

“The Results of Flow Efficiency Methodology in a Labour-Intensive, South African Operation”

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Declaration

I declare that this research project is my own, unassisted work. The research project is being submitted as a due requirement to the University of the Witwatersrand, Johannesburg in partial fulfilment for the degree of Masters of Science in Engineering (Industrial) (50/50).

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This _____ day of _____ 2016

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“I can do all things through Christ who strengthens me.” - Phil 4:13 (NKJV)

“It always seems impossible until it’s done.” – Nelson Mandela

Abstract

The research project aimed at determining employees' experiences of the application of the flow efficiency methodology. The flow efficiency methodology was the selected management methodology from the broader scope of process-focused methodologies. The significance of the flow efficiency approach is that it's an alternative approach to the traditional management approach of optimising resource efficiency, but rather focuses on improving the flow of the process in which the resources work. The research was conducted in the context of the labour-intensive, South African manufacturing sector using a case study approach. The purpose of the research was to understand front-line employees' and supervisors' perceptions during the application of the flow efficiency approach. The assessed perceptions came from four selected change factors that stemmed from the Lean change iceberg model commonly found in literature. The motivation for research was two-fold: (1) prior research of the flow efficiency methodology in the socio-technical environment focused on operational improvement impact, and not on the impact on people; and (2), most research of improvement approaches and methods in South Africa tended to focus on success factors and pre-requisite maturity levels of various methods. The chosen flow efficiency approach required no pre-requisite culture requirements. The researcher was of the view that gaining an insight (through a case study) into employees' perceptions of change factors during a flow efficiency approach, could lead to benefits of development and empowerment of employees and management in the labour-intensive, manufacturing sector of South Africa.

The case study selected was a flow efficiency-based, improvement initiative in a multinational dairy plant in South Africa. The researcher used an unstructured, group-administered questionnaire to assess operational and supervisory employees' perceptions of the selected change factors after process changes were made in the process where they work. The four selected process-improvement change factors derived from the Lean change iceberg were: *Leadership Behaviour*; *Social System Change*; *Effectiveness of Change*; and *Employee Involvement & Empowerment*. Content validity was conducted with external and internal experts to refine the questions and sequence of the questionnaire. A trained research assistant facilitated the multiple questionnaire sessions. Thematic content analysis was used to categorise participant's responses into themes and sub-themes for each question. The occurrence of themes and sub-themes per question was tallied up and discussed for operational and supervisory employees with respect to the research objectives.

The research did not yield a broad-based view on the impact of the flow efficiency management approach on employees' perceptions in the greater industry context. However, it did give an *insight*, through the case study, into some universally applicable perceptions of changes experienced by South African, front-line and supervisory employees when the flow efficiency management approach was used. Perceptions of: leadership commitment and coaching, improved teamwork, simplification of jobs, improved flow, and improvements in individual performance, and employee empowerment were prevalent perceptions felt by most employees at both levels.

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1. INTRODUCTION

1.1 Research Motivation

Bicheno & Holweg (2009) highlight that most manufacturing and service operations are 'socio-technical' systems where human beings and equipment must work in harmony to achieve a desired outcome. Aligning this socio-technical system is the challenge when it comes to implementing change and improvement (Modig & Ahlstrom, 2012).

With respect to which aspect of the socio-technical system to focus on to improve business performance, Modig & Ahlstrom (2012) argue that management should primarily focus on improving processes before attempting to exhaust the maximum efforts of their human resources in an unchanged process. In other words, management should de-prioritise the 'traditional' management approach that strives to make employees work harder or attempt to reduce the number of workers to optimise cost. The traditional management approach only yields so-called 'resource efficiency' (Modig & Ahlstrom, 2012). Instead, managers should rather focus primarily on improving the process through which the product flows in the organisation, to improve 'flow efficiency' (Modig & Ahlstrom, 2012). This approach argued by Modig & Ahlstrom (2012) doesn't imply that involving and engaging people isn't important; it merely directs the *primary* focus of management from optimising their resources to improvement of the actual processes with which the people work. In application of the flow efficiency approach, managers should involve their employees to achieve process and business improvements.

In the South African context, Goddard & Melville (2007) highlight that in the science and technology policy of South Africa's Reconstruction and Development Programme (RDP), some of the relevant issues needing further research are: (1) the need for providing jobs and dealing with unemployment; (2) managing and developing human resources; and (3) the need to build the economy. For these reasons, there appears to be a need to balance the flow efficiency approach with the management and development of the people who work in the labour-intensive, South African context.

By understanding how workers in a labour-intensive, South African context experience a process-focused approach, such as the flow efficiency approach, it can be established if this approach helps develop the human resources at the heart of the socio-technical environment. This is in context of the need for business improvement in the labour-intensive sector that has the potential to drive economic growth and employment in the face of globalisation.

1.2 Research Background

Modig & Ahlstrom (2012) argue that the use of flow efficiency methodology is a paradigm shift for managers. In other words, managers would need to move away from optimising the use of resources to optimising the process with which those resources operate. The researcher notes that Modig & Ahlstrom (2012) base their studies on flow efficiency methodology in the

contexts of first world economies such as Japan, Europe and the USA. Despite the focus and confidence of the approach, the researcher believes that managers in the labour-intensive, South African operations context would have to consider how a process-focused approach, such as the flow efficiency approach, impacts the people who operate and supervise the process. If the labour operating a given process decides not to support a process improvement, they have direct control over the process to purposely sabotage the improvement if they decide to do so (Bicheno & Holweg, 2009). As Bicheno & Holweg (2009) describe in the socio-technical system, the relationship between labour and processes is inseparable. This statement would surely apply to the labour-intensive, South African context.

