session, participants are not influenced and manipulated by other members' seniority and/or dominating personalities, better known as the "bandwagon effect" (Linestone and Turoff, 1975).
- The technique incorporates multiple iterations to develop a consensus of opinions.
- The panel of experts does not need to meet physically (Linestone and Turoff, 1975).
- The Delphi technique is used to investigate what does not exist (Skulmoski et al., 2007), i.e. the proposed framework.
- Since the participants' identities are kept secret from each other, they can freely express their opinions without unnecessary social pressure to conform to the opinions of the rest of the group (Skulmoski et al., 2007).
- The participants are allowed to change/refine their opinions in terms of the group's progress from one round to the next (Skulmoski et al., 2007).

According to Skulmoski (2007), the process of the Delphi technique consists of the following phases, which are described in the subsequent sections:

1. Selection of panel of experts
2. Development of the research question
3. Development of round one questions
4. Develop round two questionnaires
5. Develop round three questionnaires
6. Verifying, generalising and documenting research results

2.4.4.1 Selection of panel of experts

The criteria for selecting the panel of experts are the following (Skulmoski et al., 2007):

- Knowledge and experience with the issues under investigation
- Capacity and willingness to participate
- Sufficient time to participate
- Effective communication skills

According to the study done by Skulmoski and Hartman (2007), the number of research participants can vary between 4 and 171. However, when considering the size of the panel, the researcher must

keep in mind that the representation is assessed by the quality of the panel rather than the number of experts, because the Delphi technique does not call the expert panel to be a representative sample for statistical purposes, but rather selects people for their expert ability to answer the research questions (Nordin et al., 2012) (Skulmoski et al., 2007).

According to Skulmoski et al. (2007), there are no fixed rules when selecting the panel, but the following should be kept in mind:

- If a homogeneous group is used, a smaller sample panel will be sufficient, in contrast with a more heterogeneous group.
- As the sample size increases, there will be a reduction in group error and an increase in decision quality. However, above a certain threshold, managing the process and analysing the data becomes more difficult than the increase in advantages of a bigger sample.
- The larger the group, the more convincingly the results can be verified, and follow-up research is therefore not required.

2.4.4.2 Development of the research questions

The research questions of the particular study are developed to determine the purpose of the study (Skulmoski et al., 2007).

2.4.4.3 Development of Round 1 questions

The research questions are used to develop the first round of questions. Care should be taken to design the questions in such a manner that no ambiguity develops that will cause frustration for the participants (Skulmoski et al., 2007). The questions must be specific, seeking agreement among the participants by means of a Likert scale (Nordin et al., 2012).

2.4.4.4 Development of Round 2 questions

The responses from Round 1 forms the basis for questions of round two (Skulmoski et al., 2007). Participants are first given the opportunity to verify that the Round 1 questions are a true reflection of their opinions. They are then given the opportunity to change or expand their Round 1 responses upon viewing the other participants' responses (Skulmoski et al., 2007). This continuous verification throughout the Delphi process is critical for improving the reliability of the results (Linestone and Turoff, 1975; Skulmoski et al., 2007). Lastly, the participants are expected to answer the Round 2 questions.

2.4.4.5 Development of Round 3 questions

A similar analysis process to Round 2 is followed for Round 3 responses. Round 2 responses are used to develop Round 3 questions. The researcher includes additional questions to verify the previous round's responses, to understand the boundaries of the research and to understand where these results can be extended (Skulmoski et al., 2007). During each subsequent round, the questions become more focused and specific (Skulmoski et al., 2007).

2.4.4.6 Verify, generalise and document research results

As mentioned above the results are verified continuously throughout every round of questions. Finally, the artefact is presented

2.5 Conclusion

This chapter explained the literature and techniques relevant to this study: the lean philosophy , human factors, design science research (DSR), elaborated action design research (eADR) and the Delphi technique. The following chapters explain the application of these techniques.

CHAPTER 3
RESEARCH DESIGN

This chapter explains the research design that was followed for this study. The study was performed within the paradigm of design science research (DSR) by means of the elaborated action design research (eADR) method.

3.1 Introduction

This study addresses the low success rate of lean implementations by designing a people-centred lean implementation model. Given the need for a problem-solving research paradigm that facilitates the development of innovative artefacts, design science research (DSR) was chosen. DSR is also considered a form of research in which multiple stakeholders can collaborate to understand and address the problem (Hevner, 2007). This facilitated the process in which the industry provided input during the development of the new RFP model.

Within the paradigm of DSR, the action design research (ADR) method was considered, since this method addresses two challenges: (1) it addresses the problem situation encountered in the organisational setting; and (2) it constructs and evaluates an artefact that addresses the problem typified by the situation (Sein et al., 2011). However, since the focus of this research was to design a new, innovative artefact (as opposed to evaluating an existing artefact), the *elaborated* action design research (eADR) method was followed (Mullarkey and Hevner, 2015). In such a case, that an artefact does not exist, an earlier point of entry is required were the researcher identifies required theory and verify with practitioners the need for an innovative artefact.

The research continuum was entered at the *Problem Diagnosing* stage, after which four iterative *Concept Design* stages were conducted. Although the eADR method specifies the *Intervention*, *Evaluation* and *Learning* steps in each stage, this study found that there was different emphasis on these steps throughout the *Problem Diagnosing* and *Concept Design* stages. Each of the iterative rounds also had a different “sub”-problem to be solved and a different artefact was produced at the end of each iteration. Thus, the *Problem* and *Artefact* steps were included in each Concept Design iteration. The five iterative cycles that were followed are shown in Figure 17 and explained in the sections to follow.

3.2 Problem Diagnosing – Gap analysis

The purpose of this stage was to investigate the nature of the research problem

- **Problem definition** —The problem (as stated in **Chapter 1**) is, the low lean implementation success rate in South Africa due to the intense focus on tools and techniques at the expense of the human element.
- **Evaluation** — Five lean implementation strategies were reviewed and summarised according to the themes that became evident. A **gap analysis** was performed by analysing the implementation strategies in terms of the Toyota Way management principles.
- **Learning** — The learning that occurred in this stage was published in Article 1 (**Chapter 4**).

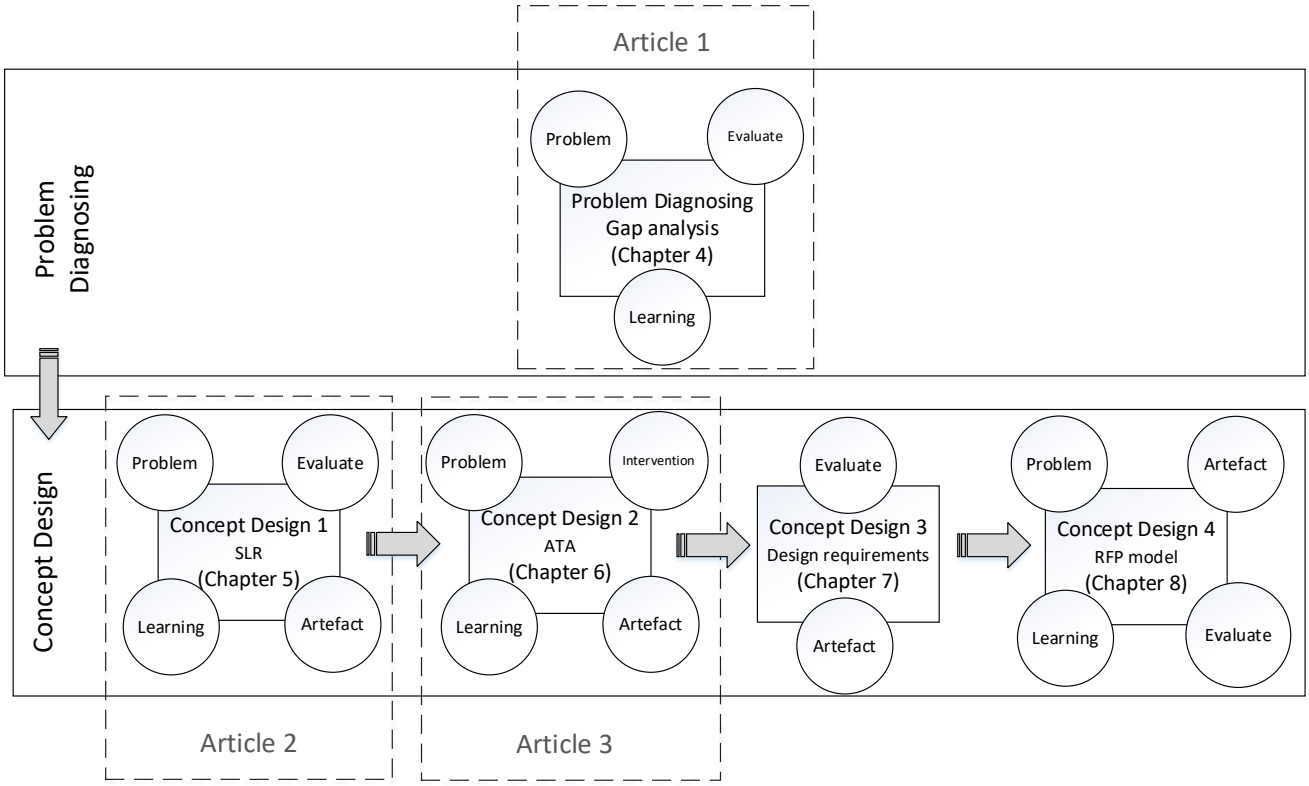

Figure 17: Research design according to the eADR method

3.3 Concept design 1 – Systematic literature review

The aim of this stage was to investigate, report and interpret the true, original meaning of the RFP principles as intended by their creators.

- **Problem definition** — The problem addressed by this stage was that the true, original meaning of *Respect for People* was not clearly defined.
- **Evaluation** — An empirical investigation was performed by means of a **systematic literature review** to determine the original meaning of the RFP principles as intended by the creators.
- **Artefact design** — Two artefacts were developed: the *Respect for People framework* and the conceptual *RFP lean implementation framework.*
- **Learning** — The results and learning that took place during this stage were published in Article 2 (**Chapter 5**)

3.4 Concept design 2 – Applied thematic analysis

The second concept design iteration focused on determining the understanding and applicability of the RFP principles in the South African context.

- **Problem definition** — Limited research has been done on the understanding and applicability of the Japanese RFP principles in the South African context.
- **Intervention** — A second empirical investigation — **an applied thematic analysis** — was conducted by means of an intervention with participants from the industry.
- **Artefact design** — A thematic map of the South African interpretation of the RFP principles was developed and compared to the Japanese RFP interpretation of the RFP principles.
- **Learning** — This method and results of this stage were reported in Article 3 (**Chapter 5**)

3.5 Concept design 3 – Design requirements traceability matrix

The third concept design iteration was used to develop the design requirements for an RFP model for lean implementation.

- **Evaluation** — The following literature was consulted to determine the design requirements:
    - The lean philosophy

  - The RFP themes identified during the systematic literature review (Japanese RFP themes) as well as the RFP themes identified during the applied thematic analysis (South African RFP themes)
  - Literature on the design of implementation framework

- **Artefact design** — Information gathered in the first two concept design iterations and from the abovementioned additional literature sources, was used to develop the **design requirements traceability matrix** (explained in **Chapter 7**).

3.6 Concept design 4 – Respect for People model

The fourth and final concept design iteration was used to develop the Respect for People model for lean implementation.

- **Problem definition** — A people-centred model for lean implementation in the South African context has not been developed.
- **Artefact design** — The **Respect for People model for lean implementation** (RFP model) was designed based on the design requirements traceability matrix from the previous eADR stage. An explanation of the model is provided in **Chapter 8**.
- **Intervention / Evaluation** — The evaluation of the artefact was done by means of the **Delphi technique**, a process used to collect and distil the judgements of experts from the industry. Questionnaires with a five-point Likert scale (strongly disagree, disagree, I don't know, agree and strongly agree) was used in combination with qualitative feedback (Linestone and Turoff, 1975; Skulmoski et al., 2007).

  Consensus was defined as an agreement between the experts in rating a particular item on the questionnaire. The minimum percentage of agreement on a particular item was considered as 75% (Nordin et al., 2012). Therefore, for this study, consensus was achieved when an average rating above 3.7 (75% of a five-point Likert scale) was achieved for each item (Nordin et al., 2012). The Delphi process and results are discussed in **Chapter 9**.
- Learning — The learning that occurred throughout this study is documented in the last chapters of this thesis: **Chapter 10** (Verification), **Chapter 11** (Validation) and **Chapter 12** (Conclusion).

3.7 Knowledge contribution

A matrix of research project contexts and potential DSR research contributions is shown in Figure 18 (Gregor and Hevner, 2013). The X-axis shows the maturity of the problem context from high to low, while the y-axis represents the current maturity of artefacts that exist as potential starting points for solutions to the research question, also from high to low. The focus on knowledge starting points provides a clearer understanding of the project goals and the new contributions envisaged (Gregor and Hevner, 2013).

In order to demonstrate the contribution that this study made to the knowledge base, the RFP lean implementation model was verified and validated in a real-world scenario by means of the Delphi technique (Discussed in **Chapter 9**). The matrix from Figure 18 was used in Section 12.3 to explain the knowledge contribution.

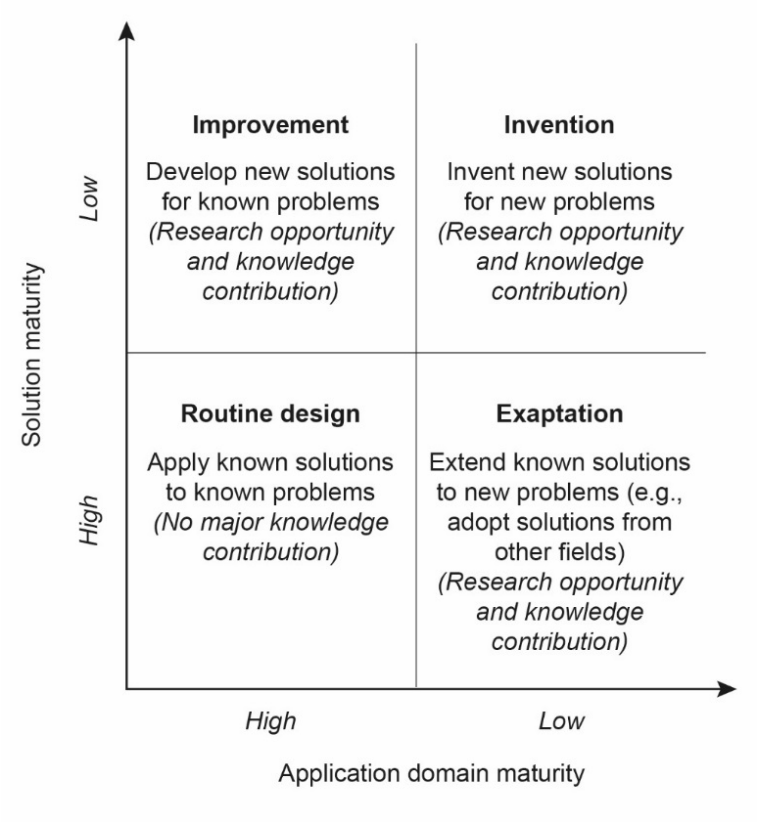

Figure 18: Design science research contribution framework (Gregor and Hevner, 2013)

3.8 Conclusion

This chapter explained the research design that was followed for the study. The chapters that follow, provide the results of each stage of the research.

CHAPTER 4
GAP ANALYSIS

Lean implementation strategies: How are the principles of the Toyota Way incorporated?

R. Coetzee, K. R. Van der Merwe and L. Van Dyk

This article reviews the extent to which the human dimensions of the lean philosophy as found in the Toyota Way management principles have been incorporated in lean implementation strategies. We found that few of the principles feature prominently in these strategies. Notably absent are those linked to the Respect for people pillar, which forms half of the foundation of the Toyota Way. This means that the adoption of the lean philosophy often contradicts the message from its creators that no tenet of the philosophy should be favoured at the expense of another. This may provide valuable insight into the reasons for the high implementation failure rate.

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4.1 Chapter orientation

The work portrayed in this chapter/article forms part of the problem-diagnosing phase of the eADR method. A further investigation was conducted on the problem stated in Chapter 1.

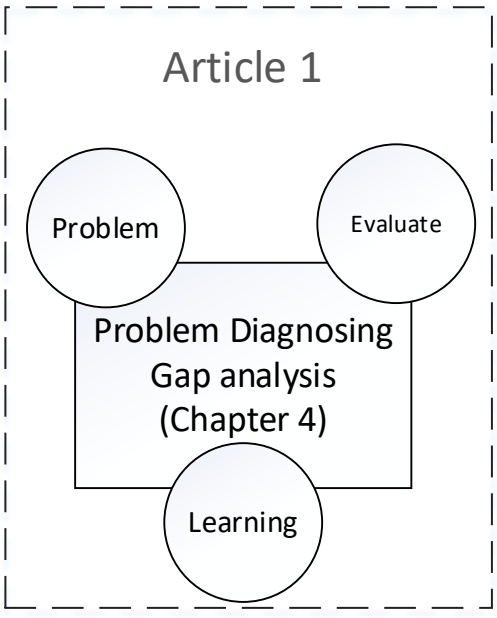

Figure 19: Chapter 4 (Gap analysis) orientation

4.2 Research question

The research question addressed by this chapter is as follows:

Research question 6.1 — Has a valid research problem been identified?

LEAN IMPLEMENTATION STRATEGIES: HOW ARE THE TOYOTA WAY PRINCIPLES ADDRESSED?

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ABSTRACT

Lean manufacturing is widely considered to be a proven organisational improvement philosophy, yet the success rate of lean implementation in industry remains relatively low. Neglect of the human aspect of lean manufacturing is often cited as the leading reason for this, despite the emphasis so clearly placed upon this aspect by the creators of the lean philosophy. This article reviews the extent to which the human dimensions of the lean philosophy, as described in the Toyota Way management principles, have been incorporated in lean implementation strategies. It is found that few of the principles feature prominently in these strategies. Notably absent are those linked to the 'respect for people' pillar, which forms half of the Toyota Way's foundation. This conclusion indicates that the adoption of the lean philosophy runs contrary to the oft-repeated message from its creators that no tenet of the philosophy should be favoured at the expense of another. This may provide valuable insight into the reasons for the high implementation failure rate.

OPSOMMING

Alhoewel lenige (*lean*) vervaardiging algemeen aanvaar word as 'n erkende filosofie vir organisatoriese verbetering, bly die implementeringsukseskoers relatief laag. Dit word dikwels toegeskryf aan die verwaarlosing van die menslike aspek, ten spyte van die klem wat die stigters van die lenige filosofie op hierdie aspek plaas. Hierdie artikel beskou die mate waartoe hierdie menslike aspekte van lenig, soos beskryf in die 'Toyota Way' bestuursbeginsels, vervat is in lenige implementering-strategieë. Daar is gevind dat baie min van die beginsels prominent in die strategieë verskyn. Dit is veral opvallend dat die beginsels wat verband hou met die 'respek vir mense' pilaar, afwesig is alhoewel hierdie pilaar die helfte van die 'Toyota Way' fondasie uitmaak. Die gevolgtrekking word gemaak dat lenige implementeringstrategieë in kontras is met die dikwels herhaalde boodskap van die stigters van die lenige filosofie, dat geen beginsels ten koste van ander uitgesonder mag word nie. Dit mag ook waardevolle insig gee tot die rede vir onsuksesvolle lenige implementering.
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1 INTRODUCTION

Improving operational performance is a key prerequisite for sustaining and growing an organisation. Lean manufacturing is widely considered to be a philosophy that brings about such continuous improvement. However, the success rate for lean implementation remains relatively low [1, 2]. Why is this? Prominent among the reasons cited is the intense focus on lean tools and techniques at the expense of the human side of lean management [3-6]. Employees often do not feel valued, even though they are the ones who are in the best position to offer suggestions for improving the efficiency of the work that they do [7]. A lack of training and resistance to change from both

employees and managers contribute to the problem [8]. Bateman and Rich [9] concluded that a general lack of resources, the need for change, and employee turnover inhibit improvements in manufacturing processes. In order to increase the success of the lean transformations, it is important for employees to develop higher commitment levels, experience stronger beliefs, be exposed to greater communication, and cultivate better work methods [10]. People-related issues need to be addressed, since in most cases they are the critical success factors for projects [11].

Taiichi Ohno [12], the originator of the Toyota Production System (TPS), realised the importance of including people in achieving continuous improvement when he created "the second, and equally important pillar, namely *respect for people"* in his book, *Toyota Production System: Beyond Large-Scale Production*. Similarly, Fujio Cho, Toyota's former chairman, emphasised the focus on people in the following famous statement: "First we build people, then we build cars" [13].

The involvement of employees in the continuous improvement process influences successful lean transformation. If employees adopt the change but are not committed to making change happen, the transformation can fail. It can thus be said that the success of a lean transformation lies substantially in the hands of the employees who are responsible for implementing the change. Stewart [14] agrees:

"In traditional organisations, it makes no difference what direction management want the company to take if the employees are not able to discern the fundamental purpose of what the company is trying to do. The greatest ideas for implementing any change in a work environment will fall flat unless the employees buy into it."

In the recent history of manufacturing, there have been various lean implementation strategies, such as the *kaizen*[1] workshops, the enterprise-level transition to lean (TTL) roadmap, and the production operations-level TTL roadmap. Despite these strategies, the lean implementation success rate remains relatively low. Liker and Franz [1] claimed that they had not seen any successful continuous improvement outside of Japan, after they had visited hundreds of companies in a 10-year period.

The hypothesis advanced in this article, therefore, is that a lack of people principles in these strategies is a fundamental reason for failures in lean implementation.

2 PURPOSE AND METHODOLOGY

It seems that Taiichi Ohno's 'respect of people' pillar is given less attention than it should receive [11, 15]. The purpose of the study reported in this article is to determine the extent to which the Toyota Way management principles have been incorporated in lean implementation strategies.

This objective is accomplished by first noting the differences between the concepts of continuous improvement, lean manufacturing, the TPS, and the Toyota Way, in Section 3. A summary of the 14 Toyota Way management principles then follows in Section 4. Five lean implementation strategies are reviewed and summarised in Section 5 according to themes that are evident in most of them. These strategies are then analysed in terms of the Toyota Way management principles, in Section 6.

3 DEFINING CONTINUOUS IMPROVEMENT, KAIZEN, LEAN MANUFACTURING, TPS, AND THE TOYOTA WAY

The terms 'continuous improvement' (CI), 'lean manufacturing', 'TPS', and 'the Toyota Way' are often used interchangeably without a full appreciation of the fundamental differences between them. Stewart [14] and Liker [13] warn that this misconception could have a negative effect on an organisation. Many companies implement management tools such as *kanban*[2] and *poka-yoka*[3] and realise substantial benefits in a short time, but unless they make an effort also to understand the broader system, they will never reach the true potential that they offer. This practice of selecting

[1] Japanese term meaning continuous improvement.
[2] Japanese term meaning 'signal', used for just-in-time production scheduling.
[3] Japanese term meaning 'inadvertent error prevention'.

specific elements of the lean philosophy to implement is not necessarily bad, but it limits the results and ultimately leads to frustration [13, 14].

CI is a philosophy that Deming [16] described as "improvement initiatives that increase success and reduce failures". Another definition of CI is "a company-wide process of focused and continuous incremental innovation" [17]. Examples of such CI initiatives or methodologies are the Theory of Constraints (TOC), Six Sigma, Total Quality Management (TQM), Balanced Scorecard, and lean manufacturing [16, 18].

One of the principles *within* lean manufacturing is *kaizen*. The term, which literally means change (*kai*) for the better (*zen*), has been around for so long that most non-Japanese books no longer even italicise it as a foreign word [1]. The problem with it being around for so long is that the misconception has developed over time that *kaizen* and CI are synonyms and can be used interchangeably. This, however, is not the case — *kaizen* is only the CI aspect *within* lean manufacturing [16].

To summarise, lean manufacturing is seen as one of many CI strategies, and *kaizen* is a fundamental part of lean manufacturing; but these concepts are not synonymous (Figure 1).

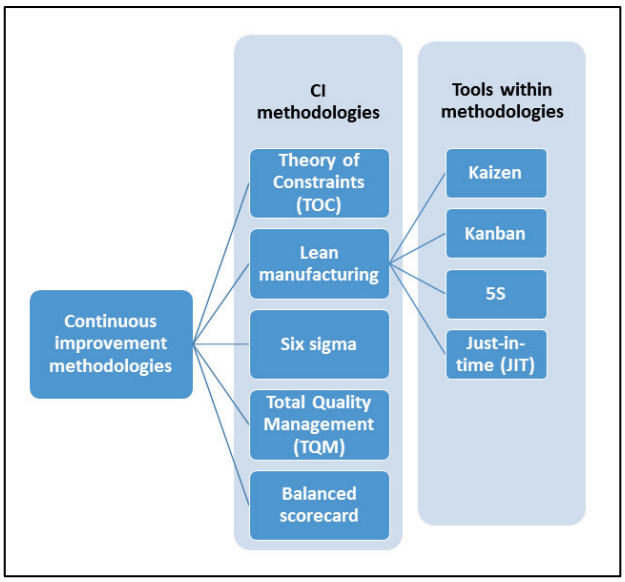

Figure 1: Schematic illustration of the differences between CI, lean manufacturing, and *kaizen*

The lean movement was launched when Womack and associates released the ground-breaking book, *The Machine that Changed the World* [19], in 1990. It was in this work that they labelled the new Toyota paradigm of manufacturing by doing more with less as "lean production" [1]. It is noteworthy that the term 'lean' was never used historically within Toyota [19, 20].

Stewart [14] explains the meaning of lean manufacturing and TPS as follows:

"The difference between lean manufacturing and TPS is that in lean manufacturing the focus is on the tools, and with TPS the focus is on the system. There are many tools (just-in-time, cells, 5S, kanban, etc.) that can be utilised to implement the TPS, but not all are mandatory."

Unlike lean manufacturing, TPS should never be seen as a toolkit; it is a sophisticated production system in which all of the parts contribute to a whole. At its root, TPS focuses on supporting and encouraging people to continually improve the process that they are working on [13, 14]. Therefore, people are the centre of the TPS house (Figure 2a).

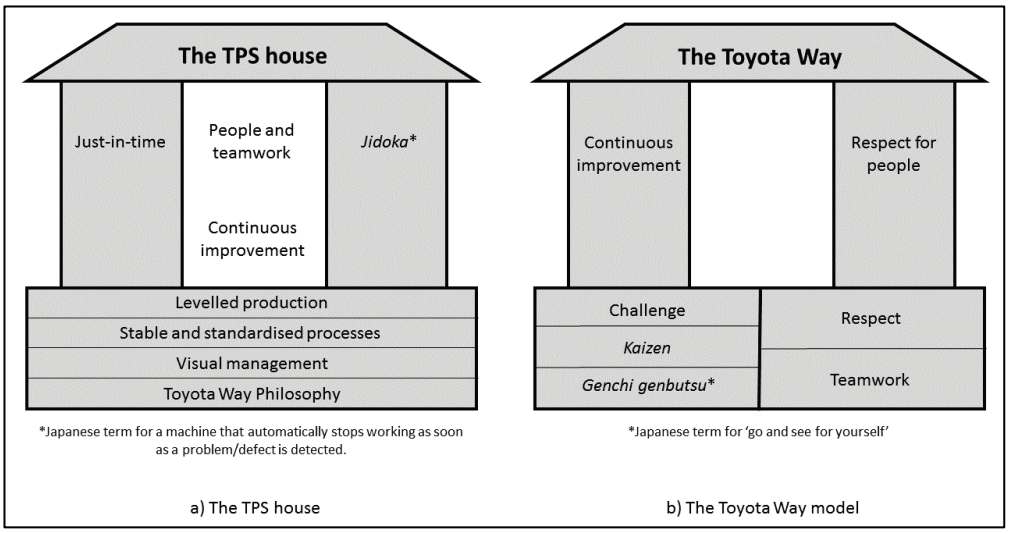

Figure 2: Illustrating the difference between the TPS house (adapted from [13]**) and the Toyota Way 2001 model (adapted from** [20]**) in terms of their foundations and pillars**

The Toyota Way is not explained as a system, process, or programme. Instead, it is a mindset that explains how thoughts and actions guide people to interact with each other on a daily basis. The Toyota Way can also be seen as an organisational culture. Fujio Cho, Toyota's former president, originally published the Toyota Way model in 2001 when he realised that there was too much inconsistency among Toyota managers in their understanding of what made the company tick. According to Cho, the Toyota Way model is a basis for daily management that is centred on two principles: *Respect for people, and Continuous improvement (Kaizen)* [14, 21]. These two pillars summarise the model and indicate that Cho wanted to emphasise the important part that people play in the change process.

In 2004, Jeffrey Liker wrote *The Toyota Way — 14 Management principles* [13], after spending 20 years working in Toyota factories in Japan and the United States. *The Toyota Way* reveals the 14 foundational management principles behind the giant automaker's world-famous production system. Liker [13] divided these principles into the 4P model, which consists of the following four categories: philosophy, process, people and partners, and problem-solving.

Figure 2 illustrates simplified versions of the TPS house and the Toyota Way model. The only aspects of the principles illustrated are the pillars and the foundations. It can be seen that the Toyota Way model incorporates the TPS house and is quite different in emphasis. In the latter, the core pillars are just-in-time and *jidoka*[4] (intelligent *autonomation*[5]), which are both technical concepts. In contrast, the pillars of the Toyota Way model focus on people: CI and respect for each other [20].

4 REVIEW: THE TOYOTA WAY

As previously stated, the Toyota Way model is centred on two principles: 'Continuous improvement' and 'Respect for people', which are built on three and two foundational blocks respectively, as shown in Figure 2b.

CI is built on [20]:

- Challenge: Form a long-term vision, meeting challenges with courage and creativity to realise dreams.
- *Kaizen*: Improve business operations continuously, always striving for innovation and evolution.

[4] Japanese term for a machine that stops working as soon as a problem/defect is detected.
[5] It may be described as 'intelligent automation' or 'automation with a human touch'.

- *Genchi genbutsu*[6]: believing in going to the source to find the facts and to make correct decisions, building consensus, and achieving goals at the best speed.

Respect for people is built on [20]:

- Respect: Respect each other, make every effort to understand each other, take responsibility, and build mutual trust.
- Team work: Stimulate personal and professional growth, share the opportunities of development, and maximise individual and team performance.

4.1 The 14 Toyota Way management principles

In order to illustrate the 14 Toyota Way management principles [13] in terms of the two pillars that were created by Fujio Cho (quoted by Stewart [14]), the principles have been categorised in terms of the two pillars in Figure 3.

The Toyota Way	Continuous improvement	Challenge	1. Long-term philosophy
		Kaizen	2. Create flow
			3. Use a pull system
			4. Level out the workload
			5. Stop and fix the problem
			6. Standardise tasks
			7. Use visual control
			8. Use reliable, tested technology
			14. Continual organisational learning through *kaizen*
	Respect for people	*Genchi genbutsu*	12. Go and see for yourself to understand the situation
			13. Make decisions slowly by consensus
		Respect	9. Grow leaders who live the philosophy
			11. Respect, challenge, and help your suppliers
		Teamwork	10. Respect, develop, and challenge your people and teams

Figure 3: Summary of the Toyota Way, including the 14 management principles

While the Toyota Way is summarised by these two pillars, the next section addresses the relationship between the two pillars.

4.2 The relationship between 'Continuous improvement' and 'Respect for people'

According to Convis[7], and as quoted by Liker [13], there is something more important than the actual improvements that individuals contribute:

"The true value of continuous improvement is in creating an atmosphere of continuous learning and an environment that not only accepts, but actually embraces change. Such an environment can only be created where there is respect for people — hence the second pillar of the Toyota Way."

The questions that arise are: Exactly what does respect for people entail? and How does it relate to CI? According to Womack [22], most managers are under the impression that if employees are treated fairly, given clear goals, trusted to achieve them in the best way, and held to account for results, they receive respect. But this is not the case. It is through the problem-solving process that true respect is shown [22, 23]. Ignoring the priceless inputs that workers can give is seen as disrespectful [14, 24]. It is only by implementing the problem-solving process effectively that there will be CI in an organisation.

However, if there is no policy to capture employees' ideas that will move the company forward, motivating the workforce becomes nearly impossible, since motivation comes from the top and

[6] Japanese term for 'go and see for yourself' truly to understand the situation.
[7] Managing Officer of Toyota and President of Toyota Motor Manufacturing, Kentucky.

generally does not trickle down to the workers on the shop floor. A CEO's speech can get the front offices really fired up and energised, only to be lost on the people who actually perform the work [14].

Womack [22] explains how the problem-solving process should be followed in order to show mutual respect between managers and workers:

- Manager(s) will ask the employee(s) what the problem is that they are experiencing. A dialogue will follow to determine the true problem (not just the surface problem).
- The possible root cause will be discussed after the worker has gathered sufficient evidence by means of the *genchi genbutsu* principle.
- The employee is given the opportunity to make suggestions about solving the problem and to explain the reason for the chosen solution.
- Employees are also required to make suggestions about the best indicators of when the problem is solved.
- Finally, after agreement is reached on the most appropriate measure of success, the employees set out to implement the solution.

By following this process, respect is shown to the employee. The manager admits that he/she cannot solve the problem alone, since he/she is not close enough to the problem to know all the facts. Moreover, the manager is showing true respect for the employees' knowledge and their dedication to finding the best answer. On the other hand, the employees cannot solve the problem alone, since they are too close to the problem to see its context, and they might not ask tough questions about their own work.

"Only by showing mutual respect — each for the others and for each other's role — is it possible to solve problems, make work more satisfying and take organizational performance to an even higher level." [22]

The CI/Respect-for-people relationship has been explained, and the importance of including people in the problem-solving process has been emphasised. The question remains as to whether "respect for people" has been incorporated in the lean manufacturing continuous improvement strategies.

5 REVIEW: LEAN IMPLEMENTATION STRATEGIES

Table 1 is used to introduce different lean implementation strategies (columns) and map them against different themes (rows). The lean implementation strategies that are described are the following:

1. Tips for a lean transition [13].
2. Prerequisites for a lean transition [4].
3. Transition to Lean (TTL) roadmap: Production operations level [25].
4. Transition to Lean (TTL) roadmap: Enterprise level [26].
5. *Kaizen* workshops [27].

The themes according to which the implementation strategies are mapped are the following:

1. Creating a vision.
2. Preparation.
3. Value-stream mapping.
4. Employee empowerment.
5. Implementation planning.
6. Implementation.
7. CI.

In Table 1, the original sequence of the implementation strategies may have been changed for grouping purposes, but the number in front of each step of each strategy (columns) reflects the original order. Strategies 1, 2, and 5 are designed as simple steps, and are simply listed in Table 1. On the other hand, the TTL roadmaps contain more information and therefore, in addition to Table 1, are elaborated on in Sections 5.1 and 5.2.

Table 1: Lean implementation strategies

	Tips for a lean transition [13]	**Prerequisites for a lean transition** [4]	**TTL — Production operation level** [25]	**TTL — Enterprise level** [26]	***Kaizen* workshop** [27]
1. Create a vision		• The enterprise should have a vision • Create a sense of urgency • The need to produce short-term results must be created	Phase 0: Adoption of the lean paradigm • Build vision • Establish need • Foster lean learning • Make the commitment • Obtain senior management buy-in	1. Adopt a lean paradigm • Build vision • Convey urgency • Foster lean learning • Make the commitment • Obtain senior management buy-in	
2. Preparation	• Use *Kaizen* workshops to teach and make rapid changes. • Be opportunistic in identifying opportunities • Make the change mandatory	• Agree on the duration of the project prior to its commencement • Fear and anxiety should be removed	Phase 1: Prepare implementation • Integrate with the enterprise level • Develop an implementation strategy • Develop a plan to address workforce changes • Address site-specific cultural issues • Establish target objectives (metrics)		1. Prepare for the workshop • Define the scope of the problem • Decide on a team • Collect data on the current situation • Decide what lean tools to use • Logistical arrangements for the event 2. Day 1 • Overview of lean manufacturing • Teach special tools needed for the workshop • Collect data on the current process

3. Value stream mapping	• Realign metrics with a value-stream perspective		Phase 2: Define value
			• Select initial implementation scope
			• Define the customer
			• Define the value
			Phase 3: Identify the flow of value
			• Record the current-state value stream
			• Chart the product & information flow
			• Chart operator movement
			• Chart tool movement
			• Collect baseline data
				2. Focus on the value stream
				• Map the value stream
				• Internalise the vision
				• Set goals & metrics
				• Identify & involve key stakeholders
					3. Day 2
					• Complete the current state analysis
					• Collect data
					• Draw a process flow map
					• Draw a walk pattern on layout
					  ○ Develop standardised work combination tables
					  ○ Develop ideas for the improved state
					  ○ Draft the future state

	Tips for a lean transition [13]	**Prerequisites for a lean transition** [4]	**TTL — Production operation level** [25]	**TTL — Enterprise level** [26]	***Kaizen* workshop** [27]
4. Employee empowerment	• Use experts for teaching • Hire or develop lean leaders and develop a succession system • Learn by doing first and training second	• Empower employees to create the change • Make use of a *sensei*[8] throughout the transformation • Assemble a strong enough team • Ensure employee engagement	Phase 1[9]: Prepare implementation • Train key people • Establish an operations lean implementation team(s)	3. Develop lean structures & behaviour • Organise for lean implementation • Identify & empower change agents • Align incentives • Adapt structure & systems	
5. Implementation planning			Phase 4: Design production system • Develop a future-state value-stream map • Identify 'takt' time requirements • Review make/buy decisions • Plan new layout • Integrate suppliers • Design visual control system • Estimate and justify costs • Plan TPM system	4. Create & refine transformation plan • Identify & prioritise activities • Commit resources • Provide education & training	
6. Implementation	• Start with action in the technical system; follow quickly with culture change		Phase 5: Implement flow • Standardise operations • Mistake-proof processes • Achieve process control • Implement total productive maintenance • Implement self-inspection • Eliminate/reduce waste • Cross-train workforce • Reduce set-up times • Implement cell layout • Implement visual controls	5. Implement lean initiatives • Develop detailed plans • Implement lean activities	4. Day 3 • Implementation (pilot of full)

[8] Japanese term for 'teacher'

[9] Phase 1 partially repeated to align training people point with other employee-related steps

	Tips for a lean transition [13]	Prerequisites for a lean transition [4]	TTL — Production operation level [25]	TTL — Enterprise level [26]	*Kaizen* workshop [27]
6. Implementation	7. Start with action in the technical system; follow quickly with culture change (continued)		Phase 6: Implement pull system • Select an appropriate production system control mechanism • Strive for single item flow • Level & balance production flow • Link with suppliers • Draw down inventories • Reassign people • Re-deploy/dispose assets		
7. Continuous improvement	• A crisis may prompt a lean movement, but may not be necessary to turn a company around • Build on your company's roots to develop your own way		Phase 7: Strive for perfection • Team development • Optimise quality • Institutionalise 5S[10] • Institute *kaizen* events • Remove system barriers • Expand TPM • Evaluate against target metrics • Evaluate progress using lean maturity matrices	6. Focus on CI • Monitor lean progress • Nurture the process • Refine the plan • Capture & adopt new knowledge	5. Day 4 • Evaluate the process (Check) • Improve (Act) • Continue PDCA cycle until a good approach is available 6. Day 5 • Develop a presentation for management • Present to management 7. Follow-up after workshop • Prepare action plan during workshop for items that could not be completed during the workshop. • Follow up on these items

[10] 5S is the name of a workplace organisation method that uses five Japanese words: *seiri* (sort), *seiton* (set), seiso (shine), *seiketsu* (standardise), and *shitsuke* (sustain).

5.1 TTL roadmap: Production operation level

The production operations TTL roadmap can be used by organisations with existing operations to implement the lean manufacturing philosophy and lean best practices. The model is divided into eight phases: these indicate points that interface with other systems that are internal and external to the business enterprise. The implementation is systematic, with milestones in a specific order of precedence [25]. Table 1 gives details of the implementation phases.

5.2 TTL roadmap: Enterprise level

The enterprise TTL roadmap was developed to assist organisations in their efforts to transform into lean enterprises. The framework portrays the overall 'flow' of action steps necessary to initiate, sustain, and continuously refine a company based upon lean principles and practices. The roadmap was developed from an enterprise perspective, with particular attention paid to strategic issues, internal and external relations with all key stakeholders, and structural issues that must be addressed during a significant change initiative [26].

The roadmap consists of three interdependent 'cycles' [26]. Figure 4 and column 4 of Table 1 illustrate the detailed steps of the TTL roadmap:

1. Entry/re-entry cycle: The environment and conditions necessary for a successful transformation are created, including preparing for the launch into detailed planning and implementation:
   - Adopt a lean paradigm.
2. Long-term cycle: Detailed implementation is planned, executed, and monitored. It includes ongoing monitoring and corrective actions:
   - Focus on the value stream.
   - Develop lean structures and behaviour.
3. Short-term cycle: This cycle is re-entered periodically to capitalise on lessons learned during implementation, and to accommodate changes occurring in the dynamic external environment:
   - Create and refine the transformation plan.
   - Implement lean initiatives.
   - Focus on CI.

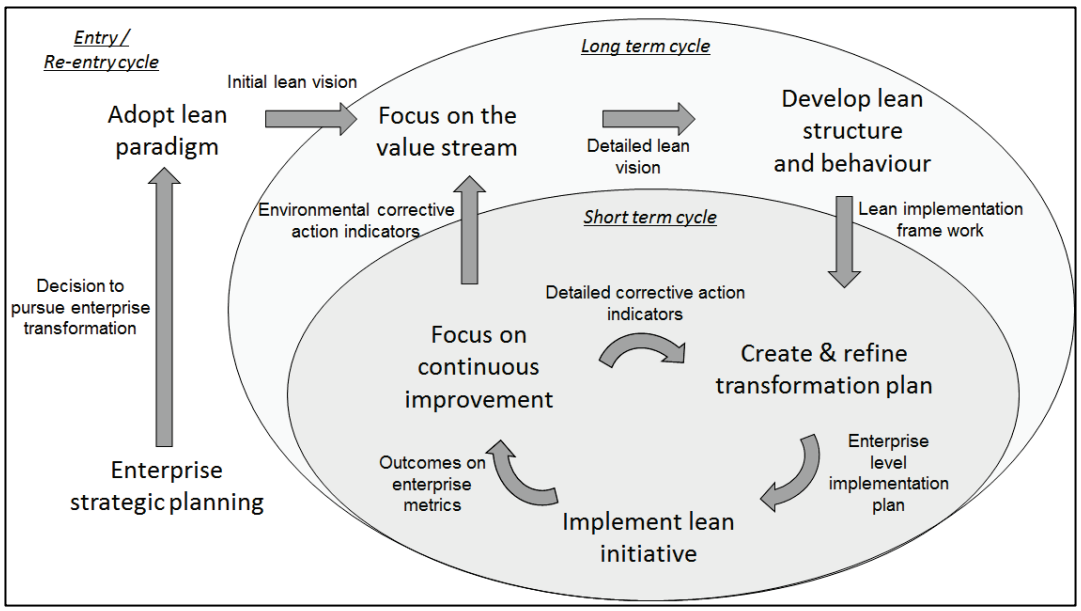

Figure 4: Enterprise level transition to lean roadmap, indicating the three interdependent cycles of implementation (adapted from [26])

6 ANALYSIS

Table 2 summarises how the 14 Toyota Way management principles (discussed in Section 4.1) have been incorporated into the lean implementation strategies (discussed in Section 5). The rows represent the 14 Toyota Way management principles, and each column represents one of the lean implementation strategies. Assuming an absolute value of 'yes' or 'no', each dot indicates that the particular Toyota Way principle has been incorporated into the specific lean implementation strategy. The columns on the right indicate how many of the implementation strategies incorporated a particular Toyota Way principle.

Table 2: Toyota Way principles incorporated into lean implementation strategies

Toyota Way Principles		Tips	Prereq.	Prod. TTL	Enterp. TTL	*Kaizen* workshop	Total
Ph	1		•	•	•		3
Process	2	•		•	•	•	4
	3			•			1
	4						0
	5						0
	6			•			1
	7			•			1
	8						0
People & partners	9	•	•				2
	10	•	•	•	•		4
	11						0
Problem-solving	12						0
	13						0
	14			•	•	•	3

6.1 Philosophy

Three of the five implementation strategies discuss the need for vision. In terms of implementation, a vision could be seen as a philosophy.

6.2 Process

Within the process group of principles, the focus is mainly on flow (Principle 2), pull (Principle 3), and value-stream mapping. Standardised tasks (Principle 6) and visual management (Principle 7) are mentioned only in the production operations TTL roadmap.

These are all positive contributions to the general implementation success, but there is great room for improvement in this layer of the 4P model of the Toyota Way. None of the strategies mentions levelling out the workload (Principle 4) or steps in creating a culture that will stop and fix problems (Principle 5). There is also no indication of how technology will be evaluated for implementation (Principle 8).

Liker [13] is of the opinion that most companies focus on the 'process' layer of the 4P model when attempting a lean transformation. However, our study does not indicate this. Considering the large number of principles that are included in this layer of the 4P model, the percentage implementation might not be an accurate indication of the industry. What Liker [13] might have implied is that, of all the principles that a specific company adopts, most of *their* time and effort goes into the technical 'process' layer of the 4P model.

6.3 People and partners

According to Table 2, four of the five strategies mention developing people or teams (Principle 10), but only two discuss developing leaders (Principle 9). This might be a contributing factor to the failures in lean implementation.

Bessant [17] concurs that the literature dealing with lean production systems (LPS) and CI does not cover behavioural aspects of the change process. One such example relates to deficiencies in the LPS implementation roadmaps that closely correlate results with the exposure to lean techniques, neglecting elements such as the development of behaviour. The literature sometimes assumes a binary division between having a TPS or not, rather than viewing it as an emerging behavioural pattern to be developed in alignment with a management philosophy [28, 29].

6.4 Problem-solving

Lean implementation strategies focus the least on principles in the problem-solving layer. This is a point of concern, since the reason for implementing lean principles is for CI, which cannot be achieved without solving problems.

Some focus is given to becoming a learning organisation by means of CI (Principle 14), but no attention is given to the 'go and see' principle (Principle 12) or the 'make decisions slowly by consensus' principle (Principle 13). Principle 12 is important in order to understand the organisation's problems that need to be solved or improved. Furthermore, Principles 12 *and* 13 are important ways of including people in the problem-identification and -solving process.

7 DISCUSSION

This article has elaborated on the content of the Toyota Way, and revealed the important link between the 'continuous improvement' pillar and the 'respect for people' pillar, emphasising the importance of including people in the CI problem-solving process. Different lean implementation strategies have been analysed, and they have revealed how few of the Toyota Way management principles have been included. This might provide insight into the failures in lean implementation.

The main point of concern demonstrated by this article is the CI/Respect-for-people relationship, which is not included in any of the lean implementation strategies. This might be the fundamental reason why the lean implementation success rate is so low, since the importance of including people in the problem-solving process has been emphasised throughout this article.

This crucial finding on lean implementation failures confirms and elaborates on what is written in the literature: "By concentrating on the tangible outcomes, organisations lose sight of the intangible aspects of change and culture, and in particular that companies are formed out of people" [4]. Furthermore, attempting to adopt any CI initiative without incorporating aspects that prove that there is respect for the people who have to undergo the change, will simply not deliver the required results [23]. This article has demonstrated that this is indeed the case with prevailing lean implementation strategies.

Production management consists of both technological and human elements. The Toyota system is a monument in the history of production management because it requires an entirely new way of analysing both of these elements simultaneously under one scheme [30]. Unfortunately, it seems that "the second, and equally important pillar" [12], 'respect for people', has largely been forgotten. The research conducted in this study and reported in this article can assist organisations to be more aware of the human element in order to make it a prominent feature in lean implementation strategies.

8 FURTHER RESEARCH

There remains a need for further research into including the Toyota Way management principles more prominently in lean implementation strategies, with an emphasis on the suggested problem-solving process, in order to increase the success rate of lean implementations. These improved implementation strategies can then be developed into effective and strategic lean implementation plans.

Further evidence is also required from industry to determine whether people are included in the CI problem-solving process. This article has stated that the main point of concern is the CI/Respect-for-people relationship, which is not included in any of the lean implementation strategies. It is suggested that this might be a fundamental reason why the lean implementation success rate is so low. Evidence from industry is required to prove this hypothesis.

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CHAPTER 5
SYSTEMATIC LITERATURE REVIEW

Towards addressing Respect for People during lean implementation

R. Coetzee, K. R. Van der Merwe and L. Van Dyk

The purpose of this study was to investigate, report and interpret the true, original meaning of the Toyota Way Respect for People (RFP) principles as intended by their creators. This investigation was conducted by means of a systematic literature review. Findings are reported in an RFP framework and are interpreted by proposing a conceptual RFP lean implementation framework. The literature on the subject is fragmented, though consistent. No single framework was found that explained the Respect for People principles. The review revealed the difference between and necessity for two value streams: a traditional product value stream that highlights problems and an additional people value stream that delivers people who can solve these problems. Furthermore, the key emerging themes of Respect for People were found.

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5.1 Chapter orientation

The systematic literature review conducted in this chapter/article forms part of the concept design phase of the eADR method. The review examines the true, original meaning of the RFP principles to develop the design requirements for the RFP model (in **Chapter 7**).

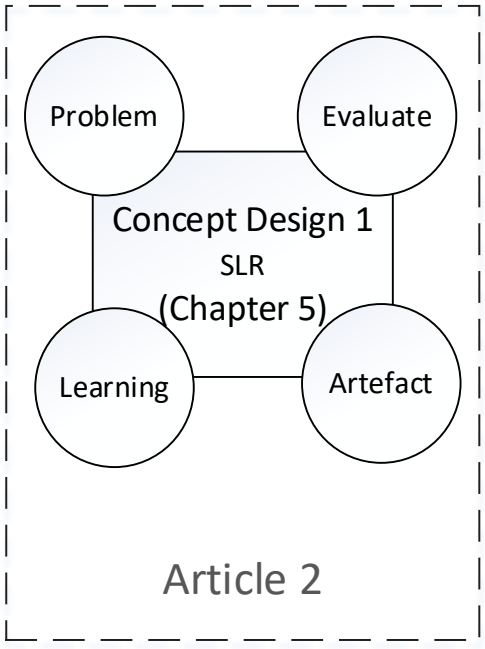

Figure 20: Chapter 5 (Systematic literature review) orientation

5.2 Research questions

The research questions addressed by this chapter are as follows:

Research question 2.1 — What was the true, original meaning of Respect for People as intended by the creators of the Toyota Way?

Research question 2.2 — How do the different RFP principles interact?

Towards addressing respect for people during lean implementation

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Abstract

Purpose – The purpose of this study is to investigate, report and interpret the true, original meaning of the Toyota Way Respect for People (RFP) principles as intended by their creators.

Design/methodology/approach – The investigation was conducted by means of a systematic literature review, and findings are reported in an RFP framework and interpreted by proposing a conceptual RFP lean implementation framework.

Findings – It was found that the literature on the subject is fragmented, though consistent, among various sources. No single framework was found that explained the RFP principles. The difference between and necessity for two value streams were discovered – a traditional product value stream that highlights problems and an additional people value stream that delivers people that can solve these problems. Furthermore, key emerging themes of RFP were found to be teamwork, develop and challenge people, motivation, develop people as problem-solvers, safety, remove waste and display people's capabilities.

Research/limitations implications – The conceptual RFP lean implementation framework remains untested. Future research should, therefore, focus on gathering empirical data concerning the applicability and validity of the proposed conceptual RFP lean implementation framework in different contexts.

Practical implications – The explanation of the two different value streams allows organisations to shift their focus towards developing employees' career paths, which will subsequently contribute towards improved organisational performance. The conceptual framework can also assist managers in providing the necessary psychological support during the change process of lean implementation. Thus, the proposed implementation framework suggests how to show RFP during lean implementation by assisting organisations to have a more balanced focus between the lean tools and techniques and the human side of lean management.

Originality/value – A contribution is made to the prevailing lean implementation literature by reporting the true, original meaning of the RFP principles as a single recapitulated framework. Furthermore, a conceptual RFP lean implementation framework is proposed that incorporates these RFP principles, according them the significance they are due. This review offers an understanding of the people aspect of lean implementation and proposes a practical means of addressing this often-neglected factor. The RFP framework and the RFP lean implementation framework could, therefore, possibly assist organisations in achieving more successful lean implementations.

Keywords Lean manufacturing, Lean, Lean management, Lean implementation, Respect for humanity, Respect for people

Paper type Research paper

1. Introduction

Respect for People (RFP) is an essential element of the lean manufacturing philosophy. Originally, lean manufacturing was derived from the Toyota Production System (TPS).

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Together with the TPS, Toyota also developed the Toyota Way, which captures the essence of the organisational culture of the company. The Toyota Way is depicted as a house with two pillars – "RFP" and "Continuous Improvement".

Ohno (1988), one of the world's leaders on the topic of "respect for humanity in the manufacturing process", realised the importance of including people to achieve continuous improvement of manufacturing processes. In his book, *Toyota Production System: Beyond Large-Scale Production*, Ohno (1988) he argues that respect for humanity is the second-most important objective of the TPS (second only to the objective of consistently and thoroughly eliminating waste from the production system).

The RFP principles are the key to making the lean management system work (Marksberry, 2011). This is, however, not widely understood among lean management practitioners if they are trying to implement lean manufacturing by focussing mostly on continuous improvement of processes while ignoring or misunderstanding the RFP pillar (Cardon and Bribiescas, 2015; Emiliani, 2006; Emiliani and Stec, 2005; Taleghani, 2010). This error in judgment significantly limits the improvement that can be achieved by lean implementation, as it is the RFP pillar that enables continuous improvement initiatives to be successful (Emiliani, 2006).

A number of research studies have been undertaken to determine the reasons for unsuccessful lean implementation. Contributing to the low levels of success is the heavy focus on lean tools and techniques at the expense of the human side of lean management (Bhasin, 2012; Cardon and Bribiescas, 2015; Coetzee *et al.*, 2016; Gao and Low, 2015; Jadhav *et al.*, 2014; Miller *et al.*, 2018; Nordin *et al.*, 2011; Pakdil and Leonard, 2014). Employees often do not feel valued, although they are the ones who are in the best position to offer suggestions for improving the efficiency of the work they do (Sim and Rogers, 2008). Developing a culture that creates the involvement of everyone in the organisation is critical for implementing lean as lean works best if driven by all employees in the organisation, not just the senior management (Radnor and Walley, 2008).

The challenge for leaders today is to comprehend what RFP truly means, or else it will hinder the efforts to practise lean manufacturing correctly and to improve business performance (Emiliani, 2006; Puvanasvaran *et al.*, 2008).

The aim of this study was, therefore, to investigate, report and interpret the true, original meaning of the RFP principles as intended by their creators. A systematic literature review (SLR) was pursued to investigate the true meaning. The results of the SLR are reported in an RFP framework and interpreted by proposing a conceptual RFP lean implementation framework.

2. Background

One of the world's most successful automotive manufacturers, Toyota caught the attention of the world in the 1980s when it became apparent that there was something exceptional about Japanese quality and efficiency in motor manufacturing. The production system used by Toyota was named the TPS. Liker (2004) described it as "a unique approach to manufacturing" and Toyota's "manufacturing philosophy". The TPS was the next major evolution in improving the efficiency of business processes after the mass production system that was developed by Henry Ford in America.

Outside of Toyota, the TPS is known as "lean" or "lean production" (Liker, 2004). These terms were subsequently made popular in the books by Womack *et al.* (1990) and Womack and Jones (2003). These authors translated most of the work from Japanese into English, but some Japanese terms could not be translated successfully into English. Therefore, certain Japanese terminology is still used today, e.g. *kaizen*, continuous incremental improvement (Womack and Jones, 2003), *kanban*, a small card attached to boxes of parts that regulates pull

by signalling upstream production and delivery (Womack and Jones, 2003), *poka-yoka*, a mistake-proofing device or procedure to prevent a defect during order-taking or manufacture (Womack and Jones, 2003), *andon cord*, a visual control device that gives the current status of the production system and alerts team members to emerging problems (Womack and Jones, 2003), *gemba*, the actual place where the real added-value work is done (Liker, 2004), and *jidoka*, a machine that automatically stops working as soon as a problem/defect is detected (Womack and Jones, 2003). According to Liker (2004), these initial researchers of lean manufacturing made it clear that the foundation of their work was based on the TPS and Toyota's way of conducting operations. The lean production movement continued to dominate manufacturing trends (along with the Six Sigma movement) for decades.

Liker (2004) explains that a lean enterprise can be seen as the end result of applying the TPS to all areas of your business. Womack and Jones (2003) developed a five-step process to achieve such an enterprise in their book *Lean Thinking: Banish waste and create wealth in your organisation*:

(1) *Define customer value*: Define value in terms of specific products with specific capabilities offered at specific prices through dialogue with specific customers.

(2) *Identify the value stream*: Identify the entire value stream for each product (or family of products) and remove all waste from the process.

(3) *Make it flow*: Make the remaining value-creating steps flow by fighting against departmentalised, batch thinking and rather focus on the product and its need, rather than the organisation or the equipment.

(4) *Pull back from the customer*: Do less forecasting and let the customer pull the product as it is needed, rather than pushing, often unwanted, products onto the customer.

(5) *Striving for excellence*: There is no end to the process of reducing effort, time, space, cost and mistakes while offering a product, which is ever more nearly what the customer actually wants.

But what was Toyota's secret of success? Several tools and quality improvement methods – such as just-in-time, *kaizen*, one-piece-flow and *jidoka* – were made popular by Toyota in the manufacturing world. These tools later helped create the "lean manufacturing" revolution. But tools and techniques alone cannot transform a business – the human factors also need to be taken into consideration:

> Toyota's continued success at implementing these tools stems from a deeper business philosophy based on its understanding of people and human motivation. (Liker, 2004)

Similarly, Fujio Cho, Toyota's former chairman, emphasised the focus on people in his famous statement: "First we build people, then we build cars" (Liker, 2004). Also supporting this notion was Eiji Toyoda – president and later chairman of the Toyota Motor Corporation and mainly responsible for bringing it to profitability and worldwide prominence (Liker and Hoseus, 2008):

> People are the most important asset of Toyota and the determinant of the rise and fall of Toyota.

According to Tsutsui (1998), production management consists of both technological and human factors, and the TPS is a monument in the history of production management as it suggests a whole new method of analysing both these elements simultaneously under one overarching operational philosophy.

In his book, Liker (2004) elaborates further on the understanding of people and human behaviour by means of the 14 management principles which, according to his 20 years of

studying the company, encapsulate the Toyota Way. At the same time that Liker (2004) wrote his book, Toyota released their own internal training document, the *Toyota Way 2001*. Until then, there was no written record of this concept. It was simply the way things were done throughout the organisation. New employees gradually became accustomed to the company's culture by means of on-the-job exposure and training (Saruta, 2006). It took almost 10 years of writing and rewriting before the *Toyota Way 2001* was released under the watch of then-president Fujio Cho (Liker and Hoseus, 2008). According to Emiliani (2006), the *Toyota Way 2001* is a 13-page document that provides detailed descriptions of the two pillars and reveals explicit and implicit beliefs that have long guided management thinking. Other than this document (which is not publicly available), very few publications give a detailed account of conditions for workers in Toyota's overseas factories. According to Saruta (2006), only introductory work has been attempted, in books such as *Choosing Sides: Union and the Team Concept* (Parker and Slaughter, 1988), *Transplanting the Toyota Culture* (Besser, 1996) and *Remade in America* (Liker *et al.*, 1999).

Toyota presented the *Toyota Way 2001* as a house with two pillars – RFP and Continuous Improvement (Emiliani, 2008b; Liker and Hoseus, 2008). The sub-categories for the RFP pillar are as follows:

(1) *Respect*: They respect each other, make every effort to understand each other, take responsibility and do their best to build mutual trust.

(2) *Teamwork*: It includes the stimulation of personal and professional growth, sharing opportunities for development and maximising individual and team performance (Liker and Hoseus, 2008).

Oppenheim *et al.* (2011) summarise RFP thus:

> Respect is trust, honesty, empowerment, teamwork, stability, motivation, drive for excellence, and healthy hiring and promotion policies. It calls for a vision which draws and inspires the best people and promotes such excellent human relations. It promotes a learning environment. Finally, it calls for treating people as the most valued assets, not as commodities.

Emiliani (2006) bluntly states that the critical failure in the dissemination of knowledge related to the correct lean management practices is related to the non-existent, inconsistent or incomplete representation of the importance of the RFP principles, despite clear writings and the presentation of lean management, *kaizen* and related processes and tools by Toyota managers and other knowledgeable people (Emiliani, 2006). In the rare case where the RFP pillar is considered at all, it is often incorrectly understood as adding cost to the lean implementation, when in fact it should reduce cost (Emiliani and Stec, 2005; Sisson and Elshennawy, 2015).

Contrary to the lean culture of RFP, productivity improvement often leads to unemployment. This approach to continuous improvement decreases the remaining employees' enthusiasm to participate in future improvement activities and, as a consequence, the pace of improvement is reduced. The lay-off of employees due to productivity improvements is against the RFP principles (Emiliani and Stec, 2005). Having a purely financial view of the benefits of lean also undercuts the RFP principles and does not help people focus on improving business processes (Emiliani and Stec, 2005).

3. Research methodology

The aim of the study reported here was to investigate, report and interpret the true, original meaning of RFP according to the creators of the Toyota Way. The investigation was conducted by means of an SLR, and findings were reported in an RFP framework and were

interpreted by proposing a conceptual RFP lean implementation framework – a guiding torch that can assist managers by providing the necessary direction during the change management programmes (Anand and Kodali, 2010).

As the *Toyota Way 2001* document is not publicly accessible, other, secondary literature sources had to be examined by means of an SLR):

(1) *Phase 1*: Planning the review.
- Formulating the problem and research question (Garza-Reyes, 2015; Khan *et al.*, 2003; Materla *et al.*, 2017; Perestelo-Pérez, 2013; Tranfield *et al.*, 2003).

(2) *Phase 2*: Conducting the review.
- Searching and identifying the relevant work (Garza-Reyes, 2015; Khan *et al.*, 2003; Perestelo-Pérez, 2013; Tranfield *et al.*, 2003).
- Pre-selection of references and selection of studies included (Garza-Reyes, 2015; Perestelo-Pérez, 2013; Tranfield *et al.*, 2003).
- Critical appraisal and assessment of the risk of bias in the studies included (Khan *et al.*, 2003; Perestelo-Pérez, 2013; Tranfield *et al.*, 2003).

(3) *Phase 3*: Reporting and dissemination.
- Analysis and synthesis of the evidence (Garza-Reyes, 2015; Khan *et al.*, 2003; Perestelo-Pérez, 2013; Tranfield *et al.*, 2003).
- Interpretation of the findings (Garza-Reyes, 2015; Khan *et al.*, 2003; Materla *et al.*, 2017; Perestelo-Pérez, 2013).

3.1 Formulating the problem and research question

The review question is critical to an SLR as other aspects of the process flow from it (Tranfield *et al.*, 2003). As explained in the introduction to this study, the problem is that business leaders do not understand the true meaning of RFP as intended by the creators of the Toyota Way. This leads to organisations not gaining the full advantages of lean implementation or at the worst, never being able to implement lean successfully.

The research question for this study is thus stated as follows:

RQ1. What was the original meaning of "RFP" as intended by the creators of the Toyota Way?

3.2 Searching and identifying the relevant work

The next step of the SLR was to perform a comprehensive, unbiased search (Tranfield *et al.*, 2003). Different publishers' electronic databases, as well as internet searches, white papers and company documents, were used to find literature relevant to the scope of the study – thus, also using sources other than articles published in journals (Tranfield *et al.*, 2003)

The search strings used were based on the main topics being investigated. The CIMO (context–intervention–mechanism–outcome) logic (Denyer, 2012; Denyer *et al.*, 2008) was used to develop the search strings and inclusion/exclusion criteria (Garza-Reyes, 2015): Context – "Lean", "Lean manufacturing" & "Lean management". Intervention – "Lean implementation". Mechanism – "Change management". Outcomes – "Respect for People" & "Respect for humanity". These search strings were used in combination.

The search led to 15 published articles, six textbooks, one reputable internet source, one White Paper and three organisational reports that were relevant to the research question.

3.3 Pre-selection of references and selection of studies included

The next step of the SLR was to pre-select potentially relevant references and, subsequently, select the studies that would be included in the review (Perestelo-Pérez, 2013). As the *Toyota Way 2001* document is not publicly available and very few publications give details on the working conditions in Toyota factories (Saruta, 2006), limited resources were found during this study. Therefore, if the literature sources found in the previous step conformed the CIMO logic (inclusion criteria) of the previous step, it was included in the study for further investigation.

3.4 Critical appraisal and assessment of the risk of bias in the studies included (Khan et al., 2003; Perestelo-Pérez, 2013)

The applicability of the results of an SLR, the validity of individual studies and certain design characteristics of a review may affect its interpretation and conclusions (Perestelo-Pérez, 2013). Therefore, the resources found by means of the CIMO search strings were critically appraised by means of comprehensive reading and detailed analysis of all the information reported in the article in terms of at least the following relevant aspects (Perestelo-Pérez, 2013):

- the methodological validity;
- assessment of the precision and scope of the results analysis; and
- applicability of the results and study conclusion to this context.

It was found that ten of the published articles only advocated the importance of including RPF principles during lean implementation but neglected to explain what RFP meant or how to incorporate it during lean implementation. The core contributions (Tranfield *et al.*, 2003) to the RFP principles were thus made from only six published articles, six textbooks, one reputable internet source, one white paper and three organisational reports (Table I).

3.5 Analysis and synthesis of the evidence

The next step was to combine, integrate and summarise the key emerging themes into a RFP framework (Perestelo-Pérez, 2013; Tranfield *et al.*, 2003). These key themes are elaborated on in Section 4.1.

3.6 Interpretation of the findings

The aim of the SLR was to present the results in an accessible and usable form to the real world of practice and policymakers (Tranfield *et al.*, 2003). To interpret the findings of the SLR in a pragmatic manner, the key emerging themes of the SLR (the RFP principles, synthesised in the previous step) were used to propose a conceptual RFP lean implementation framework. By analogy with the Womack and Jones (2003) method for developing a *product* value stream (discussed in Section 2), an additional *people* value stream was developed. The traditional *product* value stream was combined with the newly developed *people* value stream into a proposed conceptual RFP lean implementation framework, which is discussed in Section 4.2.

4. Results and discussion

4.1 The Respect for People framework

The literature on the subject of RFP principles was found to be much fragmented among different authors, and moreover, no single framework was found that explains them. Therefore, the study reported here combined and synthesised the available literature into a

#	Author(s)/Year	Title	Type of source
1	Cardon and Bribiescas (2015)	RFP: the forgotten principle in lean manufacturing implementation	Journal article
2	Emiliani (2008a,b)	The equally important "RFP" principle	Journal article
3	Forrester (1995)	Implications of lean manufacturing for human resource strategy	Journal article
4	Husar (1991)	*Corporate Culture: Toyota's secret, competitive advantage*	White paper
5	Kato (1981)	*My Years with Toyota*	Book
6	Liker (2004)	*The Toyota Way – 14 Management Principles*	Book
7	Liker and Hoseus (2008)	*Toyota Culture*	Book
8	Marksberry (2011)	*The Toyota Way – a quantitative approach*	Journal article
9	Ohno (1988)	*Toyota Production System: Beyond Large-Scale Production*	Book
10	Puvanasvaran *et al.* (2008)	A review of problem solving capabilities in lean process management	Journal article
11	Stewart (2012)	*The Toyota Kaizen Continuum: A practical guide to implementing Lean*	Book
12	Sugimori *et al.* (1977)	Toyota production system and kanban system materialisation of just-in-time and respect-for-human system	Journal article
13	Toyota_Motor_Corporation (2003)	Environmental and social report	Organisational reports
14	Toyota_Motor_Corporation (2016)	Sustainability Data Book	Organisational reports
15	Toyota_Motor_Corporation (2007)	Sustainability Report	Organisational reports
16	Womack (2008)	RFP	Internet
17	Womack and Jones (2003)	Lean Thinking: Banish waste and create wealth in your corporation	Book

Table I.
Core contributions made to the RFP principles of this study

recapitulated RFP framework, shown in Figure 1. In this section, a depiction is given of the different key themes that emerged from other writers on the principles of RFP, as well as a discussion of these results.