1.3 Purpose of the Research

The purpose of this research is to understand the perceptions of employees who are directly affected by changes related to a process-focused management approach. The flow efficiency methodology is the process-focused approach selected for this research.

1.4 Research Context

This section firstly gives an overview of the recent performance of the manufacturing sector in the economy, and the impact this performance has on the levels of employment in South Africa. Secondly, this section discusses the issue of globalisation in the labour-intensive, South African context. Lastly, this section gives an overview of the characteristics of labour and its history in South Africa. This research context draws the link between understanding the experience of labour in a flow efficiency approach and why it could support the need for a new way of managing in the labour-intensive, South African manufacturing sector.

1.4.1 Manufacturing in the South African Economy

The context of this research project starts at an economic level, where the South African economy is experiencing low year-on-year Gross Domestic Product (GDP) growth of 1.2% in Quarter 2 and 1.3% in Quarter 1 of 2015 (Statistics South Africa, 2015). In Quarter 1 of 2015, the manufacturing sector contributed only 13% to GDP and declined 2.4% on a quarter-by-quarter basis (Statistics South Africa, 2015). South Africa's trade deficit (where imports surpass exports) in August 2015 was R9.95 billion (Trading Economics, 2015). In addition, in Quarter 2 of 2015, unemployment in South Africa was relatively high at 25% (Statistics South Africa, 2015). Bhorat, et al. (2002) states that given the size and scale of poverty and inequality, together with labour market challenges facing South Africa, it was clear that even at the time of publication in 2002, domestic economic performance had not been sufficient to begin to alleviate these challenges. Nordas (1995) found that if labour-intensive, South African industries increase in competitiveness, it would yield total employment increase in the whole South African economy.

1.4.2 Globalisation Impact on South Africa

Kruger (2008) discusses how globalisation required businesses in South Africa to become more competitive through the elimination of waste, cost reduction, and improvement in general business processes. In the South African tea industry, Bokwe (2006) describes the need for dramatic changes to the South African business environment from being inward-looking, to a being globally competitive in an open economy. Bokwe (2006) identifies the need for businesses that are faced with this challenge to optimise their operations to compete in the new, global market conditions.

The impact of globalisation has various implications for the South African manufacturing sector. Kanakana (2012) found that globalisation has opened up international markets for South African companies, but has also introduced competition in the domestic market. Kanakana (2012) suggests the need for improvement in efficiency levels in order to maintain competitiveness locally, and in the global market. Naidoo (2012) adds the mining industry into the same context by stating that in the global business environment, South African companies need to improve productivity, reduce costs and enhance customer service. Manchinini (2011) emphasises the need for customer-focused, value creation to remain competitive in a global market. They found that globalisation of markets has brought about enormous challenges and opportunities for business organisations.

1.4.3 Labour in South African Manufacturing and Operations

Nordas (1995) splits the South African manufacturing sector into five ‘orientations’: Resource Intensive, Labour Intensive, Specialized Supplier, Scale Intensive, and Science Intensive. Nordas (1995) associates labour-intensive industries as ones that have ‘low technology’. Some of the challenges in the labour-intensive, South African industry include high unit labour costs (Nordas, 1995), and trade liberalization which has had adverse effects on employment (Bhorat, et al., 2002). In addition, South Africa was found to have insufficient supply of appropriate human capital to take advantage of better market access in high technology industries (Nordas, 1995).

According to Masuku (2008) the labour market is a particularly unique one in South Africa due to the history of the country. She found that South Africa has a shortage of skilled workers, and an oversupply of unskilled workers that result in bottlenecks in the labour market from the legacy of apartheid. Although the data is 14 years old, she quantified the imbalance between skilled and unskilled labour with 10.2% of the manufacturing labour force being classified as ‘highly skilled’. Despite this imbalance of skilled labour, Masuku (2008) highlights the evolution of the South African manufacturing sector, changing from its past to a new reality in the future. She found that the South African manufacturing sector is characterised by structural changes that are shifting from labour-intensive, low-technology and resource-based industries, to medium and high-technology and sales-based industries. Bokwe (2006) highlights the need for the South African manufacturing sector to change its strategies to cope with globalisation. Bokwe (2006) gives an example of the South African

tea industry which collapsed due to incapable management teams not having flexibility on their strategies.

Danso (2009) found that the ability of the South African economy to absorb labour has declined since the 1960's. They found the manufacturing sector specifically experienced employment decline since 1990, but output from the sector has increased. He attributes this to the implementation of technology in manufacturing processes that led to a loss of jobs, particularly for unskilled labour. Nordas (1995) found that if productivity can be increased in labour-intensive, South African industries, there could be growth through more competitive access to broader markets. Nordas (1995) found that a spin-off would therefore be an increase in employment in the manufacturing sector in South Africa.

1.4.4 Consolidating the Research Context

It is clear from the discussion above that there are major challenges in the South African economy and its large, unskilled labour force. The reality of globalisation has been found to present major opportunities for South African manufacturers, if they improve productivity and efficiencies to meet international requirements. If not, globalisation has been found to threaten industries' existence if they are not willing to change the way they operate. This context aligns to the three, highlighted research needs stipulated by the RDP as discussed in chapter 1.1. As discussed, it was found that there is need for a new management approach to meet the context challenges. There is also an important need to better understand how the labour force experiences a new approach in order to better develop them and managers.

1.5 Problem Statement

There are two parts contributing to the research problem at hand. The first is the lack of information given by Modig & Ahlstrom (2012) on the experience of workers to a management approach using the flow efficiency methodology. The second part is that focus tends to be on the success factors and culture requirements for implementations of a process-focused approach in the given context rather than on workers experiences or perceptions of this approach. This opens up a potential opportunity for exploratory research that could help managers understand the approach's impact from a different perspective, i.e. what workers really think of a process-focused management approach.

The problem statement for this research is therefore:

'There is an opportunity to understand the experience of workers and supervisors during a process-focused approach in the labour-intensive, South African manufacturing industry.'

1.6 Research Question

The two parts contributing to the problem statement leads to the following research question:

'What is the employees' experience of a process-focused improvement initiative?'

As previously stated, the flow efficiency methodology is the selected approach for this research within the category of a process-focused management approach. The researcher felt it necessary to use a case study where an initiative took place using this approach. Details of the case study will be discussed in chapter 4 of this report.

1.7 Research Objectives

The following research objectives were chosen to elaborate on the research question and direct the research towards results that can have useful discussion and add value to decision makers in the labour-intensive, South African sector:

- 1) To determine the key change factors affecting employees directly involved in a process-focused improvement initiative.*
- 2) To determine the perceptions of operational and supervisory employees of the changes they experienced during a process-focused improvement initiative.*
- 3) To determine if the employees experienced any benefits for themselves and for the organisation.*
- 4) To determine the differences in perceptions between operational and supervisory employees.*

1.8 Research Scope

The use of a case study was intended by the researcher to give an *insight* into the results from the set objectives in 1.7 to the introductory sections of 1.1 to 1.4. The researcher felt it necessary to keep sections 1.1 to 1.4 high level in order to ensure enough understanding into why the research was necessary; and lay a foundation for broader research on the topic across industries and companies in the future. However, the scope of this research focused on the operational and supervisory workers in the case study plant. Further focus was on the workers in the specific area of the case study plant directly affected by the changes due to the process-focused improvement initiative. Managers and support staff were excluded from the research as the researcher felt the need to obtain qualitative data from the employees who are impacted most by a different management approach. The research doesn't include similar employees from other plants or industries due to time and budget constraints. However, the researcher believes there is potential for future research that includes a broader scope of front-line employees from other factories and industries in South Africa.

1.9 Delimitations

The researcher wishes to highlight the following delimitations of the research:

Industry-wide Qualitative Data: This would have given a broader insight into employee's perceptions of the flow efficiency approach but the researcher did not have the access to or time available for additional case studies where this was applied. Also, being a manager at

the case study plant himself, the researcher could be sure that the chosen case study met the requirements of the management approach used.

Structured Questionnaire: Although this would have provided simpler data for the researcher to analyse; it would have limited the participants to express their true and detailed perceptions of the various change factors and relating perception elements identified by the researcher.

Site-Wide Population: Employees working outside of the area in the plant that was affected by the changes would not have given a close enough account of what it would have felt like to experience a new management approach. The researcher believes this would have diluted and construed the results.

Random Sampling Method: This method was considered by the researcher but in reality too time consuming and administrative to execute due to the population group being spread across three shifts. The population group was also difficult to pull out of the operation and hence a quota sampling method was applied for those available on the days when questionnaire sessions took place.

1.10 Assumptions

The researcher wishes to highlight the following assumptions of the research:

- Participants were working in the plant between the period of the initial state and the changed state of the case study focus area. They had a view of the physical process and the management approach before and after the process changes were made.
- Participants were not chosen based on a pre-selected ratio of permanent to temporary workers in the sample.
- Temporary worker participants did not feel marginalised in the questionnaire process despite being asked for worker status on the questionnaire (All workers remaining anonymous on their questionnaires).
- The use of the research assistant ensured the researcher did not influence the participant's responses.
- No questions in the questionnaire alluded to the sensitive issue of job security for participants.

2. LITERATURE REVIEW

2.1 Introduction

This section will firstly introduce the concept of the traditional management approach in operations and compare it to a process-focused methodology - explaining the benefits and some examples of the latter. This will be followed by an overview of the chosen flow efficiency methodology and its potential for use in the labour-intensive, South African industry. Section 2.4 will discuss the selected four change factors for people in a process-focused improvement approach which the researcher found to be relevant to meet research objective (1). These four selected change factors are each broken down into sub-sections or perception elements. These will be used as the research framework for the questions in the qualitative research questionnaire in the chosen case study.

2.2 The Traditional Management Approach

2.2.1 Traditional Management Approach Explained

American engineer and management guru, William Edwards Deming, famously said that ‘most problems lie with the process and not the person, so avoid blaming the person first’ (Bicheno & Holweg, 2009). Through this statement Deming indirectly criticised the management culture that prevailed at the time in most companies in the Western world. He was critical that when comparing to Japanese management culture, the Western world’s management culture focused on the wrong things. Deming emphasised the need for management to drive out workers’ fear by focusing rather on removing barriers that prevent improvement and pride (Bicheno & Holweg, 2009).