The RFP framework (Figure 1) is elaborated on in the paragraphs that follow. An explanation is given on the differences between and necessity for the two value streams – the traditional *product* value stream that delivers a production system that highlights problems (as depicted by the upper process arrow of Figure 1) and the additional *people* value stream that delivers people who can identify and solve these problems (the parallel, lower process arrow of Figure 1). The problem-solving process (central to Figure 1) is described as the "DNA code" that links the two value streams together and how it creates an environment of mutual trust that leads to a leaner system. Following this, details are given of the actions to take to improve the people value stream (bottom-left corner of the figure) and the subsequent attributes that should be developed in people (bottom-right corner of the figure). Techniques to improve the product value stream fall outside of the scope of this article and examples are therefore simply mentioned (top-left corner of the figure). Finally, a summary of the RFP framework is given.

4.1.1 The two different value streams. In traditional value stream mapping, the product's path is followed from raw material to finished goods, documenting both value-adding processes and wasted steps. This approach can also be used on a conceptual level to understand the people value stream by mapping people's careers, beginning with when they first started at a company. For this purpose, "value" is added when a person is learning and

being challenged; every *other* hour is considered to be waste. A person's work may be productive on the product value stream, but for the people value stream, if the work does not contribute to the learning and development of the person, it will be classified as waste. During the job application phase, human resource managers should thus identify key personal characteristics in the selection process for employees to assist in appointing the correct employees in the correct position (Rodríguez *et al.*, 2017). Once a person is appointed, further focus should be given to adding value to the people value stream.

The two above-mentioned value streams are considered to form the DNA of the Toyota Culture:

> When the product and people value streams are connected and that DNA reproduced, it forms the true Toyota Culture, which not only makes it possible to implement but also to sustain the Toyota Way. (Liker and Hoseus, 2008)

As Toyota's organisational DNA consists of two strings (the two value streams), the problem-solving process can be seen as the code that connects the two. A company's lean transformation will not be possible without this connection (Liker and Hoseus, 2008). The TPS is designed to bring problems to the surface. Lean techniques such as *kanban*, continuous flow, JIT, 5S, standardised work and the *andon* cord all expose problems that might not have been seen otherwise (Liker and Hoseus, 2008).

The authors of the current study are, however, of the opinion that "bringing problems to the surface" in itself creates a problem if there is nobody to solve these problems. If an organisation implements JIT and *kanban* "today", they will run out of inventory "tomorrow". This is a good thing only if the organisation sees problems as opportunities to improve. But if these problems are pointed out without anyone to solve them, they will only create frustration and negativity towards "lean". Thus, problems that are created and highlighted by a newly implemented lean system will create frustration and negativity towards lean if there is nothing that can be done to solve the problems.

There is, therefore, a need for another value stream – a people value stream that delivers people who are team-minded, competent, motivated, willing and able to identify and solve problems, team-minded, aware of safety, efficient and accountable. Liker and Hoseus (2008) concur:

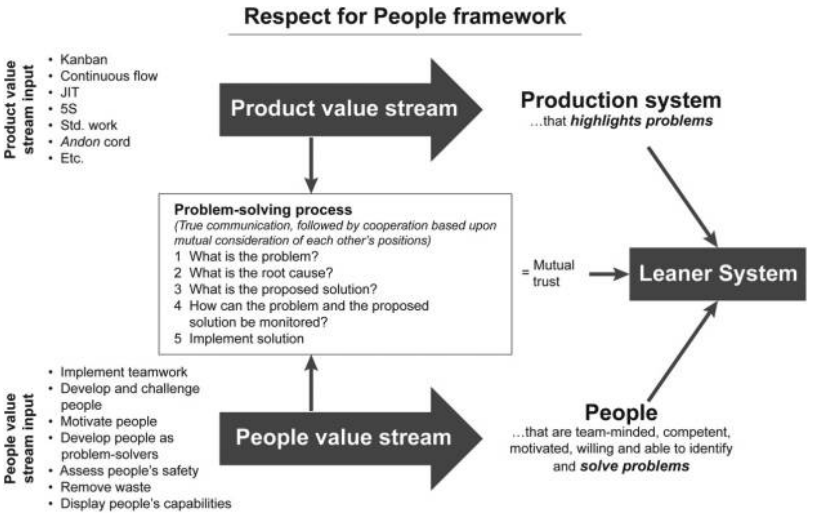

Figure 1.
The RFP framework, illustrating the product value stream that highlights problems and the people value stream that delivers people who can identify and solve these problems

> The key to success is to have a production system that highlights the problems and a human system that produces people who are able and willing to identify and solve them.

Developing people into problem-solvers and taking waste out of the system leave a leaner system in place (Liker and Hoseus, 2008). Without the waste of inventory in the product value stream, problems surface quickly and challenge team members to respond and learn from the obstacles that they encounter.

A crucial element of the problem-solving process, that effectively connects the two value streams, is mutual trust. This should be at the centre of the problem-solving process because it is key to creating an environment that both encourages the identification of problems and motivates people to solve them (Liker and Hoseus, 2008). Without trust in their employers, employees are reluctant to admit to the existence of problems and learn that it is safest to hide them (Liker and Hoseus, 2008). Mutual trust means that management and employees have confidence in each other. The relationship between labour and management should be based on mutual trust and respect (Marksberry, 2011; Toyota_Motor_Corporation, 2003). Both parties realise that they have different jobs and different responsibilities in the company. Employees must be confident that management will make the right decisions for the prosperity of the business while listening to them and rewarding them fairly for their work (Husar, 1991):

> Only by showing mutual respect – each for the others and for each other's role – is it possible to solve problems, make work more satisfying and take organisational performance to an even higher level. (Womack, 2008)

When a traditional product value stream is optimised, actions such as *kanban*, JIT, continuous flow, standardised work and the *andon* cord are used. Similar to these elements, the following actions should be taken to improve the people value stream during lean implementation:

- Implement teamwork as the foundation of the organisation.
- Develop and challenge people.
- Motivate people.
- Develop people as problem-solvers.
- Assess people's safety in their daily tasks.
- Remove waste from people's daily tasks.
- Display people's capabilities by entrusting them with greater responsibility and authority.

These key success actions are elaborated on in what follows:

4.1.2 Implementing teamwork as the foundation of the organisation. When implementing lean in an organisation, teamwork should be used as the foundation for the stimulation of personal and professional growth and for sharing opportunities of development and maximising individual and team performance (Liker and Hoseus, 2008). According to Marksberry (2011), when having a large professional team work together, each individual member must feel as though they matter in the company. An effective way to instil a feeling of self-importance is if team members have long-term trust and respect with each other. Marksberry (2011) also found that the best way to achieve this is by respecting members' contributions.

Liker (2004) applauds Toyota for the balance that they have established between individual work and group work and between individual excellence and team effectiveness.

Teamwork is critical, but it is never a substitute for a lack of individual excellence or understanding of Toyota's systems. Excellent individuals are required to make up teams that excel. Toyota's assumption is that if teamwork is made the foundation of the organisation, individual performers will be committed to making the company successful (Liker, 2004).

4.1.3 Develop and challenge people. Liker (2004) quoted Sam Heltman (one of the first five Americans hired by Toyota, Georgetown), stating that RFP means respect for the human mind, people's capability and the effective use of their time. People tend to think teamwork is about liking each other. Contrary to this, mutual respect and trust mean managers trusting employees to do their job so that the company can be successful; it does not mean that people "love" each other:

> The Toyota Way is not about lavishing goodies on people whether they earned it or not; it is about challenging and respecting employees at the same time. (Liker, 2004)

The ability to think and execute their tasks as effectively as possible should be developed in each person (Husar, 1991; Marksberry, 2011).

Workers should be taught multi-level skills such as problem-solving and group development and practise this regularly. They should also learn more about safety. Team members should have the opportunity to develop into team leaders (Liker and Hoseus, 2008). Managers must respect people's competence and provide them with new tasks and problems that will challenge their abilities (Husar, 1991; Liker and Hoseus, 2008; Toyota_Motor_Corporation, 2003).

In today's competitive world, no company can afford to waste resources. The most underutilised resource of most manufacturing companies is their people. The number one asset of these organisations is also their people. People are among the few appreciating assets of an organisation (Puvanasvaran *et al.*, 2008). This appreciation is realised by developing and challenging people's abilities (Liker and Hoseus, 2008). The growth of each employee will also contribute to the success of the business (Toyota_Motor_Corporation, 2016).

Husar (1991) states that the growth of a company is dependent on the growth of its people. Cardon and Bribiescas (2015) elaborate further by explaining that although people are the force that will help the company to grow, it is also important that the people grow with the company – people need to improve their skills and abilities and then these skills must be used by the company to their maximum potential. This, also, is accomplished by training and challenging people's abilities with new tasks.

Liker's tenth principle of his Toyota Way model (Liker, 2004) – *develop exceptional people and teams who follow your company's philosophy* – also elaborates on how to develop people.

In the original *Toyota Way 2001* document, there is a sub-section on promoting organisational learning (Liker and Hoseus, 2008), which includes learning from mistakes. Toyota views errors as opportunities for learning. Instead of blaming individuals, the organisation takes corrective actions and distributes knowledge about each experience broadly (Liker and Hoseus, 2008). Learning and teaching should, therefore, be a continuous company-wide process as superiors motivate and train subordinates and as predecessors do the same for their successors. Team members at all levels share knowledge with one another (Liker and Hoseus, 2008).

The authors of the current paper affirm that the concepts of developing and challenging people are important in lean engagement. It should be pointed out that implicit in this principle is the understanding that if a manager challenges an employee to improve his operation, then there is a tacit acknowledgement that the manager truly believes that the employee is capable of realising the improvement. This step is vitally important for

successful lean implementation and for showing respect to people in the process. Liker (2004) concurs:

> Developing excellent people who understand and support your company's culture, is not a matter of adopting simple solutions as an afterthought. Training exceptional people and building individual work groups needs to be the backbone of your management approach, an approach that integrates your social systems with your technical systems.

Furthermore, the current authors wish to emphasise the coaching aspect of this phase – managers cannot just arrange random training sessions for employees and then believe that they will continue with the process by themselves. This is the reason that the Toyota Way (Liker, 2004) also clearly recommends an organisational hierarchy that is not too flat because team leaders and group leaders cannot have too many (not more than eight) people that they need to coach.

4.1.4 Motivate people. During lean implementation, people should be motivated to take part actively in the continuous improvement process by encouraging them to provide ideas and improving the work they do (Cardon and Bribiescas, 2015; Liker, 2004). Team members add value to the products they create by suggesting new ways that can improve their work and the production process (Husar, 1991). This is crucial for lean implementation and continuous improvement as it is only the workers themselves who can identify ways of improving the prevailing process or product (Forrester, 1995).

Their work environment must, therefore, be a place where they feel appreciated as individuals (Cardon and Bribiescas, 2015). People need some autonomy to feel they have control over the job. There seems to be nothing as motivating as challenging targets, constant measurement and feedback on progress and an occasional reward thrown in (Liker, 2004).

To facilitate the motivation of people, a system should be created where workers can take part in making improvements (Sugimori *et al.*, 1977).

4.1.5 Develop people as problem-solvers. For years, Womack (2008) visited different companies where the RFP principles were core to their corporate philosophy. When asking managers what it meant, he received answers such as employees should be treated fairly, given clear goals, trusted to achieve them in the best way and be held accountable for results.

As it was Toyota that created the Toyota Way, of which one pillar was RFP, Womack (2008) chose to ask Toyota managers how they showed respect to their employees. Their answer was quite different from other organisation's answer when they started explaining it by means of the problem-solving process:

- Managers will begin by asking the employees what the problem is that they experience. They then challenge the employee's response with a dialogue about what the real problem is (not just the surface problem).
- They are then asked what caused the problem and discuss the root cause. The employee is required to gather evidence from the gemba for joint evaluation; this is also known as Genchi Genbutsu – Go and see for yourself to thoroughly understand the situation (Liker, 2004).
- Employees are asked to propose a solution and explain the reason they chose the particular solution over other options.
- The next step is to ask the employee how they (the employee and managers) will know that the problem is solved (How can it be monitored?).

- Finally, after an agreement is reached and the correct cause of action is decided, the employee is tasked with its implementation.

This problem-solving process represents the highest form of respect (Emiliani, 2008a; Womack, 2008). The manager admits that he cannot solve a particular problem alone as he is not close enough to it to know all the facts. Moreover, the manager shows real respect for the employees' knowledge and their dedication to finding the best answer to an issue. On the other hand, the employees cannot solve particular problems alone as they are too close to them to see their context and they might not ask sufficiently critical questions about their own work. In contrast, ignoring the invaluable inputs that the workers can give is seen as disrespectful (Stewart, 2012). Marksberry (2011) performed a latent semantic analysis of The Toyota Way and correspondingly found that respect and Genchi Genbutsu stood out as the most meaningful principles to Toyota.

Toyota develops people not only to do their jobs but also to think deeply about problems and become committed to the Toyota value system. The problem-solving capabilities of the employees are an essential factor that drives the system successfully, including the co-operation of everyone from top to bottom (Puvanasvaran *et al.*, 2008). In other words, management and employees must trust each other to fulfil their responsibilities for their mutual benefit (Husar, 1991).

Toyota's values of trust and continuous improvement permeate its commitment to long-term thinking, developing people, standardisation, innovation and problem-solving. It is a learning organisation that thrives on its people engaging in identifying and solving problems together and achieving results that will benefit everyone (Liker and Hoseus, 2008).

Problems are opportunities to improve. A poor manager is one who can see no problems (Husar, 1991). On the other hand, people with problem-solving capabilities become the drivers that enable lean processes as a tool to achieve excellence in work processes through RFP (Puvanasvaran *et al.*, 2008).

Seisi Kato (Kato, 1981) summarises the problem-solving process in his description of the RFP principles in terms of what he called the three C's: communication, cooperation and consideration. According to him, these three words signify both a means of personal communication and a method of management:

> Leadership is a process springing from dialogue that reaches the level of true communication, followed by sincere efforts at cooperation based upon mutual consideration and understanding of each other's positions.

4.1.6 Assess people's safety. During lean implementation, another form of RFP is to have consideration for people's safety (Sugimori *et al.*, 1977; Toyota_Motor_Corporation, 2003). People should not be allowed to perform operations that involve danger, those injurious to health or operations requiring hard physical labour (Toyota_Motor_Corporation, 2007).

4.1.7 Remove waste from people's daily tasks. Muda is the Japanese word for waste and is translated into English as any human activity which absorbs resources but creates no value (Ohno, 1988; Womack and Jones, 2003). For an organisation to be successful, they must fully use their people's abilities and capabilities as effectively as possible (Husar, 1991; Sugimori *et al.*, 1977). To achieve this, the following activities – considered as waste (*muda*) – should be removed from their daily tasks (Liker, 2004; Sugimori *et al.*, 1977; Womack and Jones, 2003):

- *Defects*: This includes mistakes that require rectification.
- *Overproduction*: This includes production of items no one wants.
- *Excess inventory*: This includes handling of inventories and goods that pile up.

- *Over-processing*: This includes processing steps which are not actually needed.
- *Unnecessary motion*: This includes movement of people.
- *Unnecessary transportation*: This includes transport of goods from one place to another without any purpose.
- *Waiting*: This includes people in a downstream activity standing around waiting because upstream activities have not delivered on time.
- *Unused employee creativity*: This includes workers performing monotonous, repetitive operations that can be mechanised, automated and unmanned.

4.1.8 Display people's capabilities by entrusting them with greater responsibility and authority. For an organisation to be successful, it must fully use its people's abilities and capabilities as effectively as possible (Husar, 1991; Sugimori *et al.*, 1977) by entrusting them with more responsibility and authority (Marksberry, 2011; Puvanasvaran *et al.*, 2008; Sugimori *et al.*, 1977).

Toyota believes that creating a system where workers can actively participate in running and improving their workshops, and be able to display their capabilities, is the foundation of the human respect environment of the highest order (Sugimori *et al.*, 1977).

The *first* step in creating such an environment is by granting workers the right to stop the production line on which they are working when a worker finds himself unable to keep up or discovers an incorrect or defective part (Sugimori *et al.*, 1977).

> It is not a conveyor that operates men, while it is men that operate a conveyor, which is the first step to respect for human independence. (Sugimori *et al.*, 1977)

The *second* step is to inform all workers of the priority order of parts to be processed and the state of the production advancement. Consequently, the authority for decisions of job dispatching and overtime is delegated to the foreman, which allows each shop to conduct production activities without orders from the control department (Sugimori *et al.*, 1977).

People's capabilities are thus displayed by delegating the authority and responsibility for running and improving the workshop themselves – empowering the workers (Puvanasvaran *et al.*, 2008; Sugimori *et al.*, 1977). "This is the most distinctive feature of Toyota's respect for human system" (Sugimori *et al.*, 1977).

Although the authors of the current article agree that people's capabilities should be displayed by entrusting them with more responsibility and authority, it is important to note that a high level of development and maturity of the people is required for this step to be possible and a success. For this reason, it is included in the RFP framework, but it should be one of the last steps when incorporating RFP principles into lean implementation. If people are given this type of freedom of stopping production lines, doing their own planning and determining their own overtime before they are mature enough, it could have damaging consequences for the organisation.

Companies that develop and leverage the capabilities of all their people will, however, achieve better performance than those that do not. In contrast, companies that fail to unlock the potential of their workforce will be forced to carry more overheads and will react more slowly to changes in the market demand (Puvanasvaran *et al.*, 2008).

4.1.9 Summary of the Respect for People framework. The differences between, and the necessity of, the two value streams – the traditional product value stream and the additional people value stream – have been explained, as well as how they interact with each other. The various critical actions to be taken to optimise the people value stream have been discussed, as well as the attributes that should develop in people as a consequence.

In the following section, a conceptual lean implementation framework that incorporates the RFP principles is proposed.

4.2 Proposed lean implementation framework

The key emerging themes of the SLR were reported in the previous section by means of the RFP framework. These results are now interpreted by proposing a conceptual RFP lean implementation framework.

By analogy with the original five-phase Womack and Jones (2003) method for developing a *product* value stream (discussed in Section 2), an additional *people* value stream was developed by adding the following five phases:

(1) The analogy of "Define customer value" is "Define the people values".

(2) The analogy of "Identify the product value stream" is "Identify the people value stream".

(3) By analogy with "Create flow in the product value stream", "Create flow in the people value stream" is added.

(4) According to "Pull from the customer", "Pull people's capabilities" is added.

(5) Finally, by analogy with "Strive for an excellent product", "Strive for excellent people" is added.

The five phases of the traditional *product* value stream were combined with the five phases of the newly developed *people* value stream into a proposed conceptual RFP lean implementation framework. The lean implementation phases alternate between the two value streams, in a particular sequence, as indicated in Figure 2.

The newly proposed RFP lean implementation framework is illustrated in Figure 3. It is designed as a continuous circle as an organisation will *always* be striving for excellence. The

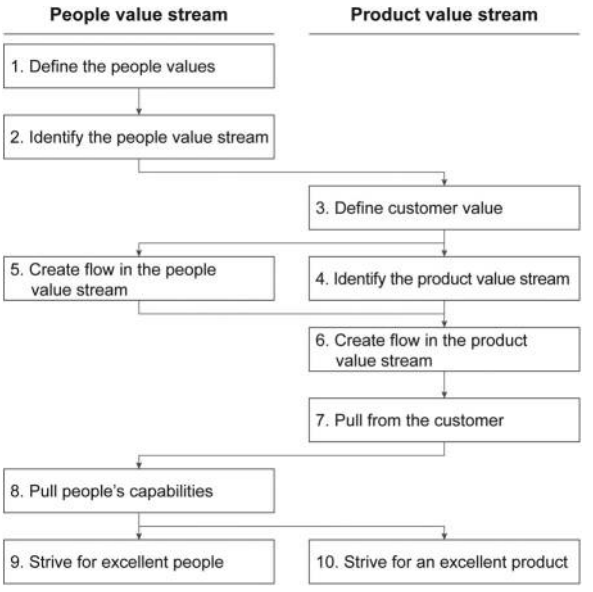

Figure 2.
The implementation phases of the RFP lean implementation framework that alternate between the people value stream and the product value stream

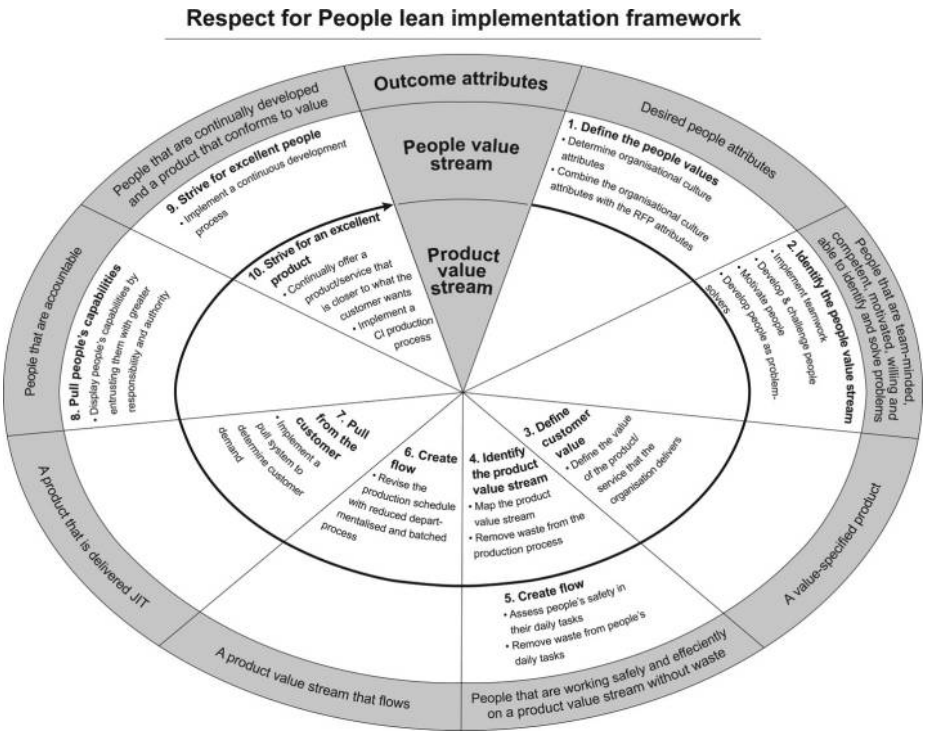

Figure 3.
A proposed RFP lean implementation framework

two internal circles represent the product and the people value streams (as explained in Figure 2) and the implementation phases progress in a clockwise direction.

The implementation framework starts in the people value stream cycle by "Defining the people values" that are required for the lean implementation. The next phase, also part of the people value stream, is to "Identify the people value stream" that will deliver the people values mentioned in Phase 1. Only then should the organisation move over to the product value stream by "Defining the customer value" of the products. Phase 4 (Identify the product value stream) and Phase 5 (Create flow in the people value stream) happen simultaneously as both phases refer to removing waste out of processes. The following two phases, Phase 6 (Create flow) and Phase 7 (Pull from the customer), take place on the product value stream side of the implementation framework. The organisation then moves back to the people value stream for Phase 8 (Pull people's capabilities). The last two phases – Phase 9 (Strive for excellent people) and Phase 10 (Strive for an excellent product) – happen also in parallel.

The perimeter of the framework indicates the attributes that develop during each implementation phase.

Further details and an explanation of each phase of the RFP lean implementation framework are elaborated on in what follows. A summary of the actions and attributes of each phase is presented in Table II.

4.2.1 Phase 1 (people value stream): define the people values. The first step in lean implementation should be to determine the desired people attributes. What are the characteristics of a person that will fit into the organisational culture of the company? These

The RFP lean implementation phases				
Phase	Value stream	Implementation phases	Key success actions	Process-outcome attributes
1	People	Define the people values	Determine the organisational culture attributes Combine the organisational culture attributes with the RFP attributes (Team-minded, competent, motivated, willing and able to solve problems, aware of safety, efficient, and capable of being trusted with greater responsibility and authority	Desired people attributes
2	People	Identify the people value stream	Implement teamwork as the foundation of the organisation by using it to Create a balance between individual excellence and team effectiveness Stimulate personal and professional growth Create opportunities for personal development Maximise individual and team performance Develop and challenge people by Improving their skills and abilities Coaching them on the lean philosophy Coaching them on safety Developing their problem identification and solving abilities Teaching them multi-level skills such as problem-solving and group development Assigning them new, challenging tasks Implementing learning and teaching as a continuous company-wide process Developing their ability to think and execute tasks as efficiently as possible Motivate people to take part in the process by Encouraging them to provide ideas on how to improve their work and workplace Creating a system through which they can provide ideas Setting challenging targets for them Putting constant measurements in place to track progress Providing regular in-progress	People that are team-minded, competent, motivated, willing and able to identify and solve problems

Table II.
RFP lean implementation phases

(*continued*)

The RFP lean implementation phases

Phase	Value stream	Implementation phases	Key success actions	Process-outcome attributes
			feedback to them Ensuring people feel appreciated as individuals Implementing a reward system for taking part in the process Develop people as problem-solvers by means of: Implementing and following the 5-phase problem-solving process Ensuring engagement and co-operation of everyone (from top to bottom) in solving problems Ensuring dialogues reach a level of true communication Ensuring sincere efforts at cooperation Ensuring mutual consideration and understanding for other people's positions	
3	Product	Define customer value	Define the value of the product or service that the organisation delivers in terms of particular Products/services Capabilities Prices Customers	A value-specified product
4	Product	Identify the product value stream	Map the product value stream for each product (or family of products) Remove waste from the production process	People that are working safely & efficiently on a product value stream without waste
5	People	Create flow in the people value stream	Assess people's safety in their daily tasks by reducing/eliminating tasks that are Dangerous Injurious to their heath Physically strenuous Remove the following forms of waste from people's daily tasks Defects – people required to rectify mistakes Overproduction – people producing items no one wants Excess inventory – people handling inventories and goods that pile up Over-processing – people performing processing steps which are unnecessary Unnecessary motion – People moving around	

(*continued*)

Table II.

The RFP lean implementation phases				
Phase	Value stream	Implementation phases	Key success actions	Process-outcome attributes
			Unnecessary transportation – people moving goods from one place to another without any purpose Waiting – people in downstream activities waiting because upstream activities have not delivered on time Unused employee creativity – people performing monotonous, repetitive operations that can be mechanised, automated and unmanned	
6	Product	Create flow in the product value stream	Revise the production schedule with reduced departmentalised and batch processes	A product value stream that flows
7	Product	Pull from the customer	Implement a pull system to determine customer demand by Reducing forecasting Having the customer pull the product as needed	A product that is delivered JIT
8	People	Pull people's capabilities	Display people's capabilities by entrusting them with more responsibility and authority by: Encouraging them to participate in managing and improving their workplaces Giving them the right to stop the production line when they cannot keep up or detect an error Delegating decisions to people (such as job-dispatching and overtime)	People that are accountable
9	People	Strive for excellent people	Implement a *continuous* development process that will continually Strengthen teams Develop and challenge people Motivate people Solve problems Keep people safe Remove waste Entrust people with greater responsibility and authority	People that are continually developed and a product that conforms to value
10	Product	Strive for an excellent product	Continually offer a product/service that is closer to what the customer wants Implement a continuous improvement production process that reduces Effort Time Space Cost Mistakes	

Table II.

attributes need to be combined with the RFP attributes to determine the desired people qualities for lean implementation. The RFP attributes are defined as being team-minded, competent, motivated, willing and able to identify and solve problems, being aware of safety, working efficiently and being accountable.

4.2.2 Phase 2 (people value steam): identify the people value stream. Once the desired people attributes have been determined, a process needs to be developed which will ensure that it is developed in each person, that is, the people value stream. It should be a structured process that consists of the following key actions (as opposed to random training sessions):

- Implement teamwork as the foundation of the organisation.
- Develop and challenge people.
- Motivate people.
- Develop people as problem-solvers.

4.2.3 Phase 3 (product value stream): define customer value. Once the people value stream has been developed and the above attributes are developed in people, attention can be given to the product value stream. The customer value of the product or service that the organisation delivers needs to be defined in terms of particular products or services with specific capabilities offered at specific prices through dialogue with particular customers (Womack and Jones, 2003). This phase will contribute to a clear definition of the value of the product or service according to the customer.

4.2.4 Phase 4 (product value stream): identify the product value stream. The next step is to draw a value stream map of the entire value stream for each product (or family of products). Also, all waste should continually be removed from the production process (Womack and Jones, 2003), creating an efficient value stream without waste.

4.2.5 Phase 5: (people value stream): create flow in the people value stream. People are one of the few appreciating assets that an organisation has; therefore, careful consideration should be given to their safety. This is done by reducing or eliminating tasks that are dangerous, injurious to their health and physically strenuous.

Furthermore, value-adding workers' time should only be used for value-adding tasks. Hence, the following activities – considered to be waste – should be removed from the people value stream: defects, overproduction, excess inventory, over-processing, unnecessary motion, unnecessary transportation, waiting and unused employee creativity.

Conventionally, waste is seen as something that is removed to optimise the *product* value stream. Although this is true, it has been indicated in the above descriptions that the eight forms of waste are also applicable to the people value stream. By removing waste, an organisation is thus achieving two goals – optimising the product value stream *and* showing RFP. Phases 4 and 5, therefore, take place in parallel in the RFP lean implementation framework, creating conditions for people to work safely and efficiently on a product value stream without waste.

4.2.6 Phase 6 (product value stream): create flow in the product value stream. As described by Womack and Jones (2003), during this phase, flow should be created in the remaining value-adding steps. This is achieved by revising the production schedule with less departmentalised batch processes. The focus should rather be on the product and its need and not on the organisation and its equipment.

4.2.7 Phase 7 (product value stream): pull from the customer. During this phase, the organisation should start moving away from forecasting (which often leads to producing unwanted products) and rather have the customer pull the product as needed. This is

referred to as a pull system, in contrast to a push system (Womack and Jones, 2003), and will consequently deliver products just-in-time.

4.2.8 Phase 8 (people value stream): pull people's capabilities. By the time an organisation reaches this phase, the people value stream has been created and people are developed accordingly. Therefore, during this phase, people's capabilities can be displayed by entrusting them with more responsibility and authority. They should be encouraged to participate in managing and improving their workplaces. They should be given the right to stop the production line when they cannot keep up or when they detect an error.

Furthermore, people should be empowered with knowledge of priority orders to be processed and the state of the production schedule. This will allow decisions on job dispatching and overtime to be delegated to middle management and avoid the need for orders from the production control department.

This is one of the final phases of the people value stream as a high level of development and maturity of the people is required for this part of the operation to be possible and a success. But implemented correctly, it will result in people being accountable, leading to fewer overheads, fewer layers of management and a quicker response time to changes in the market demand.

4.2.9 Phase 9 (people value stream): strive for excellent people. The final component of the people value stream is a *continuous* improvement process that will carry on as long as there are people driving it. People are therefore continually developed and challenged, motivated and entrusted with great responsibility and authority. Problems are continually solved, teams are continually strengthened, people are continually kept safe and waste is continually removed.

4.2.10 Phase 10 (product value stream): strive for an excellent product. Phase 10 is also a continuous improvement phase of the product value stream and therefore takes place in parallel with Phase 9. As described by Womack and Jones (2003), there is no end to the process of reducing effort, time, space, cost and mistakes while offering a product that is ever closer to what the customer wants; that is, delivering a product that conforms to value according to the customer.

5. Practical implications

According to Marksberry's (2011) latent semantic analysis of the Toyota Way, successful businesses are characterised by environments where mutual respect prevails. In the previous section, an RFP framework was presented together with a conceptual RFP lean implementation framework. These two frameworks offer a practical understanding of the people factor – the RFP principles – in lean implementations.

The RFP framework explains the difference between, and the necessity for, the two value streams – the traditional *product* value stream that highlights problems and the additional *people* value stream that delivers people that can solve these problems. In Section 4.1.1, it was explained that value, as opposed to waste, is created in the *people* value stream when a person is learning and being challenged. This principle allows organisations to shift their focus towards developing employees' career paths, which will subsequently contribute towards improved organisational performance.

In Section 4.1.5, the problem-solving process is described as the link between the two value streams. It provides a practical means of addressing and solving problems by including people's input and consequently showing RFP. It emphasises the need to develop people as problem-solvers.

Successful lean implementation depends on a supportive organisational culture due to psychological factors such as fear of failure, breaking with routines, lack of confidence, fear

of change, fear of job loss and the fear of receiving more responsibilities (Ramadas and Satish, 2018). The conceptual RFP lean implementation framework presented in the current paper suggests a means of creating such a culture by involving all employees in the organisation (not just senior management). It gives employees the opportunity to provide improvement suggestions for the work that they do every day. The conceptual RFP lean implementation framework can therefore assist managers with providing the necessary psychological support during the change management process of lean implementation.

In conclusion, the conceptual RFP lean implementation framework gives a practical indication of how to include people during the lean implementation process to achieve continuous improvement of processes. The proposed implementation framework also suggests how to practically show RFP during lean implementation by assisting organisations to have a more balanced focus between the lean tools and techniques and the human side of lean management.

6. Conclusion and opportunities for further research

Lean principles and lean implementation have been the focus of several research studies. These studies have indicated that the focus on lean tools and techniques at the expense of the human side of lean management has prevented effective lean implementation (Bhasin, 2012; Cardon and Bribiescas, 2015; Coetzee *et al.*, 2016; Gao and Low, 2015; Jadhav *et al.*, 2014; Miller *et al.*, 2018; Nordin *et al.*, 2011; Pakdil and Leonard, 2014). Different studies on lean implementation established the following examples of employee barriers to lean implementation: lack of well-trained and experienced staff, knowledge about existing specialists, management commitment, coaching, communication, support, employee development and job security, as well as cultural resistance to change and employees that do not feel valued (Jadhav *et al.*, 2014; Ramadas and Satish, 2018; Shang and Pheng, 2014; Sim and Rogers, 2008)

Companies desiring to practise lean management should be applying – together with their Continuous Improvement pillar – the RFP pillar in everyday management practice if they expect to achieve the desired outcomes (Emiliani, 2006; Marksberry, 2011). Significantly less research has, however, been conducted on the true meaning of specifically the RFP principles during lean implementation. Consequently, the phrase RFP is often ignored, misunderstood or used without a full appreciation of its intended meaning (Cardon and Bribiescas, 2015; Emiliani, 2006; Emiliani and Stec, 2005; Taleghani, 2010).

In this paper, the true, original meaning of the RFP principles of the Toyota Way was systematically reviewed from existing literature, and the results were reported in an RFP framework. The results of the SLR were, furthermore, interpreted by proposing a conceptual RFP lean implementation framework.