It is seen in more recent times that the traditional management culture that Deming criticised is still prevalent. Rother (2010) observed that the traditional Western world manager often fails to consider all available options and other peoples’ ideas when making decisions. Rother (2010) compared Toyota management’s use of Lean tools, practices and principles versus traditional or Western world management: The findings were that the success of Lean tools, practices and principles by Toyota is actually reliant on a foundation of something invisible: management thinking and routines. Rother (2010) found that companies with a traditional, western world management culture fail to fully leverage Lean tools, practices and principles because their management approach does not lead people through routine, process-focused improvement. The traditional management approach tends to focus more on increasing the efficiency of resources (people), and has dominated the way in which organisations in many industries have organised, controlled and managed their operations and processes (Modig & Ahlstrom, 2012).

2.2.2 Shortfalls of the Traditional Management Approach

Liker (2004) found that the culture of the traditional management approach is centred on the ‘ivory tower’ manager. The traditional manager is not willing to make time or humble themselves to go to the shop floor to observe the process and speak to shop floor workers

about a problem. The traditional manager, according to Liker (2004), would rather ‘pull the trigger’ rapidly on decisions without thinking through all available options or understanding the process properly. This approach doesn’t lend itself well to proper problem solving or engagement of people in an operation or factory.

Shortfalls of the traditional management approach also extend beyond a fear culture to issues of waste and capacity utilisation of a process. Modig & Ahlstrom (2012) argue that when managers focus on increasing the efficiency of their resources (people), extra work is often created. This extra work focuses on secondary needs of the organisation and not the primary needs of customers. The ‘resource efficiency’ approach creates secondary or ‘superfluous’ work which is described as a sophisticated form of waste by Modig & Ahlstrom (2012). Figure 1 symbolically shows the wasteful portion of superfluous work that creeps in to a process when management focuses primarily on the efficiency of its resources. There are three root causes to the generation of superfluous work when focus is on resource efficiency: (1) long throughput time, (2) resource overload, and (3) multiple restarts per flow unit (Modig & Ahlstrom, 2012). Long throughput time leads to secondary work, such as storing and managing excess materials, or dealing with customers’ secondary needs when waiting a long time in a queue. Resource overload refers to when workers try to work on too many jobs at the same time leading to mistakes and quality defects on the final product. Companies would typically add structures and resources to conduct additional work in dealing with the resource overload. Lastly, in poor flowing, high resource-efficient processes, many restarts are required at the various hand-over stages of the process. This typically causes information to be lost through inaccurate handovers and often leads to superfluous, double-handling and rework (Modig & Ahlstrom, 2012).

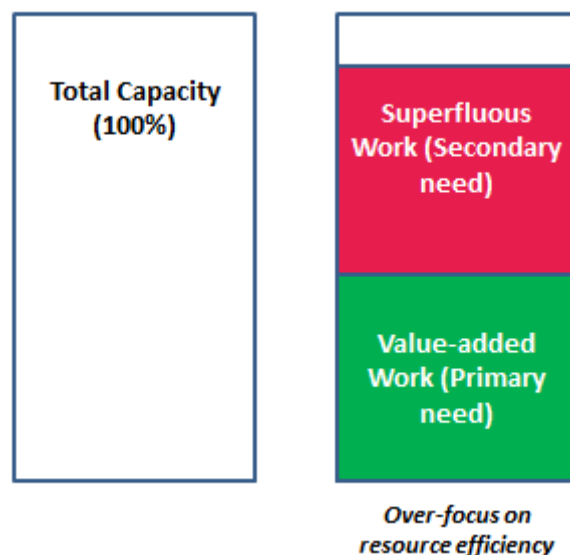


Figure 1: Relationship between capacity, superfluous and value-added work in a high resource efficiency-focused management environment. *Adapted from* Modig & Ahlstrom (2012).

2.3 Management by Process Improvement

2.3.1 Introduction

The criticism and shortfalls of the traditional Western world management approach creates the need for a more effective management approach that is both engaging with workers and effective in delivering operational improvement. Aljunaidi & Ankrah (2014) emphasise the need for traditional western world managers to make this shift, by recommending they focus more on fixing layout and process design issues. This is in contrast to the reality found by Aljunaidi & Ankrah (2014) of blaming employees or trying to make employees work harder within the same, inefficient process.

There is a common message in various literature sources suggesting that the shift to management by process improvement is a more effective approach for the future. Rother (2010) explains that management should be a 'systematic pursuit of desired conditions by utilising human capabilities in a concerted way'. Rother (2010) suggests that management should focus on repeatedly taking small steps towards a process ideal state or target condition. Rother (2010) found this should be done by engaging and empowering people towards finding solutions to improvement. Schniederjans, et al. (2010) highlights that management by 'Continuous Improvement' (CI) actually empowers employees when involving them in improvements. CI is deemed a Lean management approach that is proactive and provides many opportunities for waste removal by inviting all employees to come up with ways to enhance business operations, products and services (Schniederjans, et al., 2010). Liker (2004) found how Toyota progressed successfully with an alternative management by relentless reflection (*hansei*) and continuous improvement (*kaizen*). This has seen Toyota develop a competitive advantage over many years through its process-focused business practices and activities as an integral part of its values, beliefs and business methods (Liker, 2004).

Rother (2010) discusses how a process-focused approach forces managers and workers to understand a process well and find the root cause of the biggest obstacle at a point in time. Together they will devise and conduct an experimental action that will help improve their understanding of the process, and help remove the biggest obstacle in the flow of the process. This is in stark contrast to the traditional approach where there is fear and lack of engagement between management and front-line workers. Rother (2010) highlights that this process-focused thinking forces management to experience detailed learning of the process, while also solving problems through continuous improvement. Similarly, Goldratt & Cox (1986) devised a process focused management approach through the 5 step 'Theory of Constraints Improvement Cycle' that focused management on eliminating bottlenecks in order to improve the flow of a process.

The researcher observes a common message in the literature towards a process-focused management approach: by management focusing on improving the process where employees work, they could actually empower and engage workers to contribute towards the solution. This is in contrast to the traditional approach where employees are often blamed for the

problems and fear is instilled. The section to follow outlines the flow efficiency methodology as one of the possible process-focused approaches and is the approach selected for this research due to its simplicity. The researcher believes this could be a methodology for managers in the South African, labour-intensive industry to utilise that could handle the challenges experienced with labour in the current economic situation.

2.3.2 Business Improvement through Process Improvement

According to Modig & Ahlstrom (2012), the primary focus by management on improving the process will yield 'flow efficiency' as opposed to focusing on achieving 'resource efficiency'. Modig & Ahlstrom (2012) name their process-focused approach as 'Flow Efficiency'. At the core of the flow efficiency methodology is the definition of flow efficiency: *the measurement of how much a flow unit is processed from the time a need is identified to the time it is satisfied* (Modig & Ahlstrom, 2012).

The business benefits of improving flow efficiency are said to be: improved customer service and quality, reduced lead times, and less waste. Modig & Ahlstrom (2012) highlight that the traditional management approach actually creates a paradox of a need for additional non-value added work and resources that an otherwise flow-efficient organisation wouldn't require. The irony is that the traditional management approach can be detrimental to the KPI's that management is targeting due to three sources of inefficiency that generate superfluous work: long through-put time; overload on resources; and multiple restarts per flow unit (Modig & Ahlstrom, 2012). These will be further elaborated on in the literature review chapter.

The researcher notes *two key observations* from the flow efficiency approach: The first is that it lacks any prerequisites of a basic organisational maturity or entrenchment of practices such as problem solving skills. It also lacks requirements of the educational level of front-line workers and management. What is a clear requirement by Modig & Ahlstrom (2012) is that at the core of resolving the paradox is a shift of primary focus to flow efficiency by management. This first observation suggests that the approach could be beneficial in the chosen context of a labour-intensive, South African operation. The second key observation is that there is very little description of the experiences of the employees who work with the process changes during a flow efficiency approach. This observation lays the foundation for the purpose of this research project.

2.3.3 Business Improvement through other Approaches in South Africa

This sub-section aims to give some examples of business improvement approaches used in the manufacturing sector in South Africa. It is not necessarily inclusive of all methods used but aims to highlight some observations in the examples in relation to the key observations noted by the researcher of the flow efficiency method.

Increasing Capital per Worker

Nordas (1995) describes that a common approach used in South Africa for business improvement is to increase labour productivity by adding more capital per worker. Nordas (1995) found that this approach relies on a need for adequately skilled labour to operate and maintain high-technology, capital equipment. This is in contrast to the first key observation noted by the researcher on the flow efficiency approach where there is no pre-requisite of basic skill levels to make the approach work. Nordas (1995) made a paradox finding related to this point, that by combining sophisticated imported technology with poorly skilled labour, a mismatch of factors of production is likely to occur. This suggests that improving productivity through increasing capital per worker may not be as cost-effective and simple as it initially seems in the given context.

Lean and Business Process Re-Engineering

Kruger (2008) found that the Business Process Re-engineering (BPR) approach implemented in the case study of a South African technology company, failed to help the company achieve so-called 'Lean Status'. In comparing to the flow efficiency approach, this suggests that the management at this point in the example, focused more on achieving a certain status rather than using the method to change the way they look at managing the improvement of the operation. Kruger (2008) found that when management in the case study combined Business Process Re-engineering with Lean Production methodology, the focus shifted to waste elimination and minimisation. This suggests that this later decision helped management to focus more on improving the processes; which is related to the flow efficiency approach. Kruger (2008) backs up this alignment by stating that the combined approach delivered significant business improvements. However, Kruger (2008) adds that despite the improvements achieved, management emphasised that they had not reached so-called 'Lean Status'. The researcher is of the view that this statement suggests management were still concerned with achieving a certain maturity or culture of the organisation whereas the first key observation of the flow efficiency approach suggests this is not a pre-requisite.

Kruger (2008) describes Business Process Re-engineering as an authoritative methodology to improvement but doesn't elaborate on what impact this has on the experiences of the people who undergo the process improvement changes. The researcher is of the view that the flow efficiency approach could also be considered an authoritative process improvement methodology as it is very much related to the approach of management in improving the business, and not necessarily the culture of the front-line employees. This is despite the secondary benefits to front-line employees that the flow efficiency approach can bring which will be discussed in more detail in chapter 2. In relation to the second key observation of the flow efficiency approach, the researcher is interested in how the front-line workers experience a kind of authoritative process improvement approach – in this case the flow efficiency approach.