The literature on the subject of RFP is much fragmented, though consistent, among different authors. Limited resources were available that explain the original meaning of RFP. This study, therefore, depended to a large extent on the work of Jeffery K. Liker. This lack of resources could also be an indication that the RFP principles do not receive the required attention that was intended by the original creators of the Toyota Way. Furthermore, no single framework was found that explained the RFP principles.

The key emerging RFP themes were found to be:

- Implement teamwork as the foundation of the organisation.
- Develop and challenge people.
- Motivate people.
- Develop people as problem-solvers.

- Assess people's safety.
- Remove waste from people's daily tasks.
- Display people's capabilities by entrusting them with greater responsibility and authority.

Most notably, this is the first study to our knowledge to combine and synthesise previous work done on the meaning of RFP for the purpose of reporting the true, original meaning of the RFP principles as a single recapitulated framework.

The proposed RFP lean implementation framework is based on the results of the SLR. However, the conceptual framework remains untested. Future research should, therefore, focus on gathering empirical data concerning the applicability and validity of the proposed conceptual RFP lean implementation framework in different contexts. Case studies or surveys can be used to determine the applicability and validity of the RFP lean implementation framework in a specific country outside of Japan to determine if the country understands the RFP principles in the same manner as the original Japanese creators intended it. The knowledge and experience gained from such studies may be used to refine the RFP lean implementation framework.

The purpose of this research was to determine the original meaning of "RFP" as intended by the creators of the Toyota Way. As this aim was achieved, further research could focus on other impacting factors of job satisfaction in general during lean implementation. The field of behavioural research – the study of human behaviour and cognition and their impacts on operating systems and process (Gino and Pisano, 2008) – can further assist managers in addressing the people factors during the change process of implementing lean.

The research depicted in this paper explained the importance of focussing on the people aspects of lean (together with the technical aspect). Further research could thus also focus on the psychological factors that contribute to lean success as a holistic and adaptive system (Hozak and Olsen, 2015).

7. Contribution

The findings of this study combine and synthesise previous work done on the meaning of RFP. A contribution is therefore made to the prevailing lean implementation literature by reporting the true, original meaning of the RFP principles as a single recapitulated framework. Furthermore, a conceptual RFP lean implementation framework is proposed that incorporates these RFP principles, according to them the significance they are due.

This review offers an understanding of the people aspect of lean implementation and proposes a practical means of addressing this often-neglected factor. The RFP framework and the RFP lean implementation framework could, therefore, possibly assist organisations in achieving more successful lean implementations.

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CHAPTER 6
APPLIED THEMATIC ANALYSIS

The South African perspective on the lean manufacturing Respect for People principles

R. Coetzee, C. S. Jonker, K. R. Van der Merwe and L. Van Dyk

The purpose of this article is to provide a qualitative exploration of the understanding and applicability of the Japanese-developed RFP principles in the South African context. This is done by explaining how the human resource pillar must be applied as part of the overall lean manufacturing implementation. An empirical study was conducted by means of exploratory interviews. The data was analysed by means of an applied thematic analysis. The findings show that all the Japanese RFP principles were identified by the South African participants and are thus applicable to the South African context.

The findings further indicate that additional principles are required for employees to feel respected and contribute to successful lean implementation in the South African context. These findings are of importance to South African organisations to increase the success rate of lean implementations.

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6.1 Chapter orientation

The applied thematic analysis (ATA) conducted in this chapter/article forms part of the concept design phase of the eADR method. The analysis was conducted on the understanding and applicability of the RFP themes in the South African context, to develop the design requirements for the RFP model (in **Chapter 7**).

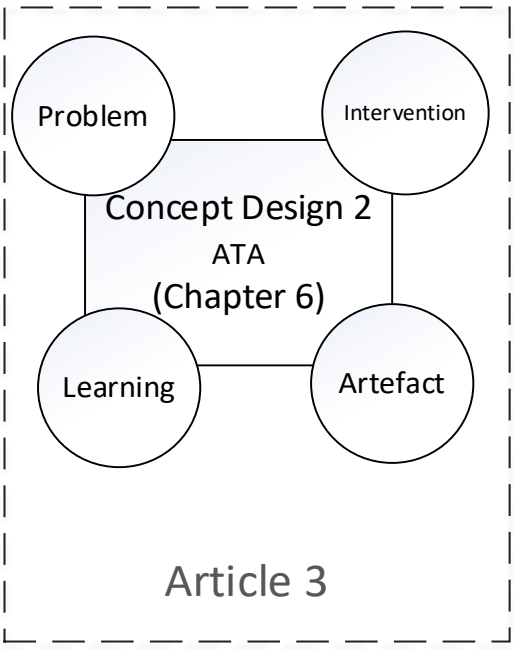

Figure 21: Chapter 6 (Applied thematic analysis) orientation

6.2 Research questions

The research questions addressed by this chapter are as follows:

Research question 3.1 — Are all the Japanese RFP principles applicable to the South African context?

Research question 3.2 — Are any additional RFP principles required for lean implementations to be successful in the South African context?

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The South African perspective on the lean manufacturing Respect for People principles

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Orientation: Many industries have adopted the popular continuous improvement (CI) approach, lean manufacturing, to facilitate CI initiatives. However, several studies have confirmed that the low success rate of lean implementation can be attributed to the disproportionate focus on lean tools and techniques at the expense of the human factor, as expressed in the Respect for People (RFP) principles mentioned in lean literature.

Research purpose: To provide qualitative insight into the understanding and applicability of the Japanese RFP principles within the South African context.

Motivation for the study: An improved understanding of these RFP principles within the South African context can contribute to more successful lean implementations.

Research approach/design and method: A phenomenological approach was followed to conduct the study in different South African industries. Purposive, expert sampling was used and 22 individuals took part in the exploratory discussions. Data analysis was performed using applied thematic analysis.

Main findings: The South African participants identified all the Japanese RFP principles as applicable to the South African context. However, additional RFP themes were also identified, specifically job security and aligned commitment.

Practical/managerial implications: These findings are of importance to organisations planning to implement a Japanese-designed optimisation technique within a South African context. Organisations should pay attention to the original Japanese RFP themes and the additional RFP themes identified in this study.

Contribution/value-add: This study contributes to the limited research available on lean manufacturing and the RFP principles within the South African context. New RFP themes are provided for organisations implementing a Japanese CI methodology within a South African context. The comparison of the understanding of the RFP themes in Japan and South Africa also contributes to the field of industrial psychology.

Keywords: Lean manufacturing; respect for people; applied thematic analysis; thematic map; continuous improvement; Japanese.

Introduction

Organisations are pressured to implement and adopt new continuous improvement (CI) approaches to enhance their efficiency and competitiveness (Kwahk & Lee, 2008; Losonci, Demeter, & Jenei, 2011; Nordin, Deros, Wahab, & Rahmand, 2012). Shifts in customer demand, an increased variety of products and demand, and the quest for perfect quality are driving these changes (Anand & Kodali, 2010). Several organisations and industries across the globe have adopted the popular CI approach, *lean manufacturing*, to facilitate these required CI changes (Losonci et al., 2011).

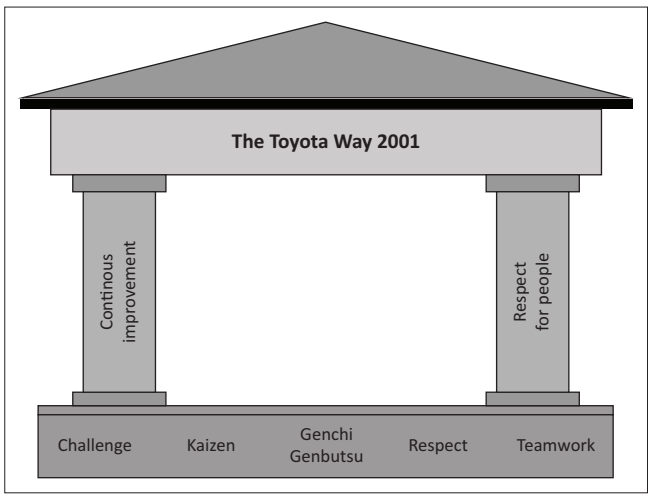
During the 1980s, the automotive industry attracted attention when it became apparent that Japanese cars were lasting longer than American cars and required less maintenance (Liker, 2004). The production system used by Toyota was appropriately named the Toyota Production System (TPS) and Liker (2004) describes it as 'a unique approach to manufacturing' and Toyota's 'manufacturing philosophy'. Professor Liker has been studying Toyota for more than 20 years and was given unprecedented access to Toyota executives, employees and factories, both in Japan and in the United States, in order to gain a better understanding of the TPS.

Outside of Toyota, the TPS is known as 'lean' or 'lean production' (Liker, 2004). The lean production movement continued to dominate manufacturing trends along with Six Sigma (a disciplined and

data-driven approach to eliminating defects) for decades. Toyota popularised several tools and quality improvement methods, but tools and techniques alone do not work as secret weapons to transform a business. The human factor also has to be taken into consideration. Liker (2004) clearly states that Toyota's continued success at implementing these tools stems from a deeper business philosophy based on its understanding of people and human motivation.

The relationship between the social and technical components of a lean manufacturing system is complex and determines the overall system performance in the short and long term (Gaiardelli, Resta, & Dotti, 2018). Tsutsui already recognised this in 1998, stating that production management consists of both technological and human elements. According to him, the development of the TPS was a monumental achievement in the history of production management, as it proposed a whole new method of analysing both these elements simultaneously as part of one system. This was crucial as it recognised human resources as part of the strategy to be applied for a competitive advantage.

Figure 1 depicts the Toyota Way model as presented in the company's internal documents. The model is centred on two principles: Continuous Improvement (CI) and Respect for People (RFP), which, in turn, are built on three and two foundational blocks, respectively (Liker & Hoseus, 2008). Continuous Improvement is built on *challenge* (identify a long-term vision that meets challenges with courage and creativity to realise dreams), *kaizen* (improve business operations continuously, always striving for innovation and evolution) and *Genchi Genbutsu* (a Japanese word for going to the source of the problem to find the facts and to make correct decisions, build consensus and achieve goals at the best speed). The second pillar, RFP is built on *respect* (respect each other, make every effort to understand each other, take responsibility and build mutual trust) and *team work* (stimulate personal and professional growth, share the opportunities of development and maximise individual and team performance).



Source: Liker, J. K., & Hoseus, M. (2008). *Toyota culture*. New York: McGraw-Hill

FIGURE 1: Toyota Way 2001.

It is clear from the pillars of the house that CI cannot be accomplished without RFP. Taiichi Ohno (1988), the developer of the TPS, emphasised this when he stated that respect for humanity is the foundation of the TPS (Womack, Jones, & Roos, 1990).

However, as Toyota expanded their operations throughout the world to countries such as South Africa, they encountered cultural challenges, as the Toyota Way is deeply rooted in the Japanese culture (Liker & Hoseus, 2008). There are differences in the way people reason in the East and in the West (Liker & Hoseus, 2008). People in the West tend to see lean (incorrectly) as a toolkit that can help control the workplace to achieve specific measurable objectives. In the western world, people also objectify the workplace by seeing simple cause-and-effect relationships, while losing sight of the people and the complex dynamics of the environment (Liker & Hoseus, 2008). Contrary to this, when a Toyota sensei looks at improving the workplace, they do not see a number of independent variables that can be manipulated. They rather see a number of people who work together in a process that is filled with waste (Liker & Hoseus, 2008).

The RFP principles are key to making the lean management system work (Marksberry, 2011). However, lean management practitioners do not understand this correctly if they are trying to implement lean manufacturing by focussing mostly on the CI of processes while ignoring or misunderstanding the *Respect for People pillar* (Cardon & Bribiescas, 2015; Emiliani, 2006; Emiliani & Stec, 2005; Taleghani, 2010). This error in judgement significantly limits the improvement that can be achieved by lean implementation, as it is the RFP pillar that enables CI initiatives to be successful and sustainable (Emiliani, 2006).

Several research studies also confirm that a contributing factor to the low levels of success for lean implementation is the disproportionate focus on lean tools and techniques at the expense of the human side of lean management (Bhasin, 2012; Cardon & Bribiescas, 2015; Coetzee, Van der Merwe, & Van Dyk, 2016; Gao & Low, 2015; Jadhav, Mantha, & Rane, 2014; Miller, Brom, & Houge, n.d.; Nordin, Deros, & Wahab, 2011; Pakdil & Leonard, 2014). Employees often do not feel valued although they are in the best position to offer suggestions to improve the efficiency of the work they do (Sim & Rogers, 2008).

This research issue can be addressed by exploring the principles and experiences of lean manufacturing within the South African context. Against this background, the following research questions were formulated:

- Are all the Japanese RFP principles applicable to the South African context?
- Are any additional RFP principles required for lean implementation to be successful within the South African context?

Research aim and objectives

This article aims to provide insight into the understanding and applicability of the Japanese RFP principles within the South African context by means of qualitative research. The study adopted an exploratory approach to data collection and interpretation to explain how the human resources pillar must be applied as part of the overall lean manufacturing implementation.

The following literature review will provide more information on the Japanese-developed lean manufacturing approach to CI.

Literature review

Before the RFP principles were investigated within the South African context, a literature review was conducted on the original RFP themes for lean implementation as developed by the Japanese creators. The literature review also explored the five-phase problem-solving process included in the Toyota Way and the eight forms of waste mentioned in lean literature.

As the study followed an inductive approach, the literature was consulted with caution in the early stages to prevent the researcher's analytical field of vision from being narrowed (Braun & Clarke, 2006; Guest, MacQueen, & Namey, 2012).

Problem-solving process

A big part of CI is to solve problems regularly. The Toyota Way refers to the following specific five-phase problem-solving process to address such problems (Womack, 2008):

- The first step is for the manager to ask the employee about the problem that the employee is experiencing to determine the 'real' problem, not just the 'surface' problem.
- The employee is then asked what causes the problem to determine the root cause. The employee should provide evidence from the actual workplace to be investigated in collaboration with the manager.
- The employee is then asked to propose a solution and provide a reason for the specific solution as opposed to other alternatives.
- The employee is also asked how they (the employer and employee) will know that the problem is solved. How can it be monitored?
- Once an agreement is reached on the correct course of action, the employee implements it.

This problem-solving process represents the highest form of respect (Emiliani, 2008; Womack, 2008): The manager admits that he cannot solve a particular problem alone as he does not know all the facts. Moreover, the manager shows respect for the employees' knowledge and their dedication to finding the best answer to an issue. Ignoring the invaluable inputs that the workers can give is seen as disrespectful (Stewart, 2012). On the other hand, the employees cannot solve the problems alone, as they are too involved in the process to ask sufficiently critical questions about their own work.

The eight forms of waste

Within the lean context, the term 'waste' is attributed to all meaningless, non-essential activities that do not add value to the product and that can be eliminated immediately in order to improve an organisation's productivity (Liker, 2004). The eight forms of waste are explained as follows (Liker, 2004):

- Transportation: Material and parts that are moved around without adding value to the product.
- Inventory: Anything that is beyond what is required by the customer negatively influences cash flow and wastes valuable floor space.
- Motion: Examples of unnecessary movement include looking for something, reaching for something and general walking around.
- Waiting: Waiting includes waiting for material, information, equipment tools, etc.
- Over-production: Producing anything more than what is required by the customer.
- Over-processing: Examples of non-value-added processing include reworking and inspection.
- Defect: Any product that does not conform to customer requirements.
- Underutilisation of employee's creativity: People are the most important asset of any organisation. Therefore, an organisation should engage people's minds (not just their bodies) in CI.

Respect for People principles

Respect for People is a broad commitment. 'It means respect for all people, touched by Toyota including employees, customers, investors, suppliers, dealers, the communities in which Toyota has operations and society at large' (Liker & Hoseus, 2008).

Coetzee, Van Dyk and Van der Merwe (2018) conducted an extensive study to investigate, report and interpret the original meaning of the RFP principles, as intended by their creators. For the study described in this article, these principles were rearranged into themes and sub-themes (Table 1).

Summary

In order to incorporate the Toyota Way, during a lean implementation, the RFP and CI principles (pillars) need to be followed. The RFP principles were elaborated on as well as two CI aspects of the Toyota Way, the five-phase problem-solving process and the eight forms of waste.

Following this review of the Japanese literature, the following section explains the research design that was followed to investigate the RFP within the South African context.

TABLE 1: The original Japanese Respect for People themes.

Theme	Sub-themes	Quotation
Individual development	(1) Value of people	(1) Ensure people feel appreciated as individuals (Cardon & Bribiescas, 2015).
	(2) Worker's input	(1) Create a system through which they can provide ideas (Cardon & Bribiescas, 2015; Liker, 2004). (2) Encourage employees to provide ideas on how to improve their work and workplace (Husar, 1991). (3) Respect not only a person's physical abilities but also their minds and experience (Liker, 2004).
	(3) Motivate people	(1) Set challenging targets for them (Liker, 2004). (2) Put constant measurements in place to track progress (Liker, 2004). (3) Provide regular in-progress feedback (Liker, 2004). (4) Ensure people feel appreciated as individuals (Cardon & Bribiescas, 2015). (5) Create a system where workers can take part in making improvements (Sugimori, Kusunoki, Cho, & Uchikawa, 1977). (6) Implement a reward system for taking part in the process (Liker, 2004).
	(4) Develop people	(1) Improve employees' skills and abilities (Cardon & Bribiescas, 2015). (2) Develop employees' problem identification and solving abilities (Liker & Hoseus, 2008; Puvanasvaran, Megat, Tang, Muhamad, & Hamouda, 2008). (3) Teach employees multi-level skills such as problem-solving and group development (Husar, 1991; Marksberry, 2011). (4) Develop employee' ability to think and execute tasks as efficiently as possible (Husar, 1991; Marksberry, 2011). (5) Stimulate personal and professional growth (Liker & Hoseus, 2008). (6) Challenge employees' abilities (Liker & Hoseus, 2008). (7) Create opportunities for personal development (Liker & Hoseus, 2008).
	(5) Training	(1) Provide training on the lean philosophy (Liker, 2004). (2) Provide training on safety issues (Liker & Hoseus, 2008). (3) Provide training on job-related tasks (Cardon & Bribiescas, 2015; Liker, 2004; Saruta, 2006).
	(6) Employee responsibilities	(1) Display people's capabilities by entrusting them with more responsibility and authority (Marksberry, 2011; Puvanasvaran et al., 2008; Sugimori et al., 1977). (2) Assign new and challenging tasks (Liker, 2004). (3) Give employees autonomy so that they feel that they have control over the job (Liker, 2004). (4) Give employees the right to stop the production line when they cannot keep up or detect an error, as it is not the conveyer that operates men, it is rather the men who should operate the conveyer (Sugimori et al., 1977). (5) Empower employees to participate in managing and improving their workplaces (Puvanasvaran et al., 2008; Sugimori et al., 1977). (6) Delegate decisions to people (such as job dispatching and overtime) (Sugimori et al., 1977).
Group development	(7) Communication	(1) Establish dialogues that reach a true level of communication that is followed by cooperation and consideration (Kato, 1981). (2) Ensure sufficient communication during the problem-solving process (Womack, 2008).
	(8) Teamwork	(1) Implement teamwork as the foundation of the organisation (Liker, 2004). (2) Maximise individual and team performance (Liker & Hoseus, 2008). (3) Create a balance between individual excellence and team effectiveness (Liker, 2004). (4) Instil a feeling of self-importance in employees (Marksberry, 2011).
	(9) Employee relationships	(1) Promote employee relationships by ensuring mutual trust and respect (Emiliani, 2008; Liker, 2004; Marksberry, 2011).
Organisational development	(10) Safety	Assess people's safety in their daily tasks by reducing/eliminating tasks that are: (1) Dangerous (Sugimori et al., 1977). (2) Injurious to their heath (Sugimori et al., 1977). (3) Physically strenuous (Sugimori et al., 1977).
	(11) Waste reduction	Remove the following forms of waste from people's daily tasks: (1) Defects – people required to rectify mistakes (Liker, 2004; Sugimori et al., 1977; Womack & Jones, 2003). (2) Over-production – people producing items no one wants (Liker, 2004; Sugimori et al., 1977; Womack & Jones, 2003). (3) Excess inventory – people handling inventories and goods that pile up (Liker, 2004; Sugimori et al., 1977; Womack & Jones, 2003). (4) Over-processing – people performing processing steps that are unnecessary (Liker, 2004; Sugimori et al., 1977; Womack & Jones, 2003). (5) Unnecessary motion – people moving around (Liker, 2004; Sugimori et al., 1977; Womack & Jones, 2003). (6) Unnecessary transportation – people moving goods from one place to another without any purpose (Liker, 2004; Sugimori et al., 1977; Womack & Jones, 2003). (7) Waiting – people in downstream activities waiting because upstream activities have not been delivered on time (Liker, 2004; Sugimori et al., 1977; Womack & Jones, 2003). (8) Unused employee creativity – people performing monotonous, repetitive operations that can be mechanised, automated and unmanned (Liker, 2004; Sugimori et al., 1977; Womack & Jones, 2003).
	(12) Problem-solving process	(1) Implement the five-phase problem-solving process (Womack, 2008). (2) Ensure engagement and cooperation of everyone (from top to bottom) in solving problems (Puvanasvaran et al., 2008). (3) Ensure sincere efforts to cooperate (Womack, 2008). (4) Ensure mutual consideration and understanding for other people's positions (Kato, 1981). (5) Implement learning and teaching as a continuous company-wide process (Liker & Hoseus, 2008).

Source: Please see the full reference list of the article, Coetzee, R., Jonker, C., Van der Merwe, K., & Van Dyk, L. (2019). The South African perspective on the lean manufacturing Respect for People principles. *SA Journal of Industrial Psychology/SA Tydskrif vir Bedryfsielkunde, 45*(0), a1613. https://doi.org/10.4102/sajip.v45i0.1613, for more information

Research design

Research approach and strategy

A qualitative research approach was followed to understand how people make sense of the world and how they experience the research questions at hand (Willig, 2013). The study was orientated to collect data that provide contextual information and contribute to understanding the specific phenomena (Sanders, Cogin, & Bainbridge, 2014). The study also has a constructionist paradigm, as meaning and experience are socially produced and reproduced (De Vos, Strydom, Fouche, & Delport, 2011). Furthermore, the study was phenomenological in nature, aiming at both understanding and interpreting how participants understood the RFP principles (Creswell, 1994; De Vos et al., 2011; Trochim & Donnelly, 2008).

Research method

Research setting

Qualitative, in-depth interviews were conducted in South Africa to obtain data on the South African perspective on the Japanese RFP principles. As these principles are incorporated in different South African industries (not just the automotive industry), interviews were conducted over a range of different industries, such as health care, precious metals, aviation and manufacturing industries, as well as the academic environment.

Entrée and establishing researcher's role

The researchers contacted the potential participants by emailing a request for an appointment that would be convenient for them. The email was sent to personal

acquaintances of the researchers and therefore the response rate was positive.

The researchers planned the study by contacting the participants and arranging the interviews, as well as conducting the interviews and analysing the data. A research assistant was appointed to assist with taking field notes.

Sampling

The sampling of this qualitative study involved purposive, expert sampling with a relatively small sample size (Trochim & Donnelly, 2008). The goal was to describe the range of variability and not the distribution across a general population (Guest et al., 2012). The inclusion criteria to participate in the study were known and demonstrable experience and expertise in the area of lean implementation (Trochim & Donnelly, 2008).

Table 2 provides the frequency distribution of the sample. It is evident that the sample comprised highly educated and experienced people. All participants had a qualification higher than matric, with 50% having either a master's or doctoral degree. In terms of experience, very few participants (13.6%) had fewer than 10 years' experience. Almost half (45.5%) had between 11 and 20 years' experience and three candidates had between 30 and 50 years of experience. South Africa was represented by participants from the Western Cape (one participant), the North West (two participants), Gauteng (six participants) and the Eastern Cape (59.1%).

TABLE 2: Characteristic of the sample.

Item	Category	Frequency	%
Industry	Automotive	9	40.9
	Cable manufacturing	1	4.5
	Precious metals	1	4.5
	Lean institutions	1	4.5
	Health care	1	4.5
	Aviation	2	9.1
	Steel manufacturing	1	4.5
	Academia	6	27.3
Organisational level	Lecturer	5	22.7
	Professor	1	4.5
	Manager	11	50.0
	Senior manager	2	9.1
	Executive manager	1	4.5
	Chairman	1	4.5
	Chief executive officer	1	4.5
Education level	Bachelor's degree	6	27.3
	B.Tech	4	18.2
	Diploma	1	4.5
	Master's degree	5	22.7
	Doctoral degree	6	27.3
Experience level	>1–10 years	3	13.6
	11–20 years	10	45.5
	21–30 years	5	22.7
	31–40 years	3	13.6
	41–50 years	1	4.5
Province in South Africa	Eastern Cape	13	59.1
	Western Cape	1	4.5
	North West	2	9.1
	Gauteng	6	27.3

The reason for the large contingent from the Eastern Cape was that the largest portion of participants was from the automotive industry (40.9%), which is situated mostly in the Eastern Cape. The second largest contribution (27.3%) was from academia.

Data collection method

A total of 31 individual, exploratory discussions were conducted with a panel of 22 participants. At the start of each interview, the participant was provided with a summary of the RFP principles, as developed by Coetzee et al. (2018). Participants were asked to reflect on the principles and to comment on the following questions:

- Do you think all the RFP principles, as developed by the Japanese creators, are applicable to the South African context?
- Are any additional RFP principles required for lean implementation to be successful within the South African context?

There was no time limit for the interviews. Participants were allowed to discuss any issues or themes as they emerged from the conversation. Interviews varied from 30 min to 2 h, the average being 1 h.

Any ambiguity that was identified from the transcripts afterwards was clarified with the participants via email or phone calls after the interviews. In some cases, participants made references to internal company documents or procedures without discussing them in detail during the interviews. Permission to see these documents was then requested afterwards via email.

Data recording

A total of 22.5 h of interviews were recorded. The interviews were transcribed to ensure that all information was noted for subsequent analysis of the correct meanings and subtleties of the participants' responses. The transcription was done by the researchers and by a professional transcriber and verified by the researchers. More than 450 pages of data were produced from the verbatim transcription process.

The researcher and the assistant took field notes as an additional source. Where the purpose of the transcripts was to capture the verbatim interviews, the field notes were used to record subtler observations, such as body language, facial expression and tone of voice – the 'feeling' of the interview.

Strategies to ensure data quality and integrity

For the purpose of this study, the term validity refers to the credibility and accuracy of the process and the outcomes associated with the research (Guest et al., 2012). Several procedures were used to strengthen the reliability of the analysis process and other parts of the research process to produce a thematic analysis that is rigorous, transparent and credible.

During the data collection, the voice recordings were transcribed verbatim in order to ensure a rigorous and systematic analysis (Guest et al., 2012). Although interviews were done in both Afrikaans and English, depending on the participant's preference, transcripts were not translated to prevent any further complexity that could affect either the validity or the reliability of the data.

During the analysis phase, validity was enhanced through the triangulation of the data sources (Guest et al., 2012). The researcher's field notes, the research assistant's field notes and the transcripts from the interview recordings were compared. Combining the data sources offered multiple points of reference, which minimised the intrinsic bias that could have emerged from a single-observer method. An audit trail was kept by documenting the entire data analysis process, for example, data included or excluded and the rationale behind this, and of changes made to the codebook and data reduction techniques (Guest et al., 2012).

During the reporting phase, quotes were used as much as possible (without creating a string of raw text), as they bring the raw data, the participants' own words, to the reader and connect the phenomenological world of the participants with the data summary and interpretation generated by the researcher (Guest & MacQueen, 2008).

Data analysis

An inductive analysis of the data was performed with a descriptive and exploratory orientation (Guest et al., 2012). Owing to the exploratory nature of the research, the applied thematic analysis (ATA) technique was used for data analysis (Guest et al., 2012; Jones, Coviello, & Tang, 2011). Applied thematic analysis is considered to be a rigorous, yet inductive, set of procedures that are designed to identify and examine themes from textual data in a way that is transparent and credible (Guest et al., 2012; Jones et al., 2011).

The purpose of the ATA method was to analyse the data thematically in a systematic way to report patterns (themes) within the data (Braun & Clarke, 2006; Guest et al., 2012; Renard & Snelgar, 2016). The method draws from other theoretical and methodological perspectives such as grounded theory and phenomenology (Tuckett, 2005). Applied thematic analysis is an inductive technique to explore new themes that emerge in relation to the research question. It corresponds with the phenomenological approach as it is the participants' 'perception, feeling and livid experiences that are paramount to the objective of the study' (Braun & Clarke, 2006; Guest et al., 2012). Applied thematic analysis therefore extracts the more useful technique from each theory and method and adapts them to an applied research context.

Contrary to word-based analysis, the thematic analysis required involvement and interpretation from the researcher. Similar to grounded theory and the development of cultural models, thematic analysis moves beyond counting explicit words or phrases and rather focusses on identifying and describing both implicit and explicit ideas within the data (themes) (Braun & Clarke, 2006). Codes are then developed to represent the identified themes and applied or linked to raw data as summary markers for later analysis (Guest et al., 2012). Contrary to methodologies such as grounded theory, the ATA technique uses quantitative techniques in combination with interpretive and other techniques to confront the research problem (Guest et al., 2012).

Phase 1: Familiarisation with the data: In an effort to gain a general overview of the data, the researchers listened to all the recordings while creating an initial list of ideas or themes in the data. The transcribing process was used as a second round to develop a thorough understanding of the data (Braun & Clarke, 2006; Renard & Snelgar, 2016).

Phase 2: Generating initial codes: During this phase, the initial codes were generated and grouped by reading the transcripts (Braun & Clarke, 2006). Frequently expressed keywords were used as an indication of potential codes (Guest et al., 2012). Therefore, the keyword-in-context technique was used as a starting point for developing the code book. ATLAS.ti was used to create a list of the unique words that reappear in the text, while counting the number of occurrences. The list had 8861 words. Common words with limited semantic value, such as articles, prepositions, modifiers, etc., were removed and only categories that were conceptually relevant to the research objectives were singled out. The list was reduced to 63 words. The list was further reduced as much as possible by combining synonyms into single categories (Guest et al., 2012). As the interviews were conducted in Afrikaans and English, Afrikaans words were combined with their English equivalents. The final list contained 38 items that were used as starting point for the development of the codebook. Further development of the codebook was systematic but iterative, only concluding after the last transcript had been coded. The analysis of the data was not a linear approach, but rather a recursive process where the researcher moved back and forth as needed through the different phases of the study (Braun & Clarke, 2006; Guest et al., 2012). As certain codes were only added after the second or third time that they appeared in transcripts, the coding process was repeated, focussing on coding the first transcripts with codes that were added only later during the first round.

Phase 3: Code reduction: Code reduction was performed to sharpen, sort, focus, discard and organise the data so that final conclusions could be drawn and verified (Miles & Huberman, 1994). A code frequency table was used to investigate the possibility of reducing the number of codes while keeping a record of what happened to each code. Codes that only appeared once or twice and did not add value to the research objectives were either deleted or combined with other codes.

Phase 4: Searching for themes: A theme captures something important about the data in relation to the research question and represents some level of patterned response or meaning

within the datasets (Braun & Clarke, 2006). Therefore, different codes were sorted into potential themes and all the relevant coded data extracts were collated within the identified themes. The relationships between codes and themes were considered, illustrating which codes appear together and providing a means of assessing the prominence of the combination (Guest et al., 2012). This phase was concluded with a collection of candidate themes and sub-themes and all data that have been coded in relation to them organised into a candidate thematic map (Renard & Snelgar, 2016).

Phase 5: Reviewing themes: The candidate themes were reviewed by reading all the collated extracts for each theme and considering whether they form a coherent pattern. Next, the validity of the individual themes was considered in relation to the dataset and by asking whether the proposed thematic map accurately reflects the meanings evident in the dataset as a whole (Guest et al., 2012).

Phase 6: Defining and naming themes: The purpose of the sixth and final phase was to define and refine the final themes and codes by means of the final thematic map (Braun & Clarke, 2006).

Ethical consideration

In an effort to ensure a high standard with regard to ethics, participation in the study was entirely voluntary and participants could withdraw at any point during or after the interview. Research participants were informed upfront of the research aims and that information would only be used for research purposes. The data remained confidential and no participants are named in this article. The interviews were not unnecessarily long or intrusive and no questions were sensitive or offensive in nature (Renard & Snelgar, 2016). Ethics approval was also granted by the researcher's university, giving the researcher permission to conduct the research.

Findings

An ATA was performed. Patterns emerged from the data collected and these were used to generate sub-themes. These sub-themes were grouped into themes according to the context within which they appeared in the transcripts: (1) individual development – sub-themes pertaining to the development of people, (2) group development – sub-themes pertaining to the improvement of interaction between people and (3) organisational development – sub-themes relevant to the improvement of the organisation as a whole (Table 3).

TABLE 3: Thematic map of the South African Respect for People themes and sub-themes.

Themes	Sub-themes
(1) Individual development	Importance of workers
	Workers' input
	Motivation and buy-in
	Development/empowerment of people
	Training responsibility, authority and accountability
(2) Group development	Communication
	Teamwork
	Employee relationship
(3) Organisational development	Waste reduction
	Ergonomics and safety
	Job security
	Aligned commitment
	Organisational problem-solving process

Individual development

Before a lean implementation can commence, the leadership of the organisation should realise the *value of people* (sub-theme 1) in the organisation:

> 'And that is what I say, where respect for people comes in, because the first thing that we did, was tell them that they are important since it is them that are doing the job. Not the directors or the business unit managers. They do the work, they see the problems.' (Participant 02-20, Lecturing Professor)

Participant 01-05 explained that many of the initiatives that managers try fail because they do not value the people side. He considers changing the thinking of managers as the bigger challenge. Participant 02-18 agreed that lean implementation is not something that will just happen by itself:

> 'They can try it as many times as they like, if that respect for people element is not present, it will fail. Respect for people should be central.' (Participant 01-05, HR Manager)

Participant 02-20 realised the difference and importance of both management and workers. He explained that although there are differences in salaries, both parties are equally important, as the worker cannot exist without management and *vice versa*. He furthermore explained that trying to separate them does not make sense:

> '… and that is where respect for humanity starts – with the people.' (Participant 01-07, Senior Manager)

Once management has realised the importance of people in the organisation, *workers' input* (sub-theme 2) should also be valued. Participant 01-01 explained that shop floor workers know a great deal more about the process than the managers themselves and that their opinions are often not taken seriously enough.

Participant 01-07 explained that management should not only respect a person's physical abilities but also his mind and experience:

> 'It is actually considered disrespectful if we do not give you an opportunity to use your experience to solve problems. Respect for man is much bigger than just using a person's motor skills. We need to use his mind as well as his experience, we need to use all five his senses.' (Participant 01-07, Senior Manager)

Once the importance of people and their input has been established, it will be easier for workers to have *motivation and buy-in* (sub-theme 3) to participate in the lean implementation. Participant 01-02 explained that:

> 'The RFP pillar is absolutely spot-on, since one cannot do a lean implementation if you do not have employees' buy-in.' (Participant 01-02, Plant Manager)

Participant 02-20 agrees:

> 'If changes are forced upon people, they will find a way to sabotage it.' (Participant 02-20, Lecturing Professor)

> 'Therefore, buy-in is required from the workers, management and the workers' unions in order for lean implementation to be successful.' (Participant 01-07, Senior Manager)

Furthermore, for *individual development*, participants felt that RFP is shown by *developing or empowering employees* (Participant 01-07) (sub-theme 4). By analogy of there being techniques and systems for improvement of the production side of the organisation, there should also be techniques and systems:

> '… for building the capabilities to enable people to realise their full potential at work.' (Participant 01-11, Lean Institute Africa)

The RFP is in:

> 'I am here to develop you as part of my management responsibility.' (Participant 01-11, Lean Institute Africa)

Participant 01-11 was very specific on a certain element of employee development:

> 'The idea of respect for people comes out in a very deep commitment to develop the subordinate. Now this is the role of the manager, in a tiered fashion, to develop the problem-solving or, in the western world we might use the terminology decision-making capabilities, of people as part of your responsibility as manager.' (Participant 01-11, Lean Institute Africa)

Training (sub-theme 5) of employees was also considered an important part of developing employees. If training is not done sufficiently, there will always be questions about how things are done in the organisation:

> 'So, training is crucial to get this Respect for People of the ground.' (Participant 01-07, Senior Manager)

Once employees have been developed, trained and empowered as individuals, it becomes possible to further show respect by authorising the employee with greater *responsibilities* (sub-theme 6):

> 'Respect is where you tell the people on the shop floor that they have the right to stop the production line. And management does not go down and shout at them and ask what they have done. They ask what is wrong, what did you see happen?' (Participant 02-20, Lecturing Professor)

> 'The advantage of doing this is that people feel that they have ownership and then they improve and develop further, better than most other people. You cannot expect to give people responsibility if you do not develop them.' (Participant 02-15, General Manager)

Group development

Respect for people is shown in how people *communicate* (sub-theme 7) with each other (Participant 02-19, Lecturer):

> If you are not able to communicate with people, respect people and come to the level of the people and be humble and understand people's problems, you are not going to get anywhere.

The participants explained that RFP is also shown by means of *teamwork* (sub-theme 8):

> 'We respect the fact that you might have to take a day off because you are sick, or your wife is sick and that is where teamwork comes in. Then the people that are with you in a team must be trained to do your job as well.' (Participant 01-07, Senior Manager)

Communication and teamwork are used to build *employee relationships* (sub-theme 9). In order to show respect for employees, managers should interact with people at all levels and not only work through the tiers (Participant 01-01). Managers should also understand their employees beyond their roles as operators. They must even begin to understand their family situations so that when they have problems at home that affect their work, they will understand and be able to assist them (Participant 02-19):

> 'Respect for people… not matter whether it is a sweeper or the CEO, the respect is there for everybody. So only by speaking to people and getting to know them is it possible to build relationships. Often, human beings judge other people by just looking at them and then making assumptions. But if you do not speak… If you speak and get to know what they are all about and what they are doing, it breaks the ice and they become familiar.' (Participant 02-19, Senior Lecturer)

Organisational development

For organisational development, *ergonomics* (sub-theme 10) is considered a way for an organisation to show respect for its people:

> 'It is considered disrespectful if I let you work too hard physically, un-ergonomically.' (Participant 01-07, Senior Manager)

Lean literature explains eight forms of waste (refer to Literature Review). Although these principles mostly pertain to the technical production side, *removing waste* (sub-theme 11) from people's everyday life can also be seen as RFP:

> 'You are disrespectful towards someone if you let him stand and do nothing – idle time. But also, the waste of it – you are paying him, and he is not doing anything. That is considered disrespectful.' (Participant 01-07, Senior Manager)

Furthermore, participant 01-09 explained that people should never lose their jobs because of a lean implementation. Contrary to the original lean culture of RFP, productivity improvements in South Africa often lead to unemployment. This approach to CI extinguishes the remaining employees' enthusiasm about participating in future improvement activities and, consequently, the pace of improvement is reduced. A lean organisation should rather provide *job security* (sub-theme 12) to all employees:

> 'Ja, and I see as result of this 'lean thing', nobody has lost their job yet … This is great man, let's participate. You know, so that is why these types of initiatives … it's very good because it's covering all of the aspects of respect and trust.' (Participant 01-09, Manager)

Lean implementation can only be successful if there is *aligned commitment* (sub-theme 13) between the government, the unions and the organisation. They should all have the

same vision (Participant 01-07). Furthermore, people within the organisation should also have the same goal:

> 'RFP is about respecting the total human being, because we have the same goal. If we respect each other as colleagues, as co-workers, then we respect each other in such a manner that causes progress for the workers, but also for the organisation.' (Participant 01-07, Senior Manager)

The final sub-theme for organisational development is the *organisational problem-solving process* (sub-theme 14). Organisations should have a standard process to solve problems (refer to Literature review) and show RFP:

> 'So that is why these types of initiatives, problem-solving specifically, it's very good because it's covering all of the aspects of respect and trust.' (Participant 01-09, Manager)

Discussion

Outline of the findings

The aim of this article was to report on a qualitative study into the understanding and applicability of the Japanese RFP principles within the South African context by means of the following research questions:

- Are all the Japanese RFP principles applicable to the South African context?
- Are any additional RFP principles required for lean implementations to be successful within the South African context?

The original Japanese RFP themes were stated in the section titled 'Respect for People principles'. The RFP themes identified by South African participants during the interviews were explained in the 'Findings' section. In order to answer the research questions, the original Japanese RFP themes are compared to the themes identified by the South African participants (Table 4). The Japanese RFP themes are listed on the left. Each theme is matched with a corresponding South African RFP theme on the right. The numbers on the left correspond with the numbers in section titled 'Respect for People principles', while the numbers on the right correspond with the numbers used in the 'Findings' section.

TABLE 4: Comparison between Japanese Respect for People principles and South African Respect for People principles.

Themes	Japanese sub-themes	South African sub-themes
Individual development	Value of people	Value of people
	Worker's input	Workers' input
	Motivate people	Motivation and buy-in
	Develop people	Development/empowerment of people
	Training	Training
	Employee responsibilities	Employee responsibilities
Group development	Communication	Communication
	Teamwork	Teamwork
	Employee relationships	Employee relationships
Organisational development	Safety	Ergonomics and safety
	Waste reduction	Waste reduction
	Problem-solving process	Job security
	-	Aligned commitment
	-	Organisational problem-solving process

For individual and group development, all the Japanese themes were identified by the South African participants. However, for organisational development, two additional themes were added by the South African participants that did not form part of the original Japanese RFP themes, namely – *job security* and *aligned commitment*.

The answer to this study's first research question is that all the Japanese RFP principles were identified by the South African participants and are therefore applicable to the South African context. The answer to the second research question is that additional RFP themes are required for successful lean implementation within the South African context and for employees to feel respected.

This study's findings draw attention to the fact that cultural differences have an impact on lean implementation. In the book, *Management Lessons from Taiichi Ohno* (Harada, 2015), Ohno cautions managers implementing lean in other countries that Japan is probably the only country where workers will admit to making mistakes and take responsibility for it: In other countries where workers are not as respected, making a mistake often means losing one's job. That means that no one will own up to or admit mistakes, and that people will hide their friend's mistakes as well. This explanation emphasises the importance of realising the influence that different cultures have on lean implementation. The results confirm this effect when lean is implemented in South Africa.

Practical implications

These findings are of importance to organisations planning to implement a Japanese optimisation technique within a South African context. Attention should be given to the original Japanese RFP themes and the additional RFP themes that were identified by the South African participants: Providing job security to employees prior to lean implementation and ensuring aligned commitment between the organisation, employees and unions by means of realising the importance of people and valuing their input.

Consequently, incorporating the correct RFP principles within a context outside of Japan, such as South Africa, will increase the possibility of successful lean implementation.

Limitation and recommendations

A possible limitation to this study could be the sample size. Although the aim was to describe the range of variability and not the distribution across a general population, it could be possible that a larger sample could provide richer data on the South African context.

Although this study focussed on a broad range of different industries in South Africa, it is recommended that future research should be expanded to more industries in South Africa. Furthermore, this article focussed on the primary manufacturing provinces of South Africa. It could be beneficial for future research to include all the provinces.

In Addition, this study focusses on the organisational levels of management and higher. Including the opinions of the lower levels, such as shop floor workers, could add further valuable insights with regard to RFP in the workplace.

Conclusion

This study has provided insight into lean implementation within the South African context. All the Japanese RFP themes are required for the South African context, but additional themes are also required. South Africans require job security prior to a lean implementation and they believe aligned commitment between employees, company and unions is required for successful lean implementation.

This study provides South African companies with the required RFP themes to implement a Japanese CI methodology within another context. The article contributes to the field of industrial psychology by comparing the understanding of RFP themes in Japan and South Africa.

The focus of further research should be on combining the South African RFP themes with the Japanese RFP themes in an RFP lean implementation model for the South African context.

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Competing interests

The authors declare that they have no financial or personal relationships that may have inappropriately influenced them in writing this article. Opinions expressed and conclusions arrived at in this article are those of the authors and are not necessarily to be attributed to the THRIP or Denel SOC Ltd.

Author's contributions

This manuscript forms part of R.C.'s PhD thesis and as such this author took the lead in the research and the writing of the manuscript. C.J., K.V.D.M and L.V.D. were co-promoters and provided conceptual input and guidance in the structuring and writing of the manuscript.

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CHAPTER 7
DESIGN REQUIREMENTS

The objective of this chapter is to address the following research question:

Research question 4.1 — What are the design requirements for a people-centred lean implementation model?

7.1 Chapter orientation

Chapters 5 and 6 report on empirical investigations to determine the true meaning of the RFP principles and the South African interpretation of these RFP principles respectively. The insights from these two chapters, among other factors, are now used to develop the principles and features of a proposed artefact in the form of a design requirements traceability matrix (Figure).

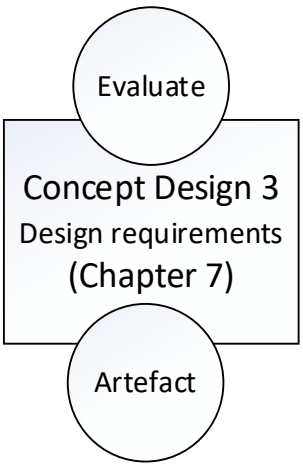

Figure 22: Chapter 7 (Design requirements) orientation

7.2 Design requirements input

The following inputs were used to determine the design requirements for the RFP model:

- The RFP themes identified during the systematic literature review (Japanese RFP themes) and the RFP themes identified during the applied thematic analysis (South African RFP themes)
- The lean philosophy
- Literature on the design of an implementation framework

These inputs are discussed in the following sections and summarised in the design requirements traceability matrix (Table 3).

(Note: The numbers in Table 3 are according to the Delphi questionnaire and therefore not sequential)

Table 3: Design requirements traceability matrix for the RFP model

Design requirements (DR)	1. RFP themes	2. Lean philosophy	3. Literature on implementation frameworks
2. Structure			
a) The model should be simple in structure			X
b) There should be coherence between the different elements of the model			X
c) The model should form an all-inclusive approach towards lean implementation		X	
3. Usability			
a) Employees at different levels of an organisation should be able to understand and use the model to take part in a lean implementation			x
b) The implementation sequences should be logical, systematic and easy to understand			X
c) The model should represent a road map and a planning tool for implementation			X
4. Effectiveness			
a) The model should have a means of providing feedback on whether the desired outcomes have been achieved			X
b) The model should address most lean implementation barriers			X
5. Completeness			
a) The model should include the required lean implementation principles		X	X
b) The model should include all RFP themes identified during the study	X		
6. Applicability			
a) The model should be applicable to most SA industries	X		

7.2.1 Respect for People themes

The Japanese RFP themes identified during the systematic literature review (**Chapter 5**) and the South African RFP themes identified during the applied thematic analysis (**Chapter 6**) are listed in Table 4.

Table 4: RFP themes

Themes	Japanese sub-themes	South African Sub-themes
Individual level	1. Value of people 2. Worker's input 3. Motivate people 4. Develop people 5. Training 6. Employee responsibilities	1. Value of people 2. Worker's input 3. Motivation and buy-in 4. Development/empowerment of people 5. Training 6. Employee responsibilities
Group level	7. Communication 8. Teamwork 9. Employee relationships	7. Communication 8. Teamwork 9. Employee relationships
Organisational level	10. Assess people's safety 11. Remove waste from people's daily tasks XXX XXX 12. Develop a problem-solving process	10. Ergonomics and safety 11. Waste reduction 12. Job security 13. Aligned commitment 14. Organisational problem-solving process

These requirements are addressed as follows:

- **Design requirement 5(b) —** The model must include all RFP themes identified during this study.
- **Design requirement 6(a) —** The model should be applicable to most SA industries.

7.2.2 The lean philosophy

According to lean literature, the following aspects should receive attention during a lean implementation:

- Respect for people (Ohno, 1988; Liker, 2004; Liker and Hoseus, 2008)
- Continuous improvement (Liker, 2004; Liker and Hoseus, 2008)
- Challenging people (Liker and Hoseus, 2008)
- *Genchi Genbutsu* (Liker and Hoseus, 2008)
- Teamwork (Liker and Hoseus, 2008)
- Reduction of waste (Ohno, 1988)

These requirements are addressed as follows:

- **Design requirement 2(c) —** The model should form an all-inclusive approach to towards lean implementation.
- **Design requirement 5(a) —** The model must include the required lean implementation principles.

7.2.3 Literature on the design of an implementation framework

Fundamental to the success of any improvement effort is the understanding that improvements require change. Unfortunately, not all changes result in improvements. Langley et al. (2009) therefore explains the principles of improvement as follows: (1) understanding the need for the improvement (the aim/purpose of the improvement); (2) ensuring a way to obtain feedback to know it the improvement is taking place; (3) developing a change that will probably result in an improvement; and (4) testing any change before attempting to implement

Deros et al. (2006) compiled the following list of design requirements for implementation frameworks. The frameworks should:

- be systematic and easily understood;
- be simple in structure;
- have clear links between the elements or steps outlined;
- be general enough to suit different contexts;
- represent a road map and a planning tools for implementation;

- answer “how to?” and not “what is?”; and
- be implementable at reasonable cost and time.

According to Anand and Kodali (2010b), an implementation framework should be like a guiding torch that helps a manager by providing the necessary direction during the change management programme that is implemented in the organisation. The framework should be fit for purpose and provide clear guidance to minimise the resistance and conflicts (Nordin et al., 2012).

During a similar study conducted by Nordin et al. (2012), the authors set the design requirements as follows:

- Overall structure
    - Comprehensive approach that covers all the major aspects of lean manufacturing implementation
    - Provide straightforward guide
    - Simplify the process even to someone that is new to the lean manufacturing concept
- Abstractness
    - The reader should be able to understand the sequence of the implementation.
    - The stages should be easy to understand and there should be a systematic guide to successful lean manufacturing implementation
    - The proposed stages should be logical and practical

These design requirements for frameworks as derived from literature were summarised in Table 3 as:

- **Design requirement 2(a)** — The model should be simple in structure.
- **Design requirement 2(b)** — There should be coherence between the different elements of the model.
- **Design requirement 3(a)** – Employees at different levels of the organisation should be able to understand and use the model to take part in the lean implementation.

- **Design requirement 3(b)** — The implementation sequences should be logical, systematic and easy to understand.
- **Design requirement 3(c)** — The model should represent a road map and a planning tool for implementation.
- **Design requirement 4(a)** – The model should have a means of providing feedback on whether the desired outcomes have been achieved.
- **Design requirement 4(b)** – The model should address most lean implementation barriers.

7.3 Conclusion

This chapter explained the different design requirements for the RFP model to address the human aspect of lean implementation. The design requirements were summarised in Table 3. The next chapter presents the RFP model designed according to these requirements.

CHAPTER 8
THE RESPECT FOR PEOPLE MODEL FOR LEAN IMPLEMENTATION

Respect for People (RFP) and continuous improvement (CI), are considered the essential elements of the lean manufacturing philosophy. However, the research problem identified and addressed by this study is that there is too much focus on lean tools and techniques at the expense of the human side of lean, leading to ineffective lean implementations. Therefore, this study emphasises the importance of including the human element in lean implementation. The Respect for People model for lean implementation, that takes the human element into consideration, is presented in this chapter.

8.1 Chapter orientation

The previous chapter developed the design requirements for the RFP model. This chapter explains the resulting RFP model.

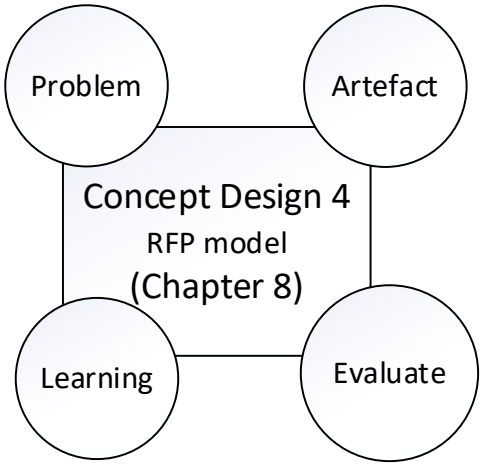

Figure 23: Chapter 8 (The Respect for People model for lean implementation) orientation

8.2 The Respect for People framework

During this study, the RFP framework was developed (refer to **Chapter 5**, Article 2). The framework explains that to achieve a leaner system, two value streams are required: the traditional product value stream (depicted by the lower process arrow in Figure 24), and the people value stream (the parallel upper process arrow of Figure 24). Liker and Hoseus (2008) argue that when these two value streams are connected, it produces the DNA of the Toyota culture, which in turn makes it possible to implement and *sustain* the Toyota Way (Figure 24).

The two value streams are connected by means of a specific problem-solving process (at the centre of Figure 24), since the product value stream is designed to bring problems to the surface and the people value stream is required to deliver people who can solve these problems. This process is required since continuous improvement can only take place if problems are identified and solved.

A crucial element of the problem-solving process is mutual trust between workers and managers. This should be at the centre of the problem-solving process because it is key to creating an environment that both encourages the identification of problems and motivates people to solve them. Therefore, the purpose of the RFP model is to develop a leaner system by developing a product value stream that highlights problems and a people value stream that is able to identify and solve these problems. In other words, a company-wide problem-solving culture.

However, to achieve such a problem-solving culture, people must be empowered to solve problems. Therefore, the implementation of the RFP model starts with the development of the people value stream. An effective people value stream will result in an efficient product value stream. By improving of the people value stream, the product value stream will improve. In other words, when implementing lean by means of the RFP model, the emphasis should be on improving the people value stream, after which an improved product value stream will follow.

However, implementing lean by focusing primary on the product value stream often leads to resistance to change. This can be overcome by first focusing on the people value stream, since workers will see the benefits that the lean implementation holds for them as employees (empowerment, skills development, etc).

First we build people then we build cars.

Fujio Cho, previous Toyota chairman (Liker, 2004)

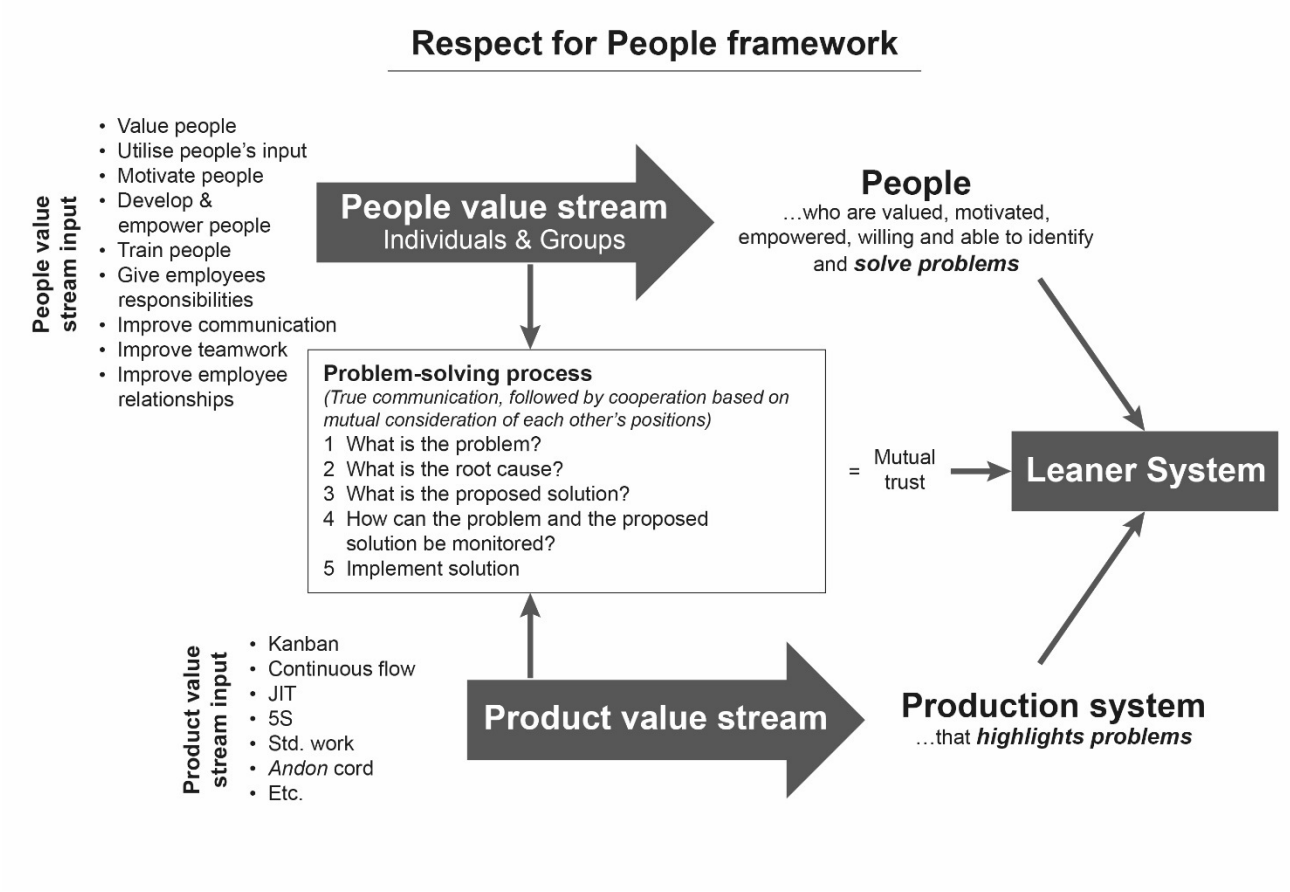

Figure 24: The Respect for People framework indicating the interaction between the two value streams and the organisational problem-solving process.

8.3 Constructs used in the RFP model for lean implementation

The following sections elaborate on the different constructs used to develop the RFP model for lean implementation.

8.3.1 Overview of the RFP model for lean implementation

The RFP model for lean implementation consists of different elements as indicated in Table 5 and Figure 25.

Table 5: Different elements of the RFP model

Dark green – The different value streams (I, II & III)
Light green – The different organisational levels (A- D)
Orange – The RFP themes identified throughout the study (1-14)
Blue – The adapted PDSA cycle
Yellow – The different PDSA steps to be taken for each RFP theme.

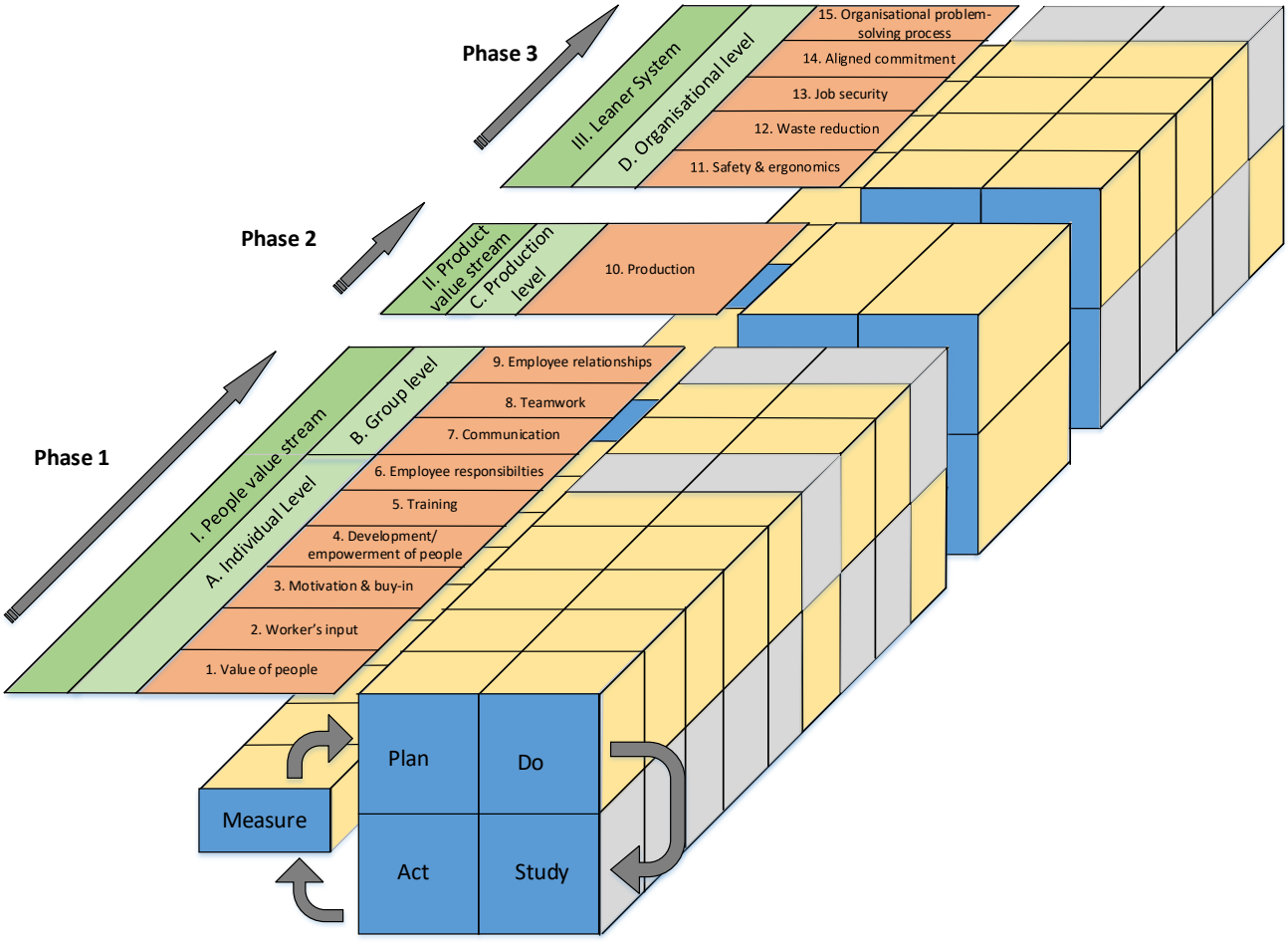

Figure 25: The RFP model for lean implementation

8.3.2 The different value streams

Referring to Figure 26, the people value stream in the RFP model (shown in dark green, I) consists of two levels, the individual level and the group level (shown in light green).

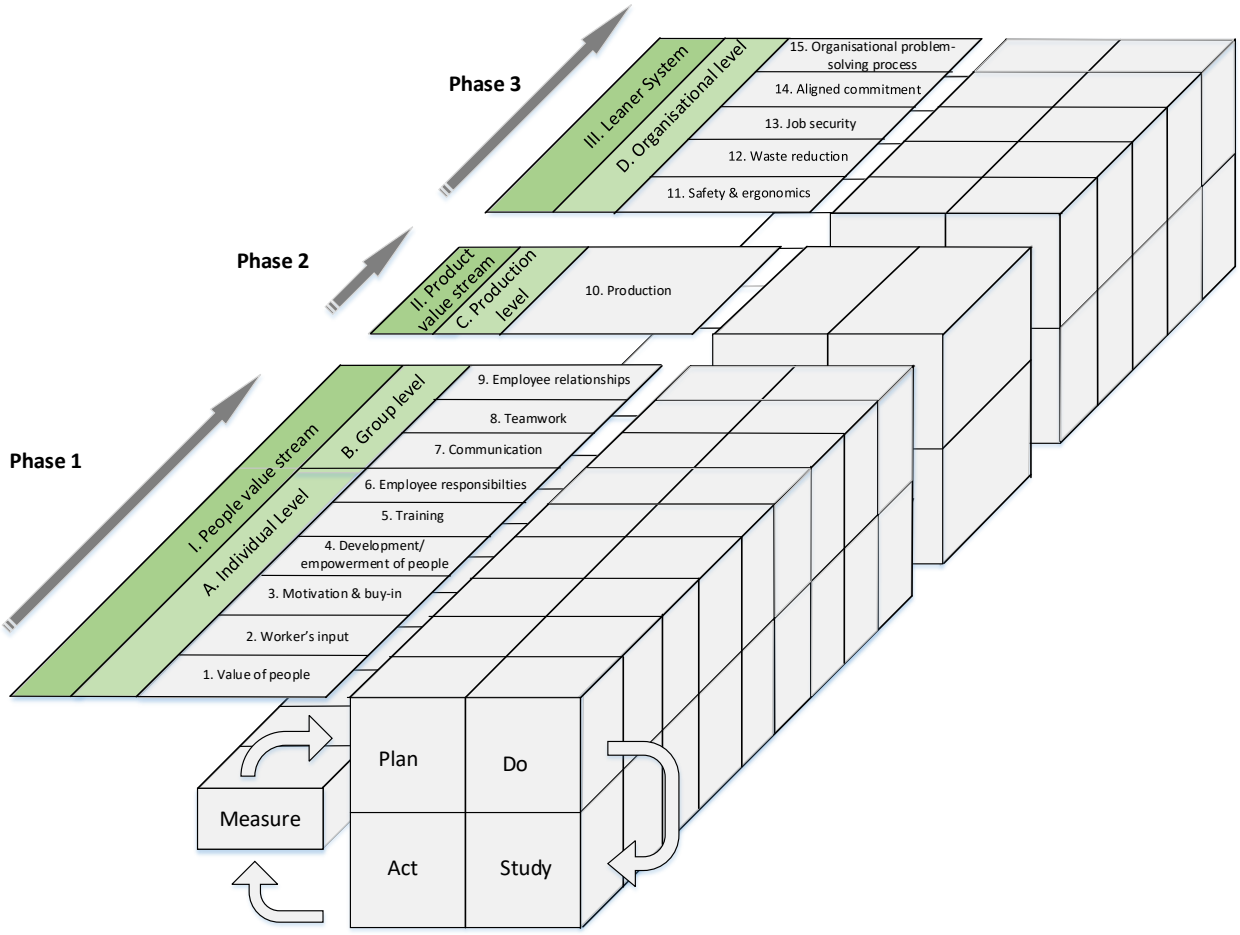

Figure 26: The people value stream (individual and group level) and the product value stream (production level) that lead to a leaner system (organisational level)

First, people are trained and empowered in different aspects of lean and problem-solving at the individual level (A). Secondly, at the group level (B), teamwork, communication and employee relationships are improved. Only then is the focus moved to development and improvement at the production level (C) of the product value stream (II). Finally, the fourth level, the organisational level (D), is improved to deliver a lean system (III).

8.3.3 Measure and PDSA

The Plan-Do-Study-Act (PDSA) continuous improvement method was developed by Dr Deming during his lectures in Japan in 1950 (Moen and Norman, 2010). The different phases are explained as follows:

- Plan — plan a change aimed at improvement.
- Do — execute change, preferably on a small scale.
- Study — examine the results. What was learned? What went wrong?
- Act — adopt the change, abandon it or run through the cycle again.

The PDSA method was used as the cyclical baseline of the implementation model. However, an additional step was added prior to the PDSA cycle. Before an organisation can implement lean, they first have to determine the current state of the organisation in terms of the overall problem(s) that they experience. They have to *measure* the current situation to know what actions to plan in the next phase. Only by diagnosing the "illness" correctly can the correct "medicine" be prescribed during the PDSA cycle(s). Figure 27 shows the adapted PDSA method that includes the *measure* step, creating the M-PDSA cycle.

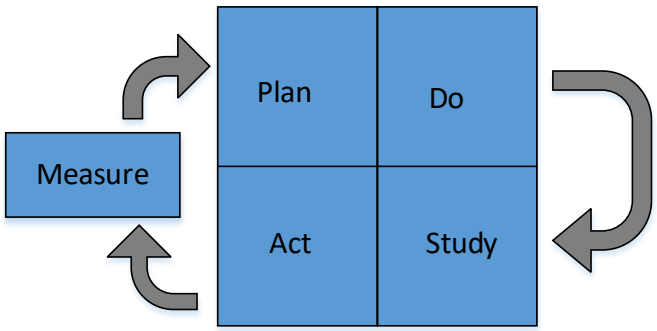

Figure 27: The M-PDSA cycle consisting of the original Plan-Do-Study-Act cycle, and the added Measure step

An organisation will not necessarily use the measure step during each PDSA cycle. The PDSA cycle is viewed as the short-term operational steps to follow, while the M-PDSA cycle is considered the long-term strategic steps.

For each theme within each level, the organisation starts at the *Measure* phase. The purpose is to determine the status quo of that theme within the organisation. The organisation then progresses

through the rest of the PDSA cycle for the particular themes. Only once the desired results are realised during the *Study* phase, does the organisation move on to the next theme (starting again at the *Measure* phase for the following theme).

8.3.4 The RFP themes

During the study, the RFP themes were identified by means of a systematic literature review and exploratory interviews with participants in South Africa. The identified RFP themes (numbered 1-14 and indicated in orange in Figure 28 and Table 6) were segregated into the different levels (individual level, group level and organisational level).