Six Sigma

Naidoo (2012) found in a South African, platinum mining company that communication and organisational culture were the most important factors to gaining success from Six Sigma. In

addition, Bicheno & Holweg (2009) state that Six Sigma relies on problem-focused projects to reduce variation of specific processes in an organisation. The researcher is of the view that Naidoo (2012) and Bicheno & Holweg's (2009) findings highlight more pre-requisite criteria for using Six Sigma compared to the flow efficiency approach. The flow efficiency approach simply requires management to primarily focus on the flow efficiency of their processes without any pre-requisite criteria of culture.

2.3.4 Flow Efficiency Process Improvement Methodology

2.3.4.1 Flow Efficiency Approach vs. Traditional Approach

Modig & Ahlstrom (2012) highlight that the traditional management focus of increasing the efficiency of its resources results in a large portion of the resource's capacity being occupied by superfluous, non-value added work. In this approach, only a portion of the resource's capacity is allocated to value-added work that meets customer needs. Modig & Ahlstrom (2012) highlight this as a paradox and term it the 'The Efficiency Paradox'.

According to Modig & Ahlstrom (2012), the key to resolving the efficiency paradox is a focus on improving the flow of a process. The quantifiable measure of the process efficiency is the flow efficiency. A management focus on flow efficiency helps eliminate many of the secondary needs managed by superfluous work as a consequence of low flow efficiency. This creates a further paradox that by *not* focusing first on efficiency of the resources, but rather on flow efficiency, resources' capacity can actually be freed up. This will allow the thing to which value is added, the flow unit, to flow quickly through the process or organisation. This creates continuous flow that is visible and allows people (resources) to take responsibility for the whole process (Modig & Ahlstrom, 2012). The opposite of this culture would be one where functional silos exist that focus on portions of the process flow and are not concerned for the overall process flow (Modig & Ahlstrom, 2012). Put most simply by Modig & Ahlstrom (2012); flow efficiency can be described as the efficiency of the time taken for the flow unit to be processed in an organisation or process. It is considered a new type of efficiency and a primary focus by management on this is known is the flow efficiency methodology.

Figures 2 and 3 illustrate the difference between the traditional management approach, represented by resource efficiency, and the flow efficiency approach. The difference lies in the relationship between the resource and the flow units. In a resource efficient focus (Figure 2), the flow unit is adapting to the situation of the resource. This situation ensures that work is always attached to the resource (person, machine or system) and always has a flow unit to process. Here, the resource does not consider the flow of the overall process. This represents how managers focus on utilising resources as much as possible (Modig & Ahlstrom, 2012).

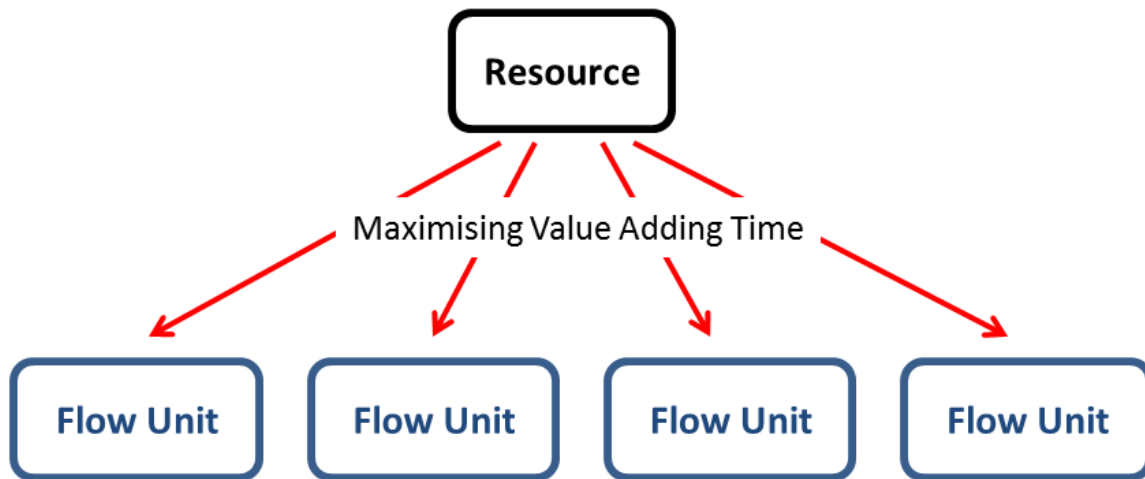


Figure 2: Relationship between resource and flow unit for high *resource efficiency*. (Adapted from Modig & Ahlstrom (2012))

Figure 3 represents a flow efficiency focus where it is more important to attach resources (person, machine or system) to work on a flow unit. This ensures the flow unit is always being processed by a resource. This focus will ensure the end-to-end flow of the flow unit through the process (Modig & Ahlstrom, 2012).