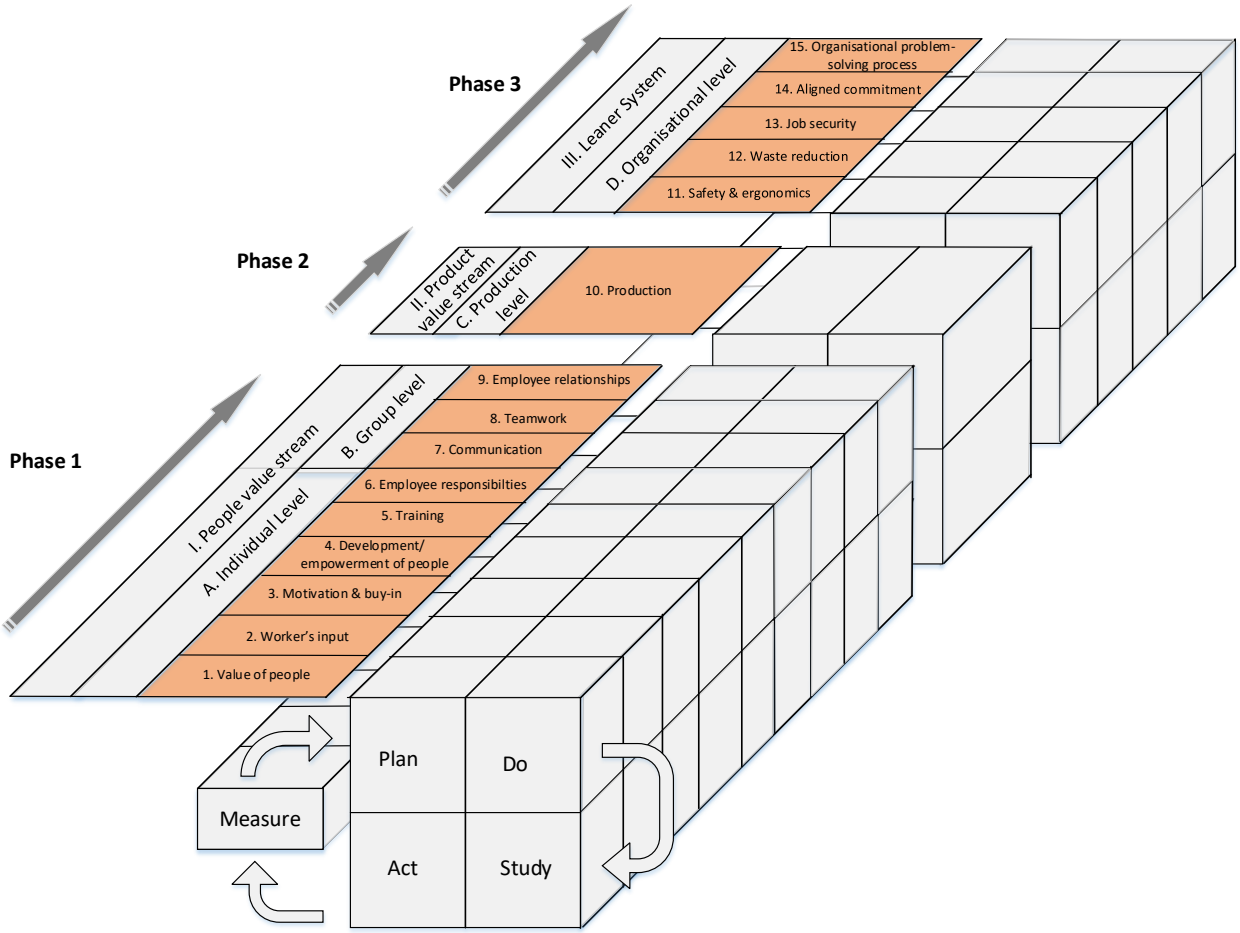

Figure 28: RFP themes

Furthermore, the different RFP themes within each level are arranged in a specific order so that the last RFP themes are always used as the *study* and *act* steps (of the M-PDSA cycle) to measure the effectiveness of the previous RFP themes. The yellow blocks in Table 6 indicate where actions are

taken for a specific theme within each of the M-PDSA steps. A grey blocks indicate that no action is taken. The arrows indicate that as the organisation progresses through the M-PDSA cycle, the focus shifts between the different RFP themes (This concept is further explained in Table 7, Table 8, Table 9 and Table 10).

Table 6: RFP themes

	M	P	D	S	A
Individual level					
1. Value of people					
2. Worker's input					
3. Motivation and buy-in					
4. Developing / empowering people					
5. Training					
6. Employee responsibilities					
Group level					
7. Communication					
8. Teamwork					
9. Employee relationships					
Production level					
10. Production					
Organisational level					
11. Safety and ergonomics					
12. Waste reduction					
13. Job security					
14. Aligned commitment					
15. Organisational problem-solving process					

8.4 Implementing the RFP model

Lean implementation by means of the RFP model starts at the *people value stream* (*individual level and group level*) and progresses through the *product value stream* until a *leaner system* is achieved. This is accomplished by spiral PDSA cycles throughout each of the RFP themes within the different organisational levels.

8.4.1 Individual level (Measure-Plan-Do)

At the individual level, *measuring, planning* and *doing* are realised by means of the following RFP themes (see Figure 29 and Table 7 for details):

8.4.1.1 Value of people

Employees often do not feel valued, although they are often the ones who are in the best position to offer suggestions for improving the efficiency of the work they do. Therefore, before a lean implementation can commence, the leadership of the organisation has to realise the important role that employees play in the organisation. It is the people who do the work and see the problems (and solutions). Many of the initiatives that managers try to put in place fail because they do not attach sufficient value to the key role that people play in processes. Developing a culture that encourages the involvement of everyone in the organisation is critical for implementing lean, since lean works best if driven by all employees in the organisation, not just the senior management, specialists or improvement facilitators.

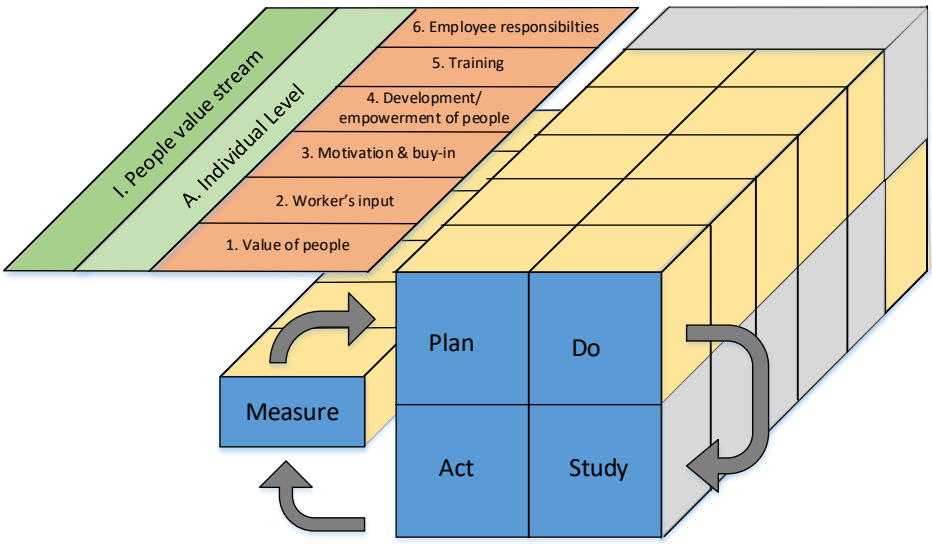

Figure 29: The PDSA cycles at the individual level of the people value stream

8.4.1.2 Worker's input

Once management has realised the importance of people in the organisation, a system should be created through which people can give their input into the systems, changes, improvements, etc. Although workers often know more about the process than the managers, their opinions are often not taken seriously enough. Management should respect a person's physical abilities, but also their minds and experience. It can actually be considered disrespectful if people are not given the opportunity to use their own minds and experience to solve problems.

8.4.1.3 Motivation and buy-in

Once the importance of people and their input has been established, it will be easier for workers to be motivated to take part in the lean implementation. An organisation cannot do a lean implementation without buy-in from employees at all levels. If changes are forced upon them, there is the risk that they will simply find a way to sabotage it. Therefor buy-in is required from the workers, management and the workers' unions.

The work environment must be a place where employees feel appreciated as individuals (Cardon and Bribiescas, 2015). Motivation comes from giving people some autonomy so that they have control over the job. Challenging targets, constant, appropriate and aligned measures, feedback on progress and rewards can also assist with motivation.

8.4.1.4 Development / empowerment of people

At many organisations, the most underutilised resource is their people. The number one asset of these organisations is also their people. People are among the few appreciating assets of an organisation. This appreciation comes from developing and challenging people's abilities.

By analogy, if there are techniques and systems to improve the production side of an organisation, there should be techniques and systems for developing and empowering people to realise their full potential, both at work and at home. RFP is shown by having a commitment as managers to develop subordinates as part of a manager's responsibilities, especially the development of a person's problem-solving or decision-making capabilities.

However, as soon as during the job application phase, HR managers should identify key personal characteristics to help managers appoint the correct employees into the correct positions. Then, once a person has been appointed, there should be a focus on developing the individual (adding value to the people value stream).

Table 7: PDSA cycle at the individual level of the people value stream

I. People value stream						
A. Individual level						
	1. Value of people	**2. Worker's input**	**3. Motivation & buy-in**	**4. Developing/ empowering people**	**5. Training**	**6. Employee responsibilities**
Measure	Measure employees' perception of hier value to the organisation	Measure employee's perception of the value of their input to the organisation	•Determine employee motivation levels	•Determine skill levels •Determine desired people values •Determine training needs	Perform a gap analysis of the training that is provided	
Plan	•Plan how to promote the importance of people to the organisation	•Plan how to increase the utilisation of workers' input	•Develop improved company motivation & buy-in strategies	•Plan employee development plan (career paths) •Develop training plan	Develop improved company training policy	
Do	•Ensure people feel appraciated as individual *Create sense of belonging	•Creating a system through which they can provide ideas •Encouraging them to provide ideas on how to improve their work and workplace •Give employees the opportunity to use their body, mind and experience to solve problems.	•Create buy-in from all employees, unions and management *Implement motivation strategies *Set challenging targets for people *Implement measure to track progress towards goals *Provide regular in-progress feedback to people *Implement reward system for taking part in the process	•Create oppertunities for peronal development & profesional growth •Improve people's skills and abilities •Teach people mulit-level skills such as problem identification and solving •Develop people's abaility to think and execute their tasks as effectively as possible •Build capabilities to enable people to realise their full potential at work and at home. •Empowering employees to participate in managing and improving their workplaces	•Provide training on the lean philosophy •Provide training on safety issues	*Display people's capabilities by entruting them with ownership, authority and responsibilities •Assign new and challanging tasks •Give employees the right to stop the production line when they cannot keep up or detect an error •Delegating decisions to people (such as job-dispatching and overtime)
Study						Study the ownershiop, authority and repsonsibilities that people take
Act						Implement learing and teaching as a continuous company-wide process

Developing and challenging people are important in lean engagement. Implicit in this principle is the understanding that if a manager challenges an employee to improve his operation, there is a tacit acknowledgement that the manager truly believes that the employee is capable of realising the improvement. This step is vitally important for successful lean implementation and for showing respect

to people in the process. The growth of each employee will also contribute to the success of the business.

8.4.1.5 Training

Before (and during) a lean implementation, employees have to receive training on the lean philosophy, safety issues, etc. Training is crucial in showing respect for people. Key to lean implementation is also the philosophy of “learning by doing” to avoid unused or forgotten training inputs.

8.4.2 Individual level (Study-Act)

The final theme of the individual level is to *study* and *act* on the effectiveness of the implementation of the previous themes of the individual level:

8.4.2.1 Employee responsibilities

For an organisation to be successful, it must fully utilise its people’s abilities and capabilities as effectively as possible by entrusting them with more responsibility and authority, in combination with providing them with guidelines (e.g. standard operating procedures) for making decisions. Once employees have been developed, trained and empowered as individuals, it is possible to further show respect by authorising the employees with greater responsibilities, e.g. authorising people on the shop floor to stop the production line. Management will then follow up with why it was necessary and how they (management) can assist in solving the problem.

People’s capabilities are thus displayed by delegating the authority and responsibility for running and improving the workshop themselves. The advantage of doing this is that people feel that they have ownership. They then improve and develop further.

This RFP theme is used in the *study* and *act* phases of the PDSA cycle, since entrusting people with more responsivity and authority will make it possible to determine if the previous RFP themes were implemented/executed effectively. In other words, the extent to which people (1) feel valued; (2) see that their input is valued; (3) feel motivated and have buy-in; (4) are developed; and (5) trained, will reflect in the extent to which they take responsibility in the workplace.

8.4.3 Group level (Measure-Plan-Do)

At the group level, *measuring, planning and doing* are addressed by means of the following RFP themes (see Figure 30 and Table 8 for details):

8.4.3.1 Communication

Respect for people is shown in the way people communicate with each other. Communicating disrespectfully with people and not understanding their problems, will hinder successful lean implementations.

8.4.3.2 Teamwork

Teamwork is used to share opportunities for development and maximising individual and team performance. However, when working together in teams, each individual member must feel as though they matter in the company. The best way to achieve this, is for each individual to understand their contribution to the organisation and by respecting other members' contributions.

Furthermore, there should be a balance between individual excellence and team effectiveness. Teamwork is critical, but it will never make up for a lack of individual excellence. Excellent individuals are required to make up teams that excel. If teamwork is made the foundation of the organisation, individual performers will be committed to making the company successful.

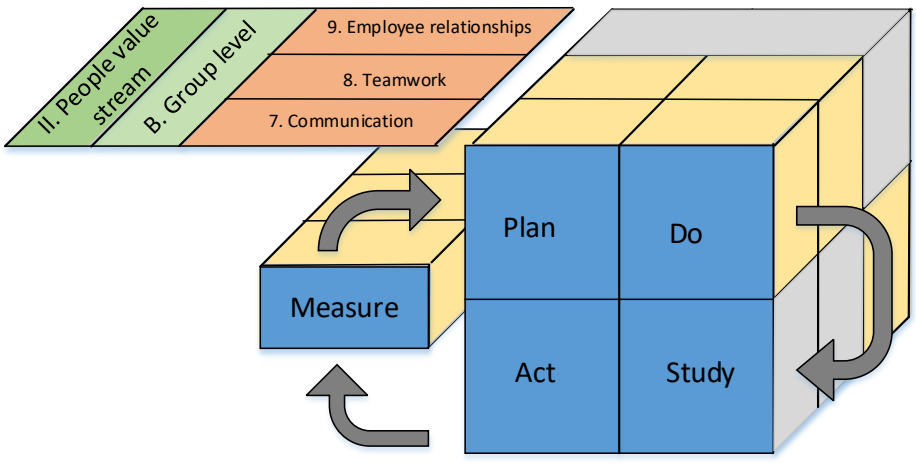

Figure 30: The PDSA cycles at the group level of the people value stream

8.4.4 Group level (Study-Act)

The final theme is used to *study* and *act* on the effectiveness of the implementation of the previous themes at the group level.

8.4.4.1 Employee relationships

Communication and teamwork are used to build relationships between employees. The effectiveness of employee relationships can therefore be considered a measure of the effectiveness of communication and teamwork within an organisation. Managers should respect their employees by interacting with people at all levels and not only working through the chain of command. Managers should also understand their employees beyond their role as operators. They must even begin to understand their family situations so that when they have problems at home that have an impact on their work, they will understand and be able to assist them.

Table 8: The PDSA cycles at the group level of the people value stream

I. People value stream			
B. Group level			
	7. Communication	8. Teamwork	9. Employee relationship
Measure	Measure effectiveness of organsiational communication	Measure effectiveness of organsiational teamwork	
Plan	Plan how to improve organisational communication	Plan how to improve organisational teamwork	
Do	•Establishing dialogue that reaches a true level of communication that is followed by cooperation and consideration •Ensure sufficient communication during the problem-solving process	•Create balance between individual excellence and team effectiveness •Maximise individual and team performance	
Study			Study employee relationships
Act			Improve employee relationships

8.4.5 Production level (Measure-Plan-Do-Study-Act)

At the production level, the production theme is used to complete the M-PDSA cycle (see Figure 31 and Table 9 for details).

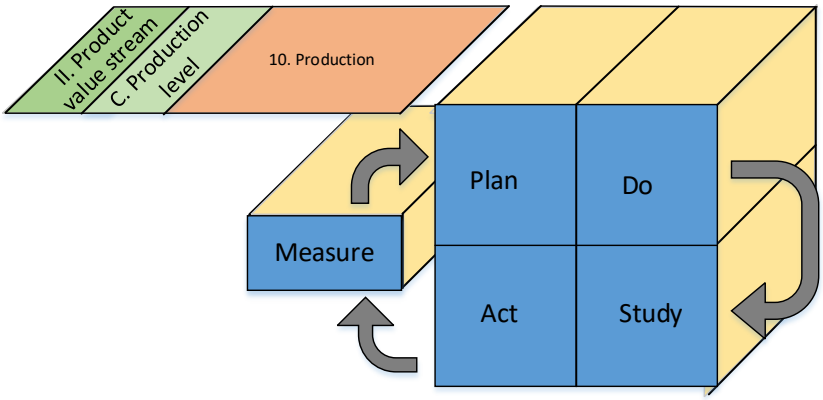

Figure 31: The PDSA cycles at the production level of the product value stream

As explained in Section 0, the purpose of the product value stream is to highlight problems so that they can be solved to improve the organisation. Lean techniques such as *kanban*, continuous flow, JIT, 5S, standardised work and the *andon* cord can be used to expose problems that might not have been seen otherwise. Problems can also be exposed by continuously measuring pre-determined KPIs.

However, exposing problems, creates difficulty if there is nobody to solve these problems. For example, if an organisation implements JIT and *kanban* “today”, they will run out of inventory “tomorrow”. This is a good thing only if the organisation sees problems as opportunities to improve. However, if these problems are pointed out without anyone to solve them, they will only create frustration and negativity towards lean. Therefore, the people value stream is developed prior to the product value stream to deliver people who are willing and able to identify and solve problems.

Table 9: The PDSA cycles at the production level of the product value stream

II. Product value stream	
C. Production level	
	10. Production
Measure	•Measure process output/KPI's
Plan	•Define the value of the product or service the organisation delivers in terms of particular (a) products, (b) capabilities, (c) prices and (d) customers •Map the product value stream for each product or family of products
Do	•Remove waste from the production process •Revise the production schedule with reduced departmentalised and batch processes
Study	Implement a pull system so that problems can surface and be solved
Act	Implement a continuous improvement production process that reduces (a) effort, (b) time, (c) space, (d) cost and (e) mistakes

8.4.6 Organisational level (Measure-Plan-Do)

At the organisational level, *measuring, planning and doing* happen by means of the following RFP themes (see Figure 32 and Table 10 for details):

8.4.6.1 Safety and ergonomics

Ergonomics is considered another way for an organisation to show respect for people, since it is considered disrespectful if you let people work too hard physically or perform tasks that are dangerous.

8.4.6.2 Waste reduction

Lean literature explains the eight forms of waste. Although these principles mostly pertain to the technical production side, removing waste from people's everyday life can also be seen as respect to people. It can be considered disrespectful for example to let someone stand and do nothing (idle time). It is also a form of waste, since the organisation is paying him/her for doing nothing.

8.4.6.3 Job security

People should never lose their jobs because of a lean implementation. An organisation should provide job security to employees, especially during a lean implementation. Failure to do so will prevent effective implementation and cooperation from employees. As soon as people see that nobody has lost their jobs because of a lean implementation, they will be more likely to take part and provide valuable inputs.

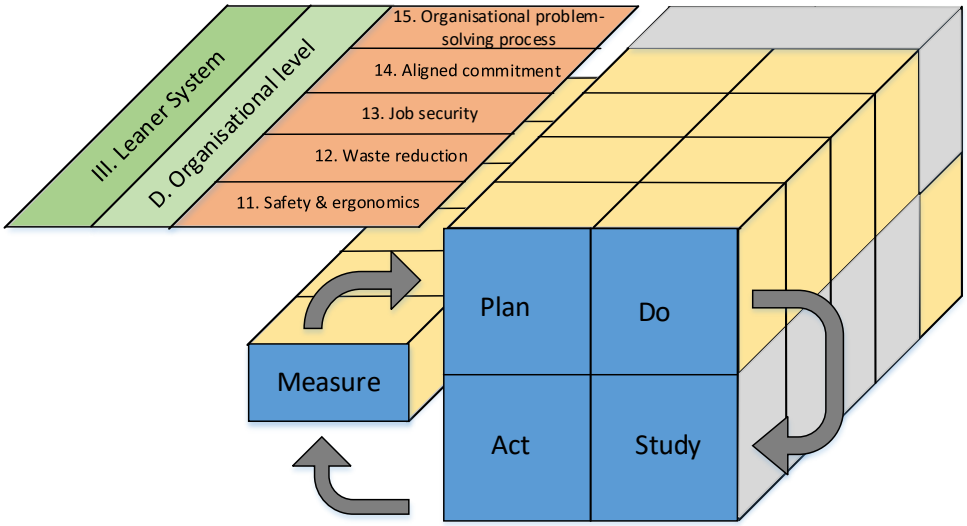

Figure 32: The PDSA cycles at the organisational level of the leaner system

8.4.6.4 Aligned commitment

Lean implementation can only be successful if there is aligned commitment between the company union representatives, the organisation and the employees. They should all have the same vision. People within the organisation should also have the same goal. If there is respect between colleagues as co-workers, there will be progress for the workers, but also for the organisation.

Table 10: The PDSA cycles at the organisational level of the leaner system

III. Lean Enterprise					
D. Organisational Level					
	11. Safety & ergonomics	**12. Waste reduction**	**13. Job security**	**14. Aligned commitment**	**15. Organisational problem-solving process**
Measure	Perform safety & ergonomics audit	Perform waste audit	Measure the perception of job security	Measure alligned commitment between workers, management and unions	
Plan	Plan how to improvrove safety and ergonomics	Plan how to remove waste from employees' daily tasks	Plan to how to improve job security	Plan how to improve alligned commitment between workers, management and unions	
Do	•Ensure safe and ergonomic work environment •Reduce/eliminate tasks that are a) dangerous, b) injurious to their health, and/or c) physically strenuous	Remove waste from employees daily tasks : a) Defects b) Overproduction c) Excess inventory d) Over-processing e) Motion f) Transportation g) Waiting h) Unused employee creativity	Provide job-security	Improve alligned commitment between workers, management and unions	•Implement the 5-phase problem-solving process *Ensure engagement and co-operation of everyone (management and workers) •Ensure mutal consideration and understanding of other people's positions •Ensure leadership involvement
Study					•Give employees the opportunity to present to management, the problems that they have solved, in order to study the effectiveness of the problem-solving process.
Act					Implement a company-wide problem-solving culture

8.4.7 Organisational level (Study-Act)

The last theme is used to *study* and *act* on the effectiveness of the lean implementation process as a whole.

8.4.7.1 Organisational problem-solving process

As explained in Section 8.2, the purpose of the RFP model is to establish a company-wide problem-solving culture. This is achieved by developing a product value stream that highlights problems and a people value stream that delivers people who would be able to solve these problems. Thus, if the organisational problem-solving process is operating effectively, the implementation can improve the organisation.

The organisational problem-solving process that should be followed, is as follows:

1. The first step is for the manager to ask the employee about the problem that the employee is experiencing. The purpose of this discussion is to determine the *real* problem, not just the *surface* problem.
2. The employee is then asked what causes the problem to determine the root cause. The employee should provide evidence from the workplace to investigate the problem in collaboration with the manager.
3. The employee is then asked to propose a solution and provide a reason for the specific solution as opposed to other alternatives.
4. The employee is also asked how they (the employer and employee) will know that the problem has been solved. How can it be monitored?
5. Once an agreement has been reached on the correct course of action, the employee will implement it.

This problem-solving process represents the highest form of respect. Managers admit that they cannot solve a problem alone since they are not close enough to it to know all the facts. Moreover, the manager shows real respect for the employees' knowledge and their dedication to finding the best answer to an issue. On the other hand, employees cannot always solve a problem alone since they are too close to the problem to see the wider context and they might not ask sufficiently critical questions about their own work.

However, a crucial element of the problem-solving process is mutual trust. This should be at the centre of the problem-solving process because it is key to creating an environment that both encourages the

identification of problems and motivates people to solve them. Without trust in their employers, employees are reluctant to admit to problems and learn that it is safest to hide them. Mutual trust means that management and employees have confidence in each other. Both parties should realise that they have different jobs and different responsibilities in the company. This should be emphasised during the process, but also emerge from the process.

8.5 Continuous improvement

Lean is a philosophy and an organisational culture. Therefore, lean implementation is never complete. The organisation will continue to follow the spiral process through the RFP model for lean implementation. Once the last block is reached, the organisation will start again from the first block following the spiral process towards the back, continually improving the organisation.

8.6 Conclusion

The purpose of this chapter was to explain the Respect for People model for lean implementation. This was done by briefly explaining the Respect for People framework (which is elaborated on in **Chapter 5**, Article 2). The construct of the RFP model for lean implementation was explained as well as the different implementation phases. The next chapter proceeds to explain how the model was verified and validated.

CHAPTER 9
THE DELPHI PROCESS

This chapter explains how the Delphi technique was used to verify and validate the RFP model for lean implementation. The purpose of the Delphi technique was to determine if there is consensus on the various aspects of the RFP model.

9.1 Introduction

The previous chapter developed the Respect for People model for lean implementation. This chapter explains the Delphi technique that was followed to verify and validate different aspects of the research.

9.2 Selection of panel of experts

The selection of the panel was done by means of purposively sampling experts. The participants were selected based on their expert ability to answer the research questions and not so that they could form a representative sample for statistical purposes (Skulmoski et al., 2007; Nordin et al., 2012). Therefore, the inclusion criteria to participate in the study were: (1) a minimum of 3 years known and demonstrable experience and expertise in the area of lean implementation; (2) capacity and willingness to participate; (3) sufficient time to participate; and (4) effective communication skills (Skulmoski et al., 2007).

Furthermore, a heterogenous group was formed by selecting (a) lean experts from academia; (b) lean experts from industry (automotive, aviation, precious metals, stainless steel); and (c) human resource managers from industry.

Twenty-six participants were purposefully sampled based on their experience and expertise. Snowball sampling was further used by asking these participants to forward the invitation to other potential participants that met the inclusion criteria. Twenty participants responded by completing the questionnaire, providing a 77% response rate.

Table 11 provides the frequency distribution of the level of experience of the participants. Most of the experts have more than 21 years' experience within lean implementation.

Table 11: Frequency distribution of level of experience of Delphi panel

Experience level	Frequency	%
3 years	1	5.6
4–6 years	3	16.6
7–10 years	5	27.8
11–15 years	4	16.6
16–20 years	1	5.6
21+ years	6	27.8

9.3 Defining consensus

Consensus was defined as an agreement between the experts on rating a particular item on the questionnaire. The minimum percentage of agreement on a particular item was set as 75% (Nordin et al., 2012). Therefore, for this study, consensus was achieved when an average rating above 3.75 (75% of a 5-point Likert scale) was achieved for each item on the questionnaire (Nordin et al., 2012).

9.4 First round questions

The questions were designed to seek agreement between the participants by means of a Likert scale (Nordin et al., 2012). The scale consisted of five points: (1) strongly disagree, (2) disagree, (3) I don't know, (4) agree, and (5) strongly agree. At the end of each section of the questionnaire, the participant was also given the opportunity to provide open-ended qualitative feedback.

Care was taken to formulate the questions to avoid any ambiguity that could frustrate the participants (Skulmoski et al., 2007). A pilot study was also run to test for any ambiguity, after which a few language changes were made.

The first-round questionnaire was developed with two inputs in mind:

- **Verification** – Questions were aimed at verifying that the model adhered to the initial design requirements.
- **Validation** – Questions were aimed at proving that a valid research problem had been identified and that the RFP model addresses this research problem (in other words, whether the model is fit for purpose).

The development of these questions is discussed below and the complete questionnaire is available in Appendix A.

(Note: The numbers in Table 12, 12 and 13 correspond to the numbers in the Delphi questionnaire and is therefore not in numerical order).

9.4.1 Verification questions

The design requirements (specified in **Chapter 7**) were converted into questions and combined into a single Delphi questionnaire. Table 12 shows how each design requirement was converted into a question for the Delphi panel.

Table 12: Design requirements versus Delphi questions

Design requirements	Questionnaire (Strongly disagree, disagree, don't know, agree, strongly agree)
2. Structure	**2. This section relates to the structure of the RFP model**
a) Simple in structure	a) The model is simple in structure
b) There should be coherence between the different elements of the model	b) The different elements of the model form a unity
c) The model should form an all-inclusive approach towards lean implementation	c) The model follows an all-inclusive approach towards lean implementation
3. Usability	**3. This section relates to the usability of the RFP model**
a) Employees at different levels of an organisation should be able to understand and use the model to take part in a lean implementation	a) Employees at the following levels of the organisation, will be able to understand and use the model to take part in a lean implementation (answer separately) • Executive level • Senior management • Middle management • Shop floor worker – literate • Shop floor worker – illiterate
b) The implementation sequences should be logical, systematic and easy to understand	b) The implementation sequence is logical, systematically and easy to understand.
c) The model should represent a road map and a planning tool for implementation	c) The RFP model represents a roadmap and a planning tool for lean implementation.
4. Effectiveness	**4. This section relates to the effectiveness of the RFP model**
a) The model should have a means of providing feedback on whether the desired outcomes have been achieved	a) The RFP model offers a means of providing feedback on whether the desired outcomes have been achieved
b) The model should address most lean implementation barriers	b) Several reasons for lean implementation failure have been noted. Do you think the RFP model will address the following barriers to lean implementation (answer each separately): • Insufficient commitment from management • Lack of coaching • Lack of communication • Lack of support from management • Employees do not feel valued even though they are the ones who are in the best position to offer suggestions for improving the efficiency of the processes • Lack of training and development support • Scepticism about being adequately rewarded • Lack of job security • Resistance to change • Lack of buy-in

Design requirements	Questionnaire (Strongly disagree, disagree, don't know, agree, strongly agree)
5. Completeness	**5. This section relates to the completeness of the RFP model**
a) The model should include all the required lean implementation principles	a) The RFP model includes the following required implementation principles (answer separately): • Respect for people • Continuous improvement • People are challenged • *Genchi Genbutsu* ("Go and see" to solve the problem) • Teamwork • Reduction of waste Please comment on whatever you feel has been left out
6. Applicability	**6. This section relates to the applicability of the RFP model to the SA context**
a) The model should be applicable to most SA industries	a) Can you think of any industry (e.g. automotive, health care, aviation, service delivery) in which this lean implementation model would NOT be applicable?

9.4.2 Validation questions – Research problem

The validity of the research problem was investigated by means of specific questions in the Delphi questionnaires. These questions are stated in Table 13

Table 13: Validation (research problem) versus Delphi questions

Validation requirement	Questionnaire (Strongly disagree, disagree, don't know, agree, strongly agree)
1. Validity of the research problem	**1. This section relates to the validity of the research problem**
a) The research problem should be valid	a) Lean implementation has a low success rate in South Africa b) Lean implementation has a low success rate due to the intense focus on tools and techniques at the expense of the human element c) Lean implementation has a low success rate in South Africa because of the cultural differences between South Africa (Western Country) and Japan (Eastern Country) where the lean philosophy and principles were developed

9.4.3 Validation questions – Research output

Validation is also a process during which a judgement is made as to whether a tool is fit for purpose (Nordin et al., 2012). The validity of the RFP model was determined by including specific questions in the Delphi questionnaire. Refer to Table 14 for these questions.

Table 14: Validation (research output) versus Delphi questions

Validation requirement	Questionnaire (Strongly disagree, disagree, don't know, agree, strongly agree)
7. Validity of the research output	**7. This section relates to the validity of the research output**
a) The model should have an original design	a) To the best of your knowledge, would you consider the construction and integration of the RFP model for lean implementation an original design (as opposed to just a duplication of other previous work)?
b) The artefact should address the research problem	b) The RFP model could increase the success rate of lean implementation in South Africa

9.5 Administering and analysing Round 1 questionnaire

An e-mail was sent to all participants with a link to a video that explains the RFP model and a link to the questionnaire. The e-mail requested them to watch the 9.5-minute video and then complete the 10-minute questionnaire.

A reminder email was sent if no response had been received after seven working days. After a further seven days, the results were analysed by combining the quantitative and qualitative feedback.

9.6 Results

The minimum percentage of agreement on a particular item was set as 75%. Therefore, consensus was achieved when an average rating above 3.75 (75% of a 5-point Likert scale) was achieved for each item on the questionnaire (Nordin et al., 2012). Table 15 shows the average response rate per question. An average of above 3.75 was achieved for all questions, thus reaching consensus after Round 1 of the Delphi technique.

Table 15: Results from the Delphi questionnaire

Questions		Results
1.	**This section relates to the validity of the RESEARCH PROBLEM**	
a)	Lean implementation has a low success rate in South Africa	3.95
b)	Lean implementation has a low success rate due to the intense focus on tools and techniques at the expense of the human element	4.00
c)	Lean implementation has a low success rate in South Africa because of the cultural differences between South Africa (Western Country) and Japan (Eastern Country) where the lean philosophy and principles were developed	3.78
2.	**This section relates to the STRUCTURE of the RFP model**	
a)	The model is simple in structure	3.84
b)	The different elements of the model form a unity	4.00
c)	The model follows an all-inclusive approach towards lean	3.89
3.	**This section relates to the USABILITY of the RFP model**	
a)	Employees at the different levels of the organisation will be able to understand and use the model to take part in a lean implementation	4.15
b)	The implementation sequence is logical, systematically and easy to understand	3.95
c)	The RFP model represents a roadmap and a planning tool for lean implementation	3.95
4.	**This section relates to the EFFECTIVENESS of the RFP model**	
a)	The RFP model includes a means of providing feedback on whether the desired outcomes have been achieved	3.95
b)	Several reasons for lean implementation failure have been noted. Do you think the RFP model will address the following barriers to lean implementation?	3.89
5.	**This section relates to the COMPLETENESS of the RFP model**	
a)	The RFP model includes the required lean implementation principles	4.40
6.	**This section relates to the APPLICABILITY of the RFP model in the SA context**	

	Questions	Results
a)	Can you think of any industry (e.g. automotive, health care, aviation, service delivery) in which this lean implementation model would NOT be applicable?	4.80
7.	**This section relates to the VALIDITY of the research output**	
a)	To the best of your knowledge, would you consider the construction and integration of the RFP model for lean implementation an original design (as opposed to just a duplication of other previous work)?	4.00
b)	The RFP model could improve the success rate of lean implementation in South Africa	4.00

The results from the Delphi questionnaires are discussed below according to the quantitative and qualitative feedback that was received. The detailed quantitative and qualitative feedback is available in Appendix B and C.