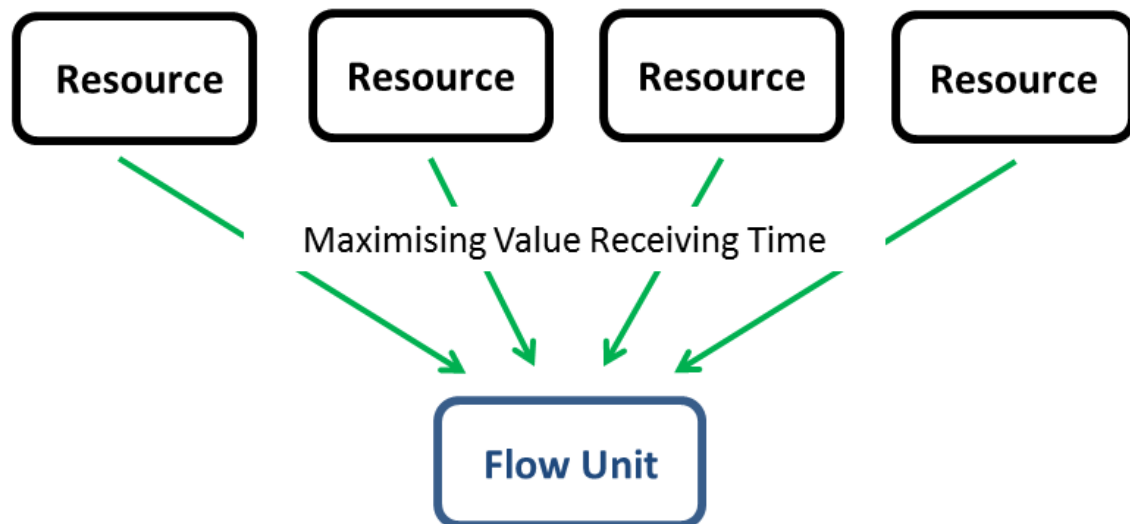


Figure 3: Relationship between resource and flow unit for high *flow efficiency* (Adapted from Modig & Ahlstrom (2012))

2.3.4.2 Flow Efficiency within Lean

The flow efficiency approach is a way of keeping managers focused on the way they manage their core process flow in their business. In other words, Flow Efficiency can be considered as a simplified summary of the widely misunderstood term, 'Lean'. Modig & Ahlstrom (2012) explain this by indicating that there are many inconsistent definitions of Lean, and also three problems with the definitions of Lean: (1) definitions are at different levels of abstraction, (2) Lean is used as a means instead of an end and (3) Lean has become all that is good and all that is good is Lean. The flow efficiency approach helps declutter the misinterpretations of Lean and helps managers focus on what will deliver business results.

Modig & Ahlstrom (2012) discuss that once this simple understanding is clear for managers, they could then decide how to use many of the tools developed by Toyota to achieve improved flow efficiency. This is opposed to implementing tools for the sake of 'becoming Lean'. As back up to this, Ahlstrom (1998) found that in the sequence in the process of adopting a Lean production system, both management and resources initial, primary focus was on using core principles to eliminate waste and implement a system for achieving zero defects. This finding shows that management took a proactive decision to focus themselves and their employees (resources) on improving the flow of their processes by eliminating waste and striving to achieve zero defects in their processes. Modig & Ahlstrom (2012) also highlight that the flow efficiency approach directs managers to better understand how their processes work in more detail. This, according to Modig & Ahlstrom (2012), will help managers avoid blind decision making from an 'ivory tower' as in the traditional way of managing. The researcher believes this is what makes the flow efficiency approach significant as it is easy to understand and simple for managers to apply in practice.

2.3.4.3 The Efficiency Matrix

The relationship between resource efficiency and flow efficiency can be plotted on a graph known as *The Efficiency Matrix* as developed by Modig & Ahlstrom (2012). Figure 4 shows the efficiency matrix with resource efficiency plotted on the vertical axis and flow efficiency on the horizontal axis. It is possible to plot any process or organisation within this matrix depending on their levels of resource and flow efficiency. The matrix is also separated into four quadrants: Efficient Islands, the Efficient Ocean, Wasteland, and the Perfect State (Modig & Ahlstrom, 2012). Briefly, the four quadrants represent:

Efficient Islands: The top left hand corner represents high resource efficiency and low flow efficiency. Typically, this state represents sub-optimised parts of an organisation where each part strives to lower costs by maximising its resource efficiency - often at the expense of low flow efficiency across the organisation. In manufacturing, this represents the product spending most of its time waiting as inventory. In the services industry, this represents processes where there is unwanted waiting time during which the customer receives no value (Modig & Ahlstrom, 2012).

The Efficient Ocean: The lower right hand corner represents high flow efficiency and low resource efficiency. Here, the focus is on meeting the customer need's as efficiently (fast) as possible. In order to achieve this, free capacity is needed in the organisation's resources. Here, resources are only used when there is an actual need to satisfy the customer's order requirements. A good understanding of the bigger picture is required and not just independent and efficient islands (Modig & Ahlstrom, 2012).

Wasteland: The lower left hand corner represents low flow and low resource efficiency. This is an undesirable state as there is a waste of resources and poor flow that results in less value being created for the customer (Modig & Ahlstrom, 2012).

The Perfect State: The top right hand corner depicts organisations and processes having high resource and high flow efficiency. This is the most desirable state to be in, but the most difficult to achieve due to the efficiency paradox explained earlier and process laws soon to be discussed. In addition, the main obstacle in achieving the perfect state is variation (Modig & Ahlstrom, 2012).