9.6.1 Research problem

The **quantitative** results indicated that there was consensus that the research problem is a valid problem. Most participants agreed that lean has a low success rate in South Africa. Furthermore, the intense focus on lean tools and techniques at the expense of the human side of lean was a significant contributing factor.

Although most participants agreed that the cultural differences, between South Africa and Japan do play a role, not all participants felt that it was one of the main reasons for the low success that in South Africa. The **qualitative** feedback indicated that participants felt that management was rather a greater contributor towards unsuccessful lean implementation:

- *Lean implementation absolutely fails due to management that approaches it incorrectly* (Participant 01–07).
- *There is a difference in saying we must do something and management actually making the resources and time available* (Participant 01–08).
- *I think in some companies it [lean] works, but through driving of the senior management* (Participant 02–15).
- *Lean deployment is often not sustained due to lack of buy-in from executive management* (Participant 03–22).
- *The problem is in the lack of top management involvement, poor knowledge base and aloof style of leadership* (Participant 04–26).

9.6.2 Structure

The **quantitative** results indicated that there was consensus on the structure of the model. It is simple, the different elements of the model form a unity, and the model follows an all-inclusive approach towards lean.

Participants used the **qualitative** feedback option to provide future suggestions for the model:

- *The impact of technology is largely ignored* (Participant 02–18).
- *I would include a service element or services processes with the product value stream* (Participant 03–22).
- *Just as the establishment of respect for people are vitality important, as the RFP framework and model argues, so is the establishment of the lean value stream. More detail is required in this regard* (Participant 04–24).

9.6.3 Usability

Although the **quantitative** results indicated that there was consensus on the general usability of the model, some participants did not agree on the detail elements of this section. Some of the participants believed that workers (literate and illiterate) would not be able to understand the model. Future research could therefore focus on how to make the model (or some aspects) more understandable for shop floor workers.

Once again, the **qualitative** feedback indicated concern about management:

- *The model offers a simple pathway but will the people, especially leadership, understand how to address the challenges that inevitably will arise during deployment?* (Participant 01–11).
- *In the aviation industry, the shop floor workers follow instructions and procedures. It is at the middle management level that the most training will be required to successfully implement the model* (Participant 02–16).

9.6.4 Effectiveness

Although **quantitative** results indicated consensus on the effectiveness of the RFP model, there was general concern about questions that directly involved management (such as management commitment and management support). Further concerns were raised in answers to questions that implied the involvement of management, such as a lack of coaching for workers, workers being adequately rewarded, and the company providing job security.

The **qualitative** responses further confirmed these concerns:

- *The start point is to get senior management and middle management to commit and drive the RFP model* (Participant 01–08).
- *The model on its own won't deliver management commitment… unless they are absolutely dedicated to make it work* (Participant 04–26).

The RFP model was initially designed for organisations where management commitment is present from the beginning. Therefore, it was not the purpose of the RFP model to increase this commitment or buy-in from management. However, these results support the importance of such commitment.

9.6.5 Completeness

The **quantitative** results proved that there was consensus that the model includes all the required lean implementation principles such as respect for people, continuous improvement, teamwork and waste reduction.

The **qualitative** feedback, however, indicated that the list is not exhaustive. There were suggestions that the list should include for example a "governance system and an external coach to help senior leadership to figure out the way through problems" (Participant 01–11).

9.6.6 Applicability

There was consensus that the model is applicable to South African industries. Only one concern was raised with regard to the municipality public sector, since they are "grossly overstaffed" (Participant 02–16).

9.6.7 Validity

The **quantitative** data indicated consensus on the model validity. Participants agreed that the model had an original design (as opposed to a duplication of other previous work) and that the RFP model could possibly increase the success rate of lean implementation.

The **qualitative** feedback indicated that one participant disagreed with the view that the model could increase the success rate, since he felt that the success lies mainly in the hands of management:

- *Management will have to fully buy into the RFP model and drive it through the organisation for it to work. The model is great and detailed, however if management are not prepared to afford people the time required for training, fact finding and implementation, it will not work* (Participant 01–08).

9.7 Conclusion

This chapter presented the quantitative and qualitative feedback on the Delphi technique. There was consensus on all seven areas of the questionnaire and therefore no further questionnaire rounds were required.

The general quantitative feedback from the participants emphasised the importance of management buy-in. It does not matter how good the RFP model (or any other model) is, management buy-in is a critical factor for lean implementation success.

The next two chapters (Verification and Validation) will summaries and conclude the results of this research study.

CHAPTER 10
VERIFICATION

The purpose of this study was to develop a people-centred model for lean implementation for the South African context, that practitioners can use as a pragmatic guide. The design requirements for such a model were specified in Chapter 7 and the RFP model was described in Chapter 8.

This chapter addresses research question 5.1: Does the model adhere to each of the specified design requirements?

10.1 Verification methodology

The verification process asks whether the Respect for People model satisfies the initial design requirements. In order to prove this, the verification process had three inputs:

- **Design intent** — Section 10.2 provides a retrospective view of the design process, indicating how the design requirements for the RFP model were considered.
- **Delphi technique** — Section 10.3 summarises the results of the Delphi technique (explained in Chapter 9).
- **Checklist** — In Section 10.4 a checklist is used to confirm the adherence to simple (yes/no) design requirements not included in the Delphi questionnaire.

A summary of these verification results is provided in Section 0

10.2 Design intent

The design requirements for the RFP model were developed in Chapter 7 and incorporated during the design of the RFP model in Chapter 8. In this section, each design requirement is considered retrospectively to verify that it was considered as part of the design process.

DR 2(a) – **The model should be simple in structure**

In order to keep the structure of the RFP model simple, known techniques and terminology were incorporated/adapted and combined in the model. The PDSA method was used as well as the known lean concepts of value stream mapping. Furthermore, a known cyclical method (PDSA) was used that repeats the same process for different RFP themes, contributing to the simple structure.

DR 2(b) – **There should be coherence between the different elements of the model**

For each RFP theme, the plan-do-study-act steps were developed, thus following the same pattern for each theme. In addition, the concept of value stream mapping was used for the people value stream, the product value stream, and the organisational level. This establishes coherence between the different elements of the model.

DR 2(c) – **The model should form an all-inclusive approach towards lean implementation**

A holistic approach towards lean was followed by including all the RFP themes identified during this study, lean philosophy principles, as well as guidelines from literature on implementation frameworks. All of these inputs were used to develop the design requirements for the RFP model.

DR 3(a) – **Employees at different levels of an organisation should be able to understand and use the model to take part in a lean implementation**

The model was designed in such a manner to be applicable to employees on different levels in the organisation, but for different purposes. Employees at senior management level, can use the model to conduct a gap analysis (the measure phase of each MPDSA-cycle) as well as use the model for medium to long-term planning. Employees at middle-management level, can use the RFP model for short-term planning and progress tracking towards each RFP theme. Shop floor workers will be able to understand and follow the model through practice.

DR 3(b) – **The implementation sequences should be logical, systematic and easy to understand**

The implementation sequence follows the same PDSA cycle for each RFP theme, making it repetitive and therefore logical, systematic and easy to understand. The (known) concept of value stream mapping is also used to explain the (unfamiliar) concept of people value stream mapping. The RFP themes that were incorporated are familiar concepts and terminology.

DR 3(c) – **The model should represent a road map and a planning tool for implementation**

Due to the systematic PDSA method of the RFP model, it is designed to function as a roadmap and a planning tool for lean implementation. For each RFP theme, the organisation can measure the status quo of that particular RFP theme and plan the required implementation accordingly.

DR 4(a) – **The model should have a means of providing feedback on whether the desired outcomes have been achieved**

The study phase of each PDSA cycle provides a means of feedback during the lean implementation. Overall success will be measured by the company's sustained rate of improvement as measured by its KPIs in the long run.

DR 4(b) – **The model should address most lean implementation barriers**

The RFP model starts the lean implementation process on the people value stream (as opposed to the product value stream). Therefore, barriers related to resistance to change is overcome, e.g. lack of buy-in and employees not feeling valued for their input. This also prevents a lack of coaching, training and development of employees.

DR 5(a) – **The model should include the required lean implementation principles**

Lean implementation principles such as continuous improvement (CI), teamwork, reducing waste, value stream mapping (VSM) and employee development have been included in the Respect for People model.

DR 5(b) – **The model should include all RFP themes identified during the study**

During this study, 14 RFP themes were identified. All these themes are included in the RFP model by placing them in the correct level of implementation (individual, group, production, organisation).

DR 6(a) – **The model should be applicable to most SA industries**

During the second concept design phase of the eADR method, input was obtained from different South African industries (automotive, aviation, health care, precious metals, steel manufacturing and cable manufacturing). These inputs from different industries were combined and integrated into the RFP model. Therefore, the model is considered to be applicable to a wide range of South African industries.

The above discussion explains how each of the design requirements of the RFP model was addressed during the *concept design* and *building* phases of the eADR process. The following section summarises the results from the Delphi technique that was used to obtain verification inputs from a panel of experts.

10.3 Delphi technique

The verification of the adherence to the design requirements was partially achieved by means of the Delphi technique (as explained in **Chapter 9**). The design requirements specified in Chapter 7 were converted into questions and combined into a single questionnaire that was sent to the panel of experts. The results are shown in Table 16. An average above 3.75 was achieved for each question, indicating that consensus was reached on all design requirements.

(Note: The numbers in Table 16 are according to the Delphi questionnaire and therefore not sequential).

Table 16: Design requirement results from Delphi questionnaire

Design requirements	Results	Consensus
7. Structure		
a) The model should be simple in structure	3.84	Yes
b) There should be coherence between the different elements of the model	4.00	Yes
c) The model should form an all-inclusive approach towards lean implementation	3.89	Yes
8. Usability		
a) Employees at different levels of an organisation should be able to understand and use the model to take part in a lean implementation	4.15	Yes
b) The implementation sequences should be logical, systematic and easy to understand	3.95	Yes
c) The model should represent a road map and a planning tool for implementation	3.95	Yes
9. Effectiveness		
a) The model should have a means of providing feedback on whether the desired outcomes have been achieved	3.95	Yes
b) The model should address most lean implementation barriers	3.89	Yes
10. Completeness		
a) The model should include the required lean implementation principles	4.40	Yes
11. Applicability		
a) The model should be applicable to most SA industries	4.80	Yes

10.4 Verification checklist

The following design requirements were not included in the Delphi questionnaire, since they required a simple yes/no answer (as opposed to requiring input of the Delphi panel).

- **Design requirement (5b)** — The model must include all RFP themes identified during this study.

Table 17 provides the results of the checklist that was used to verify this design requirement. The section in this thesis that elaborates on how each RFP themes were addressed, is also indicated.

Table 17: Design requirements verification checklist

Design requirement	Checklist		
5. Completeness	5. This section relates to the completeness of the RFP model		
b) The model should include all RFP themes identified during the study	b) Does the RFP model include the following Japanese RFP themes?	(Yes / No)	Section in thesis
	1. Value of people	Yes	8.4.1.1.
	2. Worker's input	Yes	8.4.1.2.
	3. Motivation and buy-in	Yes	8.4.1.3.
	4. Development/empowerment of people	Yes	8.4.1.4
	5. Training	Yes	8.4.1.5
	6. Employee responsibilities	Yes	8.4.2.1
	7. Communication	Yes	8.4.3.1.
	8. Teamwork	Yes	8.4.3.2.
	9. Employee relationships	Yes	8.4.4.1.
	10. Safety and ergonomics	Yes	8.4.3.1.
	11. Waste reduction	Yes	8.4.3.2.
	12. Job security	Yes	8.4.6.3.
	13. Aligned commitment	Yes	8.4.6.4.
	14. Organisational problem-solving process	Yes	8.4.7.1.

10.5 Summary of cross-verification

Table 18 provides a summary of the three inputs that were used to verify adherence to the design requirements.

- Design intent
- Delphi technique
- Verification checklist

The first column states the design requirements and columns two to four confirm the adherence by means of each input. The last column states the conclusion reached in terms of verifying the adherence to each design requirement.

10.6 Verification conclusion

The aim of this chapter was to confirm that the RFP model adheres to all the specified design requirements. This was achieved by means of cross-verification of a retrospective view of the design process, the Delphi technique, and a verification checklist, of which the conclusions are summarised in Table 18. All the design requirements were positively verified by one or more of the methods.

By confirming adherence to all the design requirements, research question 5.1 is answered. The research question was as follows: “Does the model adhere to each of the design requirements?”

However, the validation of the research question, method and output, remains to be proven. The next chapter elucidates this aspect of the research.

Table 18: Cross-verification of design requirements

Design requirements	Reference to intentional design	Verification checklist	Delphi technique	Conclusion
2. Structure				
a) The model should be simple in structure	Known techniques and terminology used	n/a	**Confirmed by Question 2(a)**	**Verified**
b) There should be coherence between the different elements of the model	PDSA method followed	n/a	**Confirmed by Question 2(b)**	**Verified**
c) A The model should follow an all-inclusive approach towards lean implementation	All RFP themes included combined with other lean principles	n/a	**Confirmed by Question 2(c)**	**Verified**
3. Usability				
a) Employees at different levels of an organisation should be able to understand and use the model to take part in a lean implementation	Applicable to different organisational levels, but for different purposes	n/a	**Confirmed by Question 3(a)**	**Verified**
b) The implementation sequences should be logical, systematic and easy to understand	The known PDSA method is followed combined with other known concepts	n/a	**Confirmed by Question 3(b)**	**Verified**
c) The model should represent a road map and a planning tool for implementation	The repetitive PDSA process assists with measuring and planning	n/a	**Confirmed by Question 3(c)**	**Verified**
4. Effectiveness				
a) The model should include a means to provide feedback on whether the desired outcomes	The *Study* phase of each PDSA cycle provides feedback	n/a	**Confirmed by Question 4(a)**	**Verified**

Design requirements	Reference to intentional design	Verification checklist	Delphi technique	Conclusion
have been achieved				
b) The model should address most lean implementation barriers	The focus on the people value stream overcomes a number of barriers.	n/a	**Confirmed by Question 4(b)**	**Verified**
5. Completeness				
a) The model should include the required lean implementation principles	Principles such as CI, VSM, employee development have been included	n/a	**Confirmed by Question 5(a)**	**Verified**
b) The model should include all RFP themes identified during the study	All 14 RFP themes are included	**Confirmed**	n/a	**Verified**
6. Applicability				
a) The model should be applicable to most SA industries	Input from different South African industries were obtained during the second *concept* design phases.	n/a	**Confirmed by Question 6(a)**	**Verified**

CHAPTER 11
VALIDATION

The key quality criterion for creating knowledge is validity, in other words, is it deemed valid by an informed audience (the scientific community) based on the arguments and empirical proof presented. Another requirement for research is the one of rigour (Van Aken, 2005).

Validation is also process by which a judgement is made as to whether a tool is fit for purpose (Nordin et al., 2012).

The word validation is derived from the Latin word *valere*, which literally means *weight*. Valere is also the root for the work *value* (Van Dyk, 2013).

Given the above statements, this chapter addresses the following research questions:

Research questions 6.1 — Has a valid research problem been identified?

Research questions 6.2 — Was a valid research design followed?

Research questions 6.3 — Does the research output address the research problem and the specific and general limitations of the study?

11.1 Validation methodology

This chapter considers the rigour of the research process and the value of the contribution by means of the following methods:

- **Research problem** — In Section 11.2 a **gap analysis** and the **Delphi technique** were used to determine the validity of the research problem.
- **Research design** — In Section 11.3 the validity of the research design was determined by the **DSR guidelines**, the **ADR principles** and a **research validation matrix**.
- **Research output** — In Section 11.4 the validity of the research output was determined by the **Delphi technique**.

A summary of these validation results is provided in Section 11.5.

11.2 Validation of research problem

In Chapter 1, the research problem was stated as follows:

> *The problem is the low lean implementation success rate in South Africa due to the intense focus on tools and techniques at the expense of the human element.*

The validity of the research problem was cross-validated by means of a gap analysis and the Delphi technique discussed in Chapters 4 and 9 respectively.

11.2.1 Validation results from gap analysis

Article 1 (**Chapter 4**) has elaborated on the content of the Toyota Way and revealed the important link between the ‘continuous improvement’ pillar and the ‘respect for people’ pillar, emphasising the importance of including people in the lean implementation process. However, different lean implementation strategies were analysed and this revealed how few of these people principles have been included.

This crucial finding on lean implementation failures confirms and elaborates on what is written in the literature: “By concentrating on the tangible outcomes, organisations lose sight of the intangible aspects of change and culture, and in particular that companies are formed out of people” (Bhasin, 2012c).

Attempting to adopt any CI initiative without incorporating aspects that prove that there is respect for the people who have to undergo the change, will simply not deliver the required results. Article 1 demonstrates that this is indeed the case with prevailing lean implementation strategies.

11.2.2 Validation results from Delphi technique

In addition to the gap analysis, the validity of the research problem was confirmed by means of specific questions in the Delphi questionnaires (**Chapter 9**). The results are shown in Table 19. An average above 3.75 was achieved for each question, indicating that consensus was reached on the validity of the research problem.

Table 19: Research question validation results from the Delphi questionnaire

Delphi questions	Results
1. This section relates to the validity of the RESEARCH PROBLEM	
a) Lean implementation has a low success rate in South Africa	3.95
b) Lean implementation has a low success rate due to the intense focus on tools and techniques at the expense of the human element	4.00

11.3 Validation of the research design

The second part of determining the validity of the study involved validating the research design that was followed. Did the process contain sufficient control to ensure that the research outputs are warranted by the inputs? In other words, are the answers to each research question warranted by the research input and research output (Van Dyk, 2013). This was achieved by means of the following three methods:

- The design science research guidelines (Section 11.3.1)
- The action design research principles (Section 11.3.2)
- A research validation matrix (Section 11.3.3)

11.3.1 Design science research guidelines

Design science research (DSR) is inherently a problem-solving process. Therefore, building and applying an artefact require knowledge and understanding of a design problem and its solutions.

In order to understand these requirements for effective design science research, Hevner et al. (2004) developed seven guidelines to assist researchers, reviewers, editors and readers.

Table 20 states these requirements and how they were addressed during this research study.

Table 20: Design science research guidelines (Hevner et al., 2004)

Guideline	Description	Confirmation	Chapter reference
1. Design as an artefact	DSR must produce a viable artefact in the form of a construct, a model, a method, or an instantiation.	The RFP model for lean implementation was designed as the artefact	• Chapter 8 – RFP model
2. Problem relevance	The objective of DSR is to develop technology-based solutions for important and relevant business problems.	The RFP model addresses the relevant business problem of the low success rate of lean implementation.	• Chapter 8 – RFP model
3. Design evaluation	The utility, quality, and efficacy of a design artefact must be rigorously demonstrated using well-executed evaluation methods.	The Delphi technique was used to verify the usability, effectiveness and applicability of the RFP model	• Chapter 9 – Delphi technique
4. Research contributions	Effective DSR must provide clear and verifiable contributions in the areas of the design artefact, design foundations, and/or design methodologies.	The Delphi technique was used to prove that the RFP model has an original design (as opposed to just a duplication of other previous work). This validated the originality of the design and the contribution of the newly designed artefact.	• Chapter 9 – Delphi technique
5. Research rigour	DSR relies on the application of rigorous methods in both the construction and evaluation of the design artefact.	During the first *concept design* phase, a Systematic literature review was conducted and during the second *concept design* phase an applied thematic analysis. During the fourth *concept design* phase, the Delphi technique was followed for the evaluation step.	• Chapter 5 – SLR (Article 2) • Chapter 6 – ATA (Article 3) • Chapter 9 – Delphi technique
6. Design as a search process	The search for an effective artefact requires utilising available means to reach desired ends while satisfying laws in the problem environment.	During the *problem diagnosing* phase, a gap analysis was performed to find a possible effective artefact.	• Chapter 4 – Gap analysis (Article 1)

Guideline	Description	Confirmation	Chapter reference
7. Communication of research	DSR must be presented effectively both to technology-oriented as well as management-oriented audiences.	The results of the research were communicated to the audience by means of a nine-and-half-minute video that explained the RFP model. Furthermore, the research is communicated via the thesis document and published articles.	• Chapter 8 – RFP model • Thesis document

11.3.2 Action design research principles

Action design research (ADR) is a research method for generating prescriptive design knowledge by building and evaluating artefacts. It is founded in the certain principles (Sein et al., 2011). Table 21 states these principles and how they were addressed during this study.

Table 21: Action design research principles (Sein et al., 2011)

Principle	Description	Confirmation	Chapter reference
1. Practice-inspired	Field problems should be viewed as knowledge-creating opportunities	The industry problem of low success rates with lean implementation was used as motivation for this study	• Chapter 4 – Gap analysis (Article 1)
2. Theory-ingrained	The artefacts created and evaluated should be informed by theories	The first concept design stage was a systematic literature review to gain insight in the theories and principles of RFP. The design requirements of the RFP model were also designed using specific literature sources.	• Chapter 5 – SLR (Article 2)
3. Reciprocal shaping	The artefact and the organisational context should exert inseparable, equal forces	Interactive intervention with practitioners took place during the exploratory interviews and the Delphi technique	• Chapter 6 – ATA (Article 3) • Chapter 9 – Delphi technique
4. Mutually influential roles	Mutual learning should take place among the different project participants	Interactive intervention with practitioners took place during the exploratory interviews and the Delphi technique	• Chapter 6 – ATA (Article 3)

Principle	Description	Confirmation	Chapter reference
			• Chapter 9 – Delphi technique
5. Authentic and concurrent evaluation	Evaluation should form part of the build stage	The build stage was outside the scope of this research, but evaluation took place during each of the *concept design* iteration, especially the evaluation of the final model by means of the Delphi technique	• Chapter 9 – Delphi technique
6. Guided emergence	The collective artefact should not only reflect the primary design created by the researchers, but also its ongoing shaping by organisational use, perspectives and participants	Interactive intervention with practitioners took place during the exploratory interviews as well as the Delphi technique	• Chapter 6 – ATA (Article 3) • Chapter 9 – Delphi technique
7. Generalise the outcomes	Outcomes of the research should be generalised by including the organisational change that took place along with the implementation of the artefact. In other words, it should move from the specific-and-unique to the generic-and-abstract.	The outcomes and conclusions of the research is explained in Chapter 12 – Conclusion	• Chapter 12 – Conclusion

11.3.3 Research validation matrix

A second validation method was used to cross-validate adherence to a rigorous research design. A research validation matrix (Figure 33) was used to confirm that each *research challenge* was addressed by a *research objective* by applying one or more *research design* steps (Van der Merwe, 2014; Holm, 2018).

Figure 33 shows how the research problem was divided into **research challenges** and how the research purpose was divided into the **research solutions**. The vertical columns show how each research challenge matched a research solution. These four vertical columns correspond to the four concept design iterations of the eADR research design that was followed (explained in **Chapter 3**, Figure 17). The top part of the validation matrix shows the information sources that were used to verify the **research problem**. The arrows indicate which sources contributed to which research challenges. Lean implementation literature, the Toyota Way literature, the gap

analysis (**Chapter 4** / article 1) and the Delphi technique (**Chapter 9**) were used as input for this part of the study.

The middle part of the validation matrix indicates how the different **literature focus areas** contributed to verifying the problem statement and to solving the research challenges. The research methods were only used to address/develop the research solutions, while literature on lean manufacturing and RFP, verified the research problem and addressed the research solutions. The lean terminology and Toyota Way literature supported the first three research challenges and addressed all four research solutions. Literature on the barriers to lean implementation contributed to the development of the design requirements of the RFP model. Finally, the PDSA method was applied when designing the RFP model.

The bottom part of the validation matrix shows the **research design** that was followed. The arrows indicate which steps contributed to which research aims. The systematic literature review was used to develop the RFP framework, explaining the true, original meaning of the Japanese RFP principles (**Chapter 5**). The applied thematic analysis was used to develop the thematic map of the South African and Japanese RFP themes (**Chapter 6**). After the RFP model was designed and built (**Chapter 7** and **8**), it was evaluated by the Delphi technique (**Chapter 9**).

The abovementioned explanation of the research validation matrix (Figure 33) has proven that a rigorous research design method was followed by indicating that each research problem was addressed by a research solution.

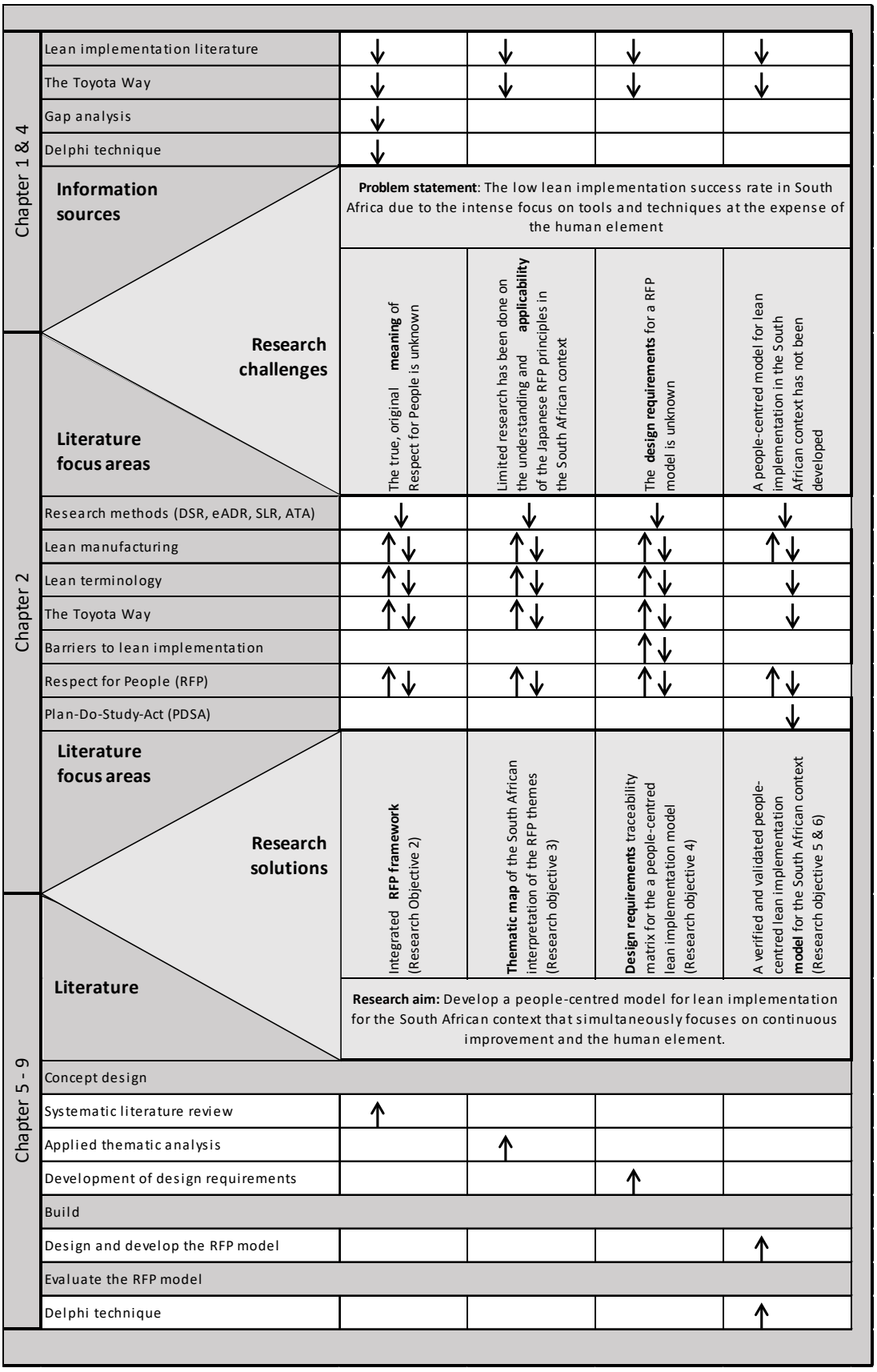

Figure 33: Research validation matrix

11.4 Validation of research output

Validation is a process during which a judgement is made as to whether a tool is fit for purpose (Nordin et al., 2012). The validity of the RFP model was determined by including specific questions in the Delphi questionnaire. Refer to Table 14.

for these questions and results. An average above 3.75 was achieved for each question, indicating that consensus was reached that the RFP model has a novel design and that it will address the research problem.

Table 22: Research output validation results from the Delphi questionnaire

7. This section relates to the VALIDITY of the research output	
a) To the best of your knowledge, would you consider the construction and integration of the RFP model for lean implementation an original design (as opposed to just a duplication of other previous work)?	4.00
b) The RFP model could increase the success rate of lean implementation in South Africa	4.00

11.5 Summary of cross-validation

Table 23 provides a summary of the three inputs that were used to determine the validity of the study and the conclusions. The first column states the validation requirement and columns 2–4 confirm which method(s) was used to proof the validity. The last column states the conclusion that was reached in terms of the validation of the study.

Table 23: Summary of cross-validation results

Validation requirement	Gap analysis	DSR guidelines	ADR principles	Research validation matrix	Delphi technique	Conclusion
Validity of the research problem						
a) A valid research problem should be identified	**Confirmed**	n/a	n/a	n/a	**Confirmed by Question 1(a) & (b)**	**Validated**
Validity of the research design						
a) A valid research design should be followed	n/a	**Confirmed**	**Confirmed**	**Confirmed**	n/a	**Validated**
Validity of the research output						
a) The model should have an original design	n/a	n/a	n/a	n/a	**Confirmed by Question 7(a)**	**Validated**
b) The artefact should address the research problem	n/a	n/a	n/a	n/a	**Confirmed by Question 7(b)**	**Validated**

11.6 Validation conclusion

The aim of this chapter was to confirm the validity of the research problem, the research design and the research output. This was achieved by cross-validation by conducting a gap analysis, using the DSR guidelines, using a research validation matrix and the utilising the Delphi technique. The results were summarised in Table 23, confirming of the validity of this study by answering the following research questions:

- **Research question 6.1 —** Has a valid research problem been identified?
- **Research question 6.2 —** Was a valid research design followed?
- **Research question 6.3 —** Does the research output address the research problem and the specific and general limitations of the study?

The validity of the study is therefore confirmed. The next chapter concludes the study.

CHAPTER 12
CONCLUSION

The purpose of this chapter is to conclude the research and make recommendations for further research.

12.1 Introduction

This final chapter contains an overview of the research and the resulting contributions. The chapter also elaborates on the limitations of the study and recommendations for further research. The conclusions on the study ends the chapter.

12.2 Research overview

Despite the popularity of lean manufacturing, the success rate outside of Toyota remains relatively low due to the intense focus on tools and technique at the expense of the human side of lean. During the first phase of the research this problem was investigated and validated by means of a gap analysis. Once the problem had been validated, the concept design of the solution artefact could commence. In an effort to address the lack of focus on the human elements of change during lean implementations, the RFP pillar of the Toyota Way house was used as guideline. A systematic literature review was conducted to understand this pillar. The results were published as an RFP framework. The next step was to apply these RFP themes to the South African context. Are all the Japanese RFP themes applicable to the SA context and are any additional principles required? Exploratory interviews were conducted in different South African industries to compile a thematic map to uncover the South African RFP themes and the Japanese RFP themes.

Design requirements were developed to provide a frame of reference for the design of a people-centred model for lean implementation. These requirements, together with the South African RFP themes, were used to design and develop the *Respect for People model for lean implementation for the South African context.* A questionnaire and an explanation of the model in the form of a video were sent to a panel of experts. Consensus was reached on all questions, thus verifying and validating the RFP model.

12.3 Contribution

Using the matrix from Figure 34, the contribution of this study is classified as falling primarily in the top left “improvement” quadrant, providing a new solution for a known problem. The goal of DSR in this quadrant is to create better solutions in the form of more efficient and effective products and processes, services, technologies, or ideas. A thorough understanding of the problem environment was used to build an innovative artefact as a solution to an important problem.

It could also be argued that the contribution of the study to some extent lies in the “exaptation” quadrant, since known solutions from the social sciences could be investigated and applied to the field of engineering. However, since the focus of this study was in the field of engineering, the investigation into the social sciences was limited and the exaptation contribution cannot be claimed.

Therefore, the primary contribution of this study is classified as an “improvement” — a new solution to a known problem in the field of Engineering.

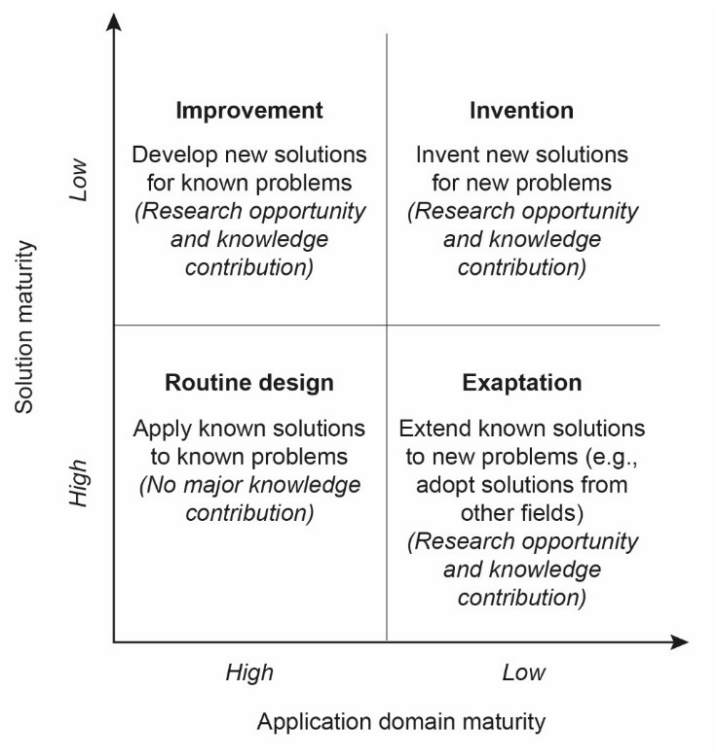

Figure 34: Design science research contribution framework (Gregor and Hevner, 2013)

Furthermore, this study contributes to the industrial engineering literature, to organisations and the individuals in the organisation, as explained below.

12.3.1 Contribution to industrial engineering literature

This study contributes to the literature by providing the following:

- An RFP framework, explaining the true, original meaning of *Respect for People*
- A thematic map of the Japanese and South African RFP principles
- The design requirements for a people-centred lean implementation model
- The Respect for People model for lean implementation

12.3.2 Contribution to organisations

The RFP lean implementation model gives a practical indication of how to include people during the lean implementation process to achieve continuous improvement of processes. The proposed implementation framework also suggests how to practically demonstrate Respect for People during lean implementation by helping organisations to have a more balanced focus between the lean tools and techniques, and the human side of lean management.

Successful lean implementation depends on a supportive organisational culture due to psychological factors such as fear of failure, breaking with routines, lack of confidence, fear of change, fear of job loss and the fear of receiving more responsibilities (Ramadas and Satish, 2018). The RFP lean implementation model suggests a means of creating such a culture by involving all employees in the organisation (not just senior management). It gives employees the opportunity to provide improvement suggestions for the work that they do every day. The RFP model can therefore, assist managers with providing the necessary psychological support during the change management process of lean implementation.

12.3.3 Contribution to individuals

Since most employees experience negative emotions such as shock, fear, anxiety and depression during an organisational change, they become resistant to continuous improvement processes, such as lean manufacturing. If organisations follow the suggested lean implementation model, employees will have a less negative and stressful experience of organisational change. Furthermore, problem-solving skills that are taught at work during the lean implementation, can be used to improve the employee's home and/or community, thereby addressing broader social issues.

12.4 Limitation and recommendations for future research

The study provided a lean implementation model with 15 RFP themes that should be addressed during lean implementation. The PDSA steps were applied to each of the RFP themes. However, more detail is required on *how* to execute each of the PDSA steps. For example, more detail is required on exactly how to *measure, plan*, do and *study* motivation, training, communication, teamwork, employee relationships and aligned commitment.

The RFP framework refers to people who are "team-minded, competent, motivated, willing and able to identify and solve problems". Further research is required on how to develop and measure these qualities in an individual in the problem-solving environment.

For the purposes of this study, the initial version of Deming's PDSA method was utilised and the measure phase was added. However, other scholars after Deming also adapted the method by adding and renaming phases. Further investigation into these changes could perhaps add value to the RFP model.

In order to address the research problem, the eADR method within the DSR paradigm was followed. The research continuum was entered at the first *(problem diagnosing)* stage and four iterative *concept design* stages were followed. This created the opportunity for future research to focus on the *build* and *implement* stages of the eADR method, in other words to implement and test the model in a real-world situation.

Management buy-in was assumed to be in place during the model design process. During the Delphi feedback, this was raised as a concern. Future research should therefore investigate how to increase the buy-in from management prior to implementing the RFP model. During the Delphi process, participants used the qualitative feedback option to provide suggestions to further improve the model:

- *The impact of technology is largely ignored* (Participant 02–18).
- *I would include a service element or services processes with the product value stream* (Participant 03–22).
- *Just as the establishment of respect for people are vitality important, as the RFP framework and model argues, so is the establishment of the lean value stream. More detail is required in this regard* (Participant 04–24).

In addition, some of the Delphi participants believed that shop floor workers (literate and illiterate) would not be able to understand the model. Future research could therefore focus on how to make the model (or aspects thereof) more understandable for shop floor workers.

As explained in Chapter 1, this study was conducted in the field or *industrial engineering*, with a focus on *human factors engineering* and *management systems*, which is supported by knowledge areas of *psychology* and *organisational behaviour*. Future research can further explore the knowledge areas or psychology and organisational behaviour in order to address the psychological impact of change. Studies can for example include an investigation into how to utilise emotional intelligence and participative management during organisational changes. Future research should investigate how to include the human resources (HR) department in implementing the RFP model. Lean principles should be included in the HR department from the recruitment phase and through every PDSA cycle of the RFP model.

12.5 Concluding remarks

The benefit of the lean philosophy cannot be achieved by merely implementing a selection of lean tools and techniques. A comprehensive, all-inclusive approach is required with buy-in and cooperation at all levels of the organisation. Leadership buy-in is required to provide direction and enablement of the employees. Employee buy-in is required so that they can provide valuable input based on their daily tasks. Only by valuing employees' knowledge, experience and insight, and developing their skills, can effective and sustainable lean implementation be realised.

An improved people value stream will naturally lead to an improved product value stream.

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APPENDIX A

DELPHI QUESTIONNAIRE

Respect for People model

Thank you very much for taking the time to complete this questionnaire

The questionnaire forms part of the research dissertation: Development of the Respect for People model for lean implementation in the South African context. (Ethics clearance no: NWU- HS-2017-0094)

The purpose of this questionnaire is to determine the validity of the above mentioned research as well as the Respect for People (RFP) model

Please provide the followings details. However, please note that all information will be kept confidential and will not be shared. It is only for record-keeping purposes.

* Required

1. **Email address** *

2. **Name and surname** *

3. **How many years of experience do you have on lean implementation** *
   Mark only one oval.
   - 0-3
   - 4-6
   - 7-10
   - 11-15
   - 16-20
   - 21 +

1. This section relates to the RESEARCH PROBLEM addressed by this study

The research problem is stated as the low lean implementation success rate in South Africa. Firstly, due to the intense focus on tools and techniques at the expense of the human element and secondly, due to the differences in national cultures between South Africa and Japan.

4. **The research problem:** *
   Mark only one oval per row.

	Strongly disagree	Disagree	I don't know	Agree	Strongly agree
Lean implementation has a low success rate in South Africa					

5. **If you agreed with the previous statement, please answer the following two questions before continuing**
Mark only one oval per row.

	Strongly disagree	Disagree	I don't know	Agree	Strongly agree
Lean implementation has a low success rate due to the intense focus on tools and techniques at the expense of the human element					
Lean implementation has a low success rate in South Africa because of the cultural differences between South Africa (Western country) and Japan (Eastern Country) where the lean philosophy and principles were developed.					

6. **Comments (optional)**

2. This section relates to the STRUCTURE of the RFP model

Please answer the following questions:

7. *
Mark only one oval per row.

	Strongly disagree	Disagree	I don't know	Agree	Strongly agree
The model is simple in structure					
The different elements of the model form a unity					
The model follows an all-inclusive approach towards lean					

8. **Comments (optional)**

3. This section relates to the USABILITY of the RFP model:

9. **Employees at the following levels of the organisation, will be able to understand and use the model to take part in a lean implementation** *

Mark only one oval per row.

	Strongly disagree	Disagree	I don't know	Agree	Strongly agree
Executive level					
Senior management					
Middle management					
Shop floor worker – literate					
Shop floor worker – illiterate					

10. **Comments (optional)**

11. **Please answer the following questions:** *

Mark only one oval per row.

	Strongly disagree	Disagree	I don't know	Agree	Strongly agree
The implementation sequence is logical, systematical and easy to understand.					
The RFP model represents a roadmap and a planning tool for lean implementation.					

12. **Comments (optional)**

4. This section relates to the EFFECTIVENESS of the RFP model:

13. **Please answer the following questions:** *

Mark only one oval per row.

	Strongly disagree	Disagree	I don't know	Agree	Strongly agree
The RFP model includes a means of providing feedback on whether the desired outcomes have been achieved					

14. **Comments (optional)**

15. **The RFP model will address the following barriers to lean implementation :** *
Mark only one oval per row.

	Strongly disagree	Disagree	I don't know	Agree	Strongly agree
Insufficient commitment from management					
Lack of coaching					
Lack of communication					
Lack of support from management					
Employees do not feel valued even though they are the ones who are in the best position to offer suggestions for improving the efficiency of the processes					
Lack of training and development support					
Scepticism about being adequately rewarded					
Lack of job security					
Resistance to change					
Lack of buy-in					
Lack of management commitment					
Lack of a coherent lean implementation plan					
Lack of an effective feedback mechanism to monitor progress towards the lean goal					

16. **Comments (optional)**

5. This section relates to the COMPLETENESS of the RFP model:

17. **The RFP model includes the following required lean implementation principles:** *
Mark only one oval per row.

	Strongly disagree	Disagree	I don't know	Agree	Strongly agree
Respect for people					
Continuous improvement					
People are challenged					
Genchi Genbutsu ("Go and see" in order to solve the problem)					
Teamwork					
Reduction of waste					

18. **Comments (optional)**

6. This section relates to the APPLICABILITY of the RFP model to the South African context

19. **Can you think of any industry (e.g. automotive, health care, aviation, service delivery) in which this lean implementation model would NOT be applicable?** *
Mark only one oval.

- No
- Yes

20. **If you answered yes in the previous question, please elaborate:**

7. This section relates to the VALIDITY of the RFP model

(For the purposes of this questionnaire, VALIDATION refers to the question, whether the proposed solution solves the problem)

21. **The RFP model** *

Mark only one oval per row.

	Strongly disagree	Disagree	I don't know	Agree	Strongly agree
To the best of your knowledge would you, consider the construction and integration of the RFP model for lean implementation an original design (as opposed to just a duplication of other previous work)? If you disagree, please elaborate in the comments below					
The RFP model could increase the success rate of lean implementation in South Africa?					

22. **Comments (optional)**

8. Closure

Once again, thank you for taking the time to complete this questionnaire, your input is greatly valued.

23. **Would you be available for follow-up questions relating to this questionnaire?** *

Check all that apply.

- [ ] No
- [ ] Yes, via email
- [ ] Yes via telephone (please provide your contact number in the comment section below)

24. **Comments (optional)**

25. **Would you like to receive a copy of the final dissertation (via email)?** *

Check all that apply.

- [ ] Yes
- [ ] No

26. **Comments (optional)**

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APPENDIX B

PARTICIPANTS' FEEDBACK – QUANTITATIVE

Questions				Participants' responses																			Average per question	Average per Section
				01-03	01-05	01-06	01-07	01-08	01-10	01-11	01-12	02-15	02-16	02-18	02-20	03-21	03-22	04-23	04-24	04-25	04-26	04-27	04-28		
1. Research Problem	a	[Lean implementation has a low success rate in South African]		5	4	4	3	4	4	4	4	2	3	4	4	4	5	4	4	5	4	4	4	3.95	3.91
	b	[Lean implementation has a low success rate due to the intense focus on tools and techniques at the expense of the human element]		4	5	4		4	4	4	4	3		4	4	4	4	4	4	4	3	5	4	4.00	
	c	the cultural differences between South Africa (Western country) and Japan (Eastern Country) where the lean philosophy and principles were		5	5	2		4	4	2	4	4		2	4	3	3	4	4	5	3	5	5	3.78	
2. Structure	a	[The model is simple in structure]		4	4	4	1	4	3	4	4	4	4	4	5	4	4	4	4	4		4	4	3.84	3.91
	b	[The different elements of the model form a complete model]		4	3	3	5	4	4	2	4	5	4	4	5	4	5	4	4	4	4	4	4	4.00	
	c	[The model follows an all-inclusive approach towards lean]		5	4	4	4	4	4	1	4	5		3	5	4	4	4	3	4	4	4	4	3.89	
3. Useability	a	Employees at the following levels of the organisation, will be able to understand and use the model to take part in a lean implementation	[Executive level]	5	5	4	5	5	4	3	4	5	5	4	5	4	5	3	5	5	4	4	5	4.15	4.15
			[Senior management]	5	5	4	5	5	4	3	4	5	4	4	5	4	5	4	5	5	4	4	5		
			[Middle management]	4	4	4	5	5	4	3	4	5	3	3	5	4	4	5	5	5	4	4	5		
			[Shop floor worker – literate]	4	4	4	1	4	4	3	4	5	4	3	4	4	2	3	4	4	2	4	2		
	b	[The implementation sequence is logical, systematical and easy to understand.]		4	4	4	5	5	4	4	4	5	4	4	4	3	5	3	5	4	4	4	4	3.95	
	c	[The RFP model represents a roadmap and a planning tool for lean implementation.]		4	4	4	4	4	4	4	4	5	4	4	4	4	5	4	4	4	4	5	4	3.95	
4. Effectiveness	a	[The RFP model includes a means of providing feedback on whether the desired outcomes are being achieved]		5	4	4	5	4	4	3	4	5	3	3	4	3	5	4	4	4	4	4	4	3.95	3.90
	b	The RFP model will address the following barriers to lean implementation :	[Insufficient commitment from management]	5	3	3	5	3	2	3	4	4	4	4	4	3	4	2	3	4	4	4	4	3.89	
			[Lack of coaching]	4	4	4	2	4	2	3	4	5	4	5	4	3	4	3	4	3	4	4	4		
			[Lack of communication]	4	5	4	2	4	4	3	4	5	4	5	4	3	4	3	3	4	4	4	4		
			[Lack of support from management]	4	3	4	2	3	2	3	4	5	4	4	4	4	2	3	4	4	4	4	4		
			[Employees do not feel valued although they are the ones who are in the best position to offer suggestions for improving the efficiency of the processes]	5	5	4	5	4	4	3	4	5	4	5	5	4	4	4	5	4	5	4	5		
			[Lack of training and development support]	4	4	4	5	4	4	3	4	5	2	4	4	4	4	3	3	4	5	4	4		
			[Skepticism about being adequately rewarded]	2	4	4	2	4	4	3	4	5	2	3	5	3	4	3	3	3	3	4	3		
			[Lack of job security]	2	3	3	5	4	4	3	4	5	2	3	5	3	4	2	5	4	3	4	3		
			[Resistance to change]	4	4	4	2	4	4	3	4	5	3	4	5	4	4	3	5	4	4	4	4		
			[Lack of buy-in]	4	4	4	5	4	4	3	4	5	4	4	5	4	4	4	4	4	3	4	5		
			[Lack of a coherent lean implementation plan]	5	5	4	5	4	4	3	4	5	5	4	5	4	5	4	5	5	5	4	4		
			[Lack of an effective feedback mechanism to monitor progress towards the lean goal]	2	5	4	5	4	4	3	4	5	5	4	5	4	5	4	5	4	5	4	4		
5.Completeness	a	The RFP model includes the following required lean implementation principles:	[Respect for people]	5	5	4	5	5	4	4	4	5	4	5	5	5	5	4	5	5	5	4	4	4.40	4.40
			[Continuous improvement]	5	5	4	5	5	4	4	4	5	5	5	5	5	5	4	5	5	5	4	4		
			[People are challenged]	5	4	3	5	4	4	4	4	5	5	5	4	3	5	4	5	5	4	4	4		
			[Genchi Genbutsu ("Go and see" in order to solve the problem)]	5	4	4	1	4	4	4	4	5	5	5	5	4	4	3	5	5	4	4	5		
			[Teamwork]	5	4	4	5	5	4	4	4	5	4	5	5	4	5	4	5	5	5	4	4		
			[Reduction of waste]	5	4	4	5	4	4	4	4	5	3	4	5	4	4	3	5	5	3	4	4		
6. Applicabilty	a	Can you think of any industry (e.g. automotive, health care, aviation, service delivery) for which this lean implementation model would NOT be applicable?		5	5	5	5	5	5	5	5	5	5	5	5	5	1	5	5	5	5	5	5	4.80	4.80
7.Validity	a	[To the best of your knowledge, would you, consider the construction and integration of the RFP model for lean implementation an original design (as opposed to just a duplication of other previous work)? If you disagree, please elaborate in the comments below]		4	4	4	5	3	3	3	4	5	4	4	4	4	4	4	4	4	4	5	4	4.00	4.00
	b	[The RFP model could increase the success rate of lean implementation in South Africa?]		4	4	4	5	2	3	3	4	5	4	3	5	4	4	3	5	5	4	5	4	4.00	

APPENDIX C

PARTICIPANTS' FEEDBACK – QUALITATIVE

	1. Research problem
01-06	I was invited to see a Company in Ireland, in March, who is doing Shingo, an insightful experience. What I learnt then and experiencing in our company going the TPS route (adapted to Heraeus and called the Heraeus Production System) I hold the view that cultural differences between east and west does not influence your ability to successfully implement such principles. The key remains to make the transition to a behaviour based approach to the implementation of lean, I believe Heraeus is successful in doing this regardless of the cultural difference between us and the Japanese. Please be reminded that the Japanese systems were originally influenced by the west in the form of the Quality gurus like Juran and Deming.
01-07	Ek het die vraag gelees en verstaan in die konteks van die inleiding tot die afdeling(different cultures and focus on manpower/facclities)hoop ek he reg onthou. Vir my faal lean implementation nie as gevolg van bg nie(baie ou plants met baie ou equipt in Japan).Dit help dat Japanese verskillend dink as ons,maar nie n decisive factor nie). Dit faal absoluut net as gevolg van bestuur wat dit nie reg aanpak nie.Capsule formulation). Ek het ook vir jou gese dink regering,besigheid ,unie en werkers dieselfde. Laat weet as ek nie duidelik is of jy nie saamstem nie.
01-08	Western culture is very different to Eastern culture. Eastern cultures respect and apply systems and rules, not so in western cultures. Yes. I have been on business to Japan and Thailand and spent 3 weeks visiting in China. The people are hardworking and abide by the rules. In the factories there is a work ethic, no talking or walking around. Everyone has a function and they do it. I experienced a similar work ethic in China. I'm not saying that lean cannot be implemented in South Africa, just that it is not a concept that we are used to so we first have to instil basic disciplines like 5s. I have also experienced a lack of interest (knowledge) to recognise and identify things that are abnormal (wrong, breaking) and to report them or to make suggestions and improvements. These initiatives have to be constantly spoken about or "policed". Once again the Japanese spend a long time planning and scrutinising a concept before acting and implementing. They tend to have Engineers specialised in certain areas who spend time on specific implementations. My experience in South Africa is that Engineers are multi tasked and do not afford the time it takes to fully implement initiatives e.g. to do in depth root cause analysis. This is partly due to them being stretched and not having time, but also because it is not a company culture driven from the top. There is a difference in saying we must do something and management actually making the resources and time available. It will also be a mind-set change to include the workforce in problem solving.

01-11	Lean Management has been implemented successfully all over the world in many different cultures for many years which proves that it can be done anywhere. After the 2nd world war when Toyota implemented TPS the economy was in dire straits and labour relations were poor. LM fails to be sustained for other reasons.
02-15	It actually falls in line with ubunthu and working together for a common goal. I think in some company's it works, but through driving of the senior management. With my limited knowledge I think it should work. I think implementing is easy but sustaining a lot more difficult… There I think cultural differences have for sure a role to play. The drive for excellence in Japan is not in South Africa, unless it is driven by leadership
02-16	We have always been engaged in "LEAN" even though it might not have been termed as such. We also have had personnel trained at [Company] (Sweden), [Company] (France) and others. In the few cases where there was resistance the actions of retrenchment entrenched the belief that the company is out to make more profit at the expense of employment - the employees have not been entirely incorrect. [Organisation] reduced staff from 30,000 in 1995 to 6,000 in diagree018. Yet I believe LEAN has had a measure of success - hence my "disgreement" above. Ek wil dit eerder stel as "gemengde suksesse". Daar was suksesse en falings by [Organisation] (wat my antwoord van disagree merendeels was). Oor die hele RSA het ek ook 'n groot sukses by die [Company] Aanleg in Rosslyn gesien. Ek sal nie kan uitspraak lewer aangaande die hoevelheid (dikwels of seldsaam) oor die hele RSA – dit sal mees waarskynlik uit jou eie navorsing kom.
02-18	The cultural difference impact is much smaller that generally accepted

03-21	I also believe that Lean is often not properly understood and "implemented" in a way that misunderstands the underlying Lean philosophy. Tools like 5S are often implemented quickly without a proper understanding of their purpose. I believe that one of the reasons that Lean fails is because it is implemented as a short term cost cutting measure, certainly not appreciating the importance of the people factors. Lean is often stated as not being successful although it was not really Lean that was implemented at all but one or tools in isolation. Honestly, I think that it is because although I have heard many people use this as a reason before, I have never seen any evidence whatsoever to support it. I have always felt that it is one of those excuses that people use when they don't really understand why something isn't working. I think that the other reason is that I have seen Lean working extremely well in South African companies with South African employees which has always made me doubt this claim. I have also seen Lean fail (probably in many more cases) but I think that the reasons are complex. I do believe that you are right about the people element being missing in most of these scenarios though. But, in truth, I know very little about Japanese culture beyond what you read about in books about Toyota so it is difficult for me to be sure that there are differences in our culture that could be the cause for Lean failure.
03-22	Lean deployment is often not sustained due to lack of buy-in from executive management. This factor would rank higher for me that the cultural difference between SA and Japan
04-23	Of course cultural differences pla a role - there is no doubt about this, but in general, i have seen tremendous lean work in SA and largely that was where rather than transplanting Japanese culture, the focus is on the underlying philosophies, and then adaptng behaviours to culturally resonate with SA staff. This is probably true globally
04-26	The problem is in the lack of top management involvement, poor knowledge base and aloof style of leadership; not necessarily because of ordinary cultural differences. The SA brand of "management culture" (i.e. the Western style of management cultivated by Business Schools) is obviously different and there is the real issue; not the national culture as such. I am not sure whether tools and techniques are overly emphasised at all; in many cases the tools and techniques are not understood or applied in the correct manner due to a lack of training; in many cases they are not applied at all. Results from techniques are motivating and empowering, not demotivating. I do agree that the people factor plays a role.

04-28	I would also like to add that from my experience, the South African workforce is more reluctant to share ideas because of the historical management practices of encouraging "doing" and leaving the "thinking" to the managers.

	2. Structure
01-07	Workers are the backbone of this and issues status regarding implementation must be shared company wide with groups continuously did not see that clearly
01-11	Respect for People is a (very) necessary, but not sufficient condition, for successful implementation. A number of other key practices, basic thinking and deployment pathway (aka transformation journey) are required to make up a complete Lean Management System.
02-16	What is lacking perhaps is to accommodate the inevitable staff reduction. The salary bill must be reduced as it is the biggest cost item and there is seldom new work in the pipeline to boost sales. A block that speaks to "what after LEAN" might be a helpful addition.
02-18	The overall model is simple and good. The detail part is complex. Correct - but impact of technological change is largely ignored - this applies to questions b and c
03-21	I really like the RFP model - I think that is relevant and very useful. I found the breakdown of the elements in the implementation a little difficult to follow. It seems logical but the choice of elements and the sequencing as well as the classification in the MPDSA blocks was a little unclear.
03-22	I would include a services element or services processes with the product value stream. Production companies also have various services that they need to provide. This is a critical element to understand for lean deployment to be succesful
04-23	Although I agree with the statement that your model is complete and all inclusive, careful of emphasising this - because Lean is all about continuous improvement and experimentation. So even if this becomes the current complete and inclusive solution, it will evolve with time -and should.

04-24	I partially agree that the model follows an all-inclusive approach towards lean, because it does state the elements necessary for effective lean implementation, however, I do not believe that this model should be used in isolation. In phase 3, step 10 (production level) of the model, it is stated that techniques such as JIT etc. could be implemented. Here I believe there is more to it than implementing tools and techniques in isolation. Just as the establishment of respect for people are vitally important, as the RFP framework and model argues, so is the establishment of the lean value stream. To establish a value stream you need to start with a basis of standardisation (if processes are not standardised, improvements will be unquantifiable). You then need to identify the value stream (all value adding and non-value adding process steps), then create flow, then allow the customer to pull the production process and lastly, you will aim for product perfection (quality). All this is done keeping in mind the specified value of the product or service.
04-26	The model introduces a valuable and innovative framework; it cannot be seen as simple though. It is fairly complex in nature due to the endeavour to integrate so many aspects of continuous improvement, life cycle concept and lean management systems. It is fairly complete in the sense that it indicates the overall impact of considerations for people and the involvement of people. Lean philosophy is included effectively, and this is a novel approach.

	3. Usability	
01-07	implementation is very complex due to various issues for instance what tool will be used(selected) to understand the challenges facing the functional group?benchmarking? P&L?	
01-11	I'm neutral rather than "don't know" about the model's usability. It offers a simple pathway, but will the people, especially leadership, understand how to address the challenges that inevitably will arise during deployment?	I agree that the model is a simple roadmap for implementation. However, it is not clear to me how it will address the unpredictable, situational obstacles that arise when you try to transform complex, adaptive organisational systems.
02-15	Good model	
02-16	In the aircraft industry the shop floor follows instructions and procedures. It is at Middle Management level that the most training will be required to successfully implement the model.	
02-18	Difficult to answer - the overall model is good and easy to understand at all levels The detail implementation - PDSAM cycle is difficult to grasp and implement	
03-21	Again, I just found that the reasoning behind the sequencing and choice of elements in the implementation model was missing.	

04-23	I think the mental recallibration to see how these people would be able to understand and use the model is difficult. Although I can say that it should be easily understood by all categories, the nuance of the agency might be lost throughout, executive leadership the questions would be more aimed at buy in and enthusiasm and due to their distance to operations might not be able to make valuable use of the model, even if they understood it. the most direct contact to operational staff might understand the model most precisely, however the question remains whether the value would be apparanet to such supervisory roles	I always think linear implementations are potentially problematic - in other words the notion of a sequence. I agree, that the categories you present are all valid. I also think that the sequence is generically right. however based on site characteristics, don't you think sometimes moving away from a rigid sequence to a more need-determined action cloud might help? also, despite the "people before parts" mantra - which i completely buy into, some parallel development is probably necessary.
04-26	The model is an integrated overview requiring experience and a wide perspective on business processes. I am not even sure many executives will understand what the model is trying to say. It could possibly be simplified and explained in a different way. The PDSA cycle is a generic process for improvement of "anything"... I am not sure it is understood in this sense by everybody.	Definitely logical and systematic; but I diagree that is easy to understand. It could be used as a road map and planning tool, yes.

	4a. Effectiveness	
01-08	The start point is to get senior management and middle management to commit and drive the RFP model	
01-11	I might have missed it, but I did not see a governance structure for the deployment process	The road to hell is paved with good intentions. Even the most brilliantly conceived implementation plans run into unexpected problems that need a rapid system for resolution. Even committed leadership lose their way when confronted with the mental barriers rooted in their (unconscious?) mindsets. In well designed implementations it usually required an experienced external coach to help senior leadership to figure out the way through this problem.
02-16	It provides clearly for desired tangible outcomes - the outcome/effect on the personnel (after LEAN) is not directly measured (if I read the model correctly).	Skepticism stems from bitter experience by more that half the workforce in [Organisation].
03-21	This is an interesting question. It forms a good framework but I imagine that to actually give feedback on outcomes, more detail or guidelines would be needed for each element.	Whether it addresses the barriers or not is a question that is not easily answered but it is certainly thought provoking, provides a framework for discussion and an alternative means for approaching Lean which I think is very commendable and necessary in South Africa.
04-23	This question was difficult to answer. I truly believe that your model is excellent, and describes a pathway towards good lean practice. The model itself however I think is unlikely to have much impact without enculturation, lots of traiing, and essentially getting people across the organisation to embrace the pronciples you describe here. I think to assess the ability of your model to effect change is speculative, whilst the quality of the model as a descriptive tool is not in question.	

04-24	If I understood it correctly, the PDSA(M) model will provide the feedback loop for continuous improvement. This should become an iterative process that will continue until a new product is launched (as per product lifecycles), when this process will start from the beginning again. The nice thing about the RFP model is that you will not need to start from the beginning for phase 1 of the model, which focusses on people. When people are replaced and new people enter the organisation, they will form part of the PDSA(M) for phase 1.	
04-26	The PDSA cycle is supposed to deliver the feedback; therefore useful within the context, if it is diligently applied.	Some of these outcomes are dependent on many other factors; for example labour relations, unions, understanding of the PDSA approach, the need for continuous attention to relationships and operational issues, skills at supervisory level, leadership in improvement projects, mechanisms of decisionmaking, extent of the delegation of powers, and so on. The model on its own won't deliver management commitment... unless they are absolutely dedicated to make it work. The potential strong point of the model is its use as a framework for change management, for planning and the deliberate involvement of the work force by various methods and throughout the life cycle of the business.

	5. Completeness
01-11	Yes, the RFP model does include these practices, but see my earlier comments about what is not in the model.
02-16	The uncertainty on waste reduction stems from my experience that the company is not always in control of all factors - especially external ones. For example many components are "lost" in the logistics consignments in Africa and even Europe.
04-24	I agree that it includes the above mentioned lean implementation principles, however, I would not say that the above list is an exhaustive one that includes all the required/essential implementation principles.

04-26	It definitely reflects the lean philosophy, but as such LEAN is also a learning process with many detailed requirements. You are probably looking for a sweet blend of methods... moreover every organisation has restrictions and contingencies; and certainly a legacy of habits and policies. This has an important influence on the implementation of any improvement strategy.

	6a. Applicability
Can you think of any industry for which this lean implementation model would NOT be applicable? Please elaborate:	
01-11	In principle it is applicable in many sectors, but the language will need to be adapted to what is used in each sector and organisation
02-16	I'm hesitant about the delivery at municipal level - they are grossly overstaffed.
04-26	It is flexible enough; it is not yet a programme; every organisation will have to tailor this approach to its own requirements.

	7. Validity
01-08	Management will have to fully buy into the RFP model and drive it through the organisation for it to work.
01-11	Best to validate the model by trying to use it. Give it at least 3 and preferably 5 years before making a finding.
02-16	The originality is most specific in the systematic structure and focus on RFP.
02-18	As said - wonderful conceptually correct model. Detail implementation is however too complex
04-23	Ultimately, the successful implementation of Lean in SA is down to passionate leaders and engaged workforces. I believe that this model could be a tool in creating such people.

04-26	It is original in the sense of an integrated approach to improvement strategies and change management, although making use of existing methods such as PDSA or the Lean Philosophy. It is also innovative in the manner in which human factors and respect for people is deliberately and systematically realised.
04-28	Although I agree with the originality of the model, I do think that there are a few touch points with the Continuous Improvement Framework of 20 Keys.

	8. Closure	
01-07	The Topic was extremely well researched. I would like to see more regarding why Lean fails/takes long to implement, its Company culture change! to give groups some tools beforehand to deal with these as implementation starts. good job.	
01-08	In my experience, proper problem solving / improvement initiatives are not successful because they are long winded, time consuming and resource consuming. The model is great and detailed, however if management are not prepared to afford people the time required for training, fact finding and implementation, it will not work.	
01-11	A commendable effort! I hope my comments weren't too harsh, but it is based on my real experience. Let's talk...	Thanks for including me in the research.
02-16	How do you see/propose the roll-out in [Organisation] (once we recover our financial predicament)?	
02-18	Well done Rojanette, it is a good contribution to the low lean success rate problem. Worthwhile to build further onto the model.	I basically like what you are trying to do, Rojanette!
03-21	Good luck with writing up your results! And well done on getting so far.	
03-22	Excellent model well done!	

04-23	Good job Rojanette, you have done interesting work. I hope that you get good data and all the best for the last push.	
04-26	Any time yes. It was a challenge to answer some of these questions since there are so much involved, and many contingencies.	The complexity of human nature enters into the equation. The history of improvement strategies such as TQM and Lean and models for Excellence shows how difficult it is to find the final best-for-all model. There are no short cuts, no quick fixes, where organisational culture is concerned. As Dr William Edwards Deming reminded us: "Ignorance is a poor field to run on." And also: "There is no substitute for knowledge" This is the problem among the ranks of management in general.

APPENDIX D

ETHICAL APPROVAL

NORTH-WEST UNIVERSITY
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Institutional Research Ethics Regulatory Committee

Tel: +27 18 299 4849

Email : Ethics@nwu.ac.za

ETHICS APPROVAL CERTIFICATE OF STUDY

Based on approval by the **Engineering Research Ethics Committee (EngREC)** on **08/06/2017**, the North-West University Institutional Research Ethics Regulatory Committee (NWU-IRERC) hereby **approves** your study as indicated below. This implies that the NWU-IRERC grants its permission that, provided the special conditions specified below are met and pending any other authorisation that may be necessary, the study may be initiated, using the ethics number below.

Project title: Development of a lean implementation framework upheld by the "Respect for People" - pillar

Project Leader/Supervisor: Prof L van Dyk
Student: Rojanette Coetzee

Ethics number:

N	W	U	-	HS	-	2	0	1	7	-	0	0	9	4
Institution						Year					Project Number			

Application Type: Single Study

Commencement date: 2017-06-08 **Expiry date**: 2020-06-08 **Risk:** Low

Special conditions of the approval (if applicable):

- Translation of the informed consent document to the languages applicable to the study participants should be submitted to the EngREC (if applicable).
- Any research at governmental or private institutions, permission must still be obtained from relevant authorities and provided to the EngREC. Ethics approval is required BEFORE approval can be obtained from these authorities.

General conditions:

While this ethics approval is subject to all declarations, undertakings and agreements incorporated and signed in the application form, please note the following:

- *The project leader (principle investigator) must report in the prescribed format to the NWU-IRERC via EngREC:*
  - *annually (or as otherwise requested) on the progress of the study, and upon completion of the project*
  - *without any delay in case of any adverse event (or any matter that interrupts sound ethical principles) during the course of the project.*
  - *Annually a number of projects may be randomly selected for an external audit.*
- *The approval applies strictly to the proposal as stipulated in the application form. Would any changes to the proposal be deemed necessary during the course of the study, the study leader must apply for approval of these changes at the EngREC. Would there be deviated from the study proposal without the necessary approval of such changes, the ethics approval is immediately and automatically forfeited.*
- *The date of approval indicates the first date that the project may be started. Would the project have to continue after the expiry date, a new application must be made to the NWU-IRERC via EngREC and new approval received before or on the expiry date.*
- *In the interest of ethical responsibility the NWU-IRERC and EngREC retains the right to:*
  - *request access to any information or data at any time during the course or after completion of the study;*
  - *to ask further questions, seek additional information, require further modification or monitor the conduct of your research or the informed consent process.*
  - *withdraw or postpone approval if:*
    - *any unethical principles or practices of the project are revealed or suspected,*
    - *it becomes apparent that any relevant information was withheld from the EngREC or that information has been false or misrepresented,*
    - *the required annual report and reporting of adverse events was not done timely and accurately,*
    - *new institutional rules, national legislation or international conventions deem it necessary.*
- *EngREC can be contacted for further information or any report templates via Tania.Visser@nwu.ac.za or 018 285 2278.*

The IRERC would like to remain at your service as scientist and researcher, and wishes you well with your project. Please do not hesitate to contact the IRERC or EngREC for any further enquiries or requests for assistance.

Yours sincerely

Prof LA Du Plessis

Digitally signed by Prof LA Du Plessis
Date: 2017.06.23 09:04:40 +02'00'

Prof Linda du Plessis

Chair NWU Institutional Research Ethics Regulatory Committee (IRERC)