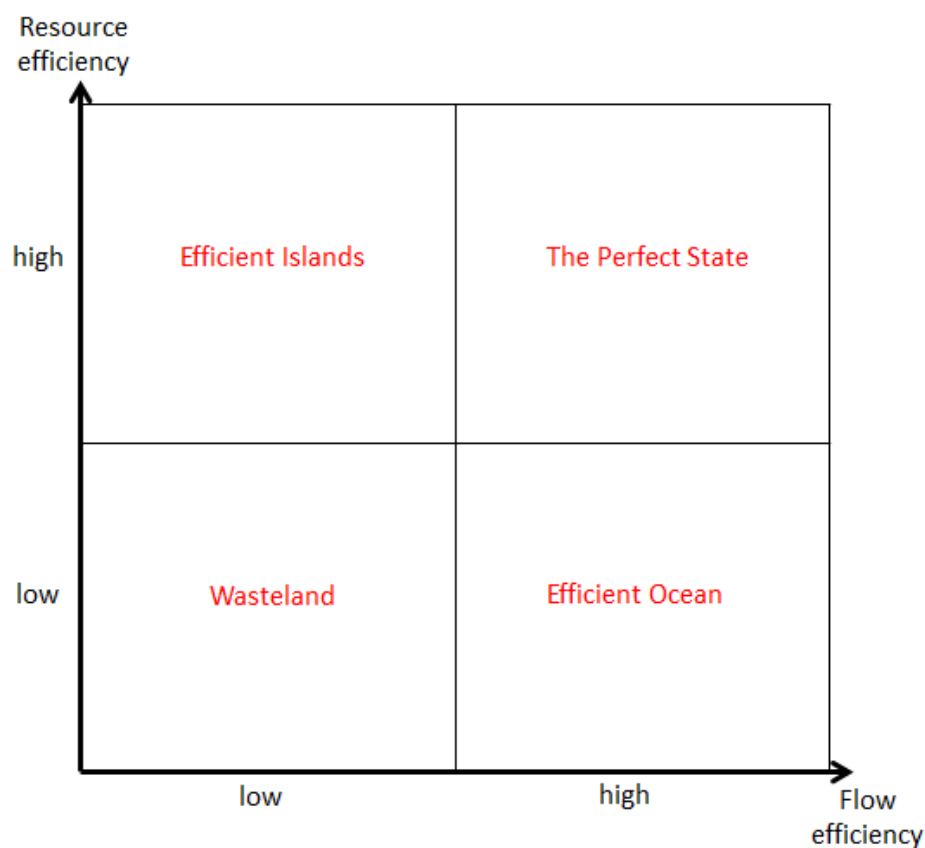


Figure 4: Efficiency Matrix with the four operational states (Adapted from Modig & Ahlstrom (2012)).

2.3.5 The Conflict between Flow Efficiency and the Traditional Approach

Modig & Ahlstrom (2012) summarise there are 3 laws of processes that explain why it's difficult to combine high resource efficiency with high flow efficiency in a real world process. This is important as it highlights why a management shift is needed from the traditional approach to a process-focused approach. The laws show it is not possible to focus on the two jointly. Briefly, these three process laws are as follows:

1) Little's Law

Little's law is simply the product of the number of flow units processed, and the cycle time for each flow unit:

$$\text{Throughput Time} = (\text{Flow Units Processed}) \times (\text{Cycle Time})$$

There is a paradox in Little's Law: If we ensure a buffer of flow units in order to ensure maximum utilisation of resources, this serves to increase throughput time. This highlights the flaws in traditional, resource efficiency management styles as the end customer experiences unwanted delays while the organisation focuses on maximising its resource efficiency in an attempt to reduce labour costs (Hopp & Spearman, 2000).

2) The Law of Bottlenecks

The points in a process at which queues form are called bottlenecks. These are stages in the process that limit or slow down the flow of flow units through a process. If not intentionally designed into the process, bottlenecks will ultimately limit the flow of the entire process (Modig & Ahlstrom, 2012). There are 2 reasons why a bottleneck is formed in a process: (1) if the stages of the process must be performed in a certain order. (2) The presence of variation in a process (Hopp & Spearman, 2000), (Goldratt & Cox, 1986). Reason (1) highlights that a management decision can create inherent bottlenecks. This is because management decides on processes and procedures, not workers. If management doesn't have a process-focused approach it will not be able to identify and remove bottlenecks for workers.

3) The law of the Effect of Variation

Modig & Ahlstrom (2012) describe that throughput time increases as variation in the process increases and the process gets closer to 100% resource utilisation. This finding originates from the work of Kingman (1966), where variation in a process was found to come from three sources: resources, flow units, and external factors. Modig & Ahlstrom (2012) describe how variation has a negative impact on an organisation's ability to combine high resource efficiency with high flow efficiency. This is best illustrated in Figure 5 where Kingman (1966) plots the relationship between variation, resource efficiency, and throughput time. Figure 5 shows how throughput time of a process increases exponentially with resource utilisation. This is important for managers to understand as it shows that increasing resource efficiency causes an exponential increase in throughput time of a flow unit through a process.

For example, an increase in resource utilisation from 90 to 95% gives a greater increase in throughput time versus an increase in utilisation from 80 to 85%.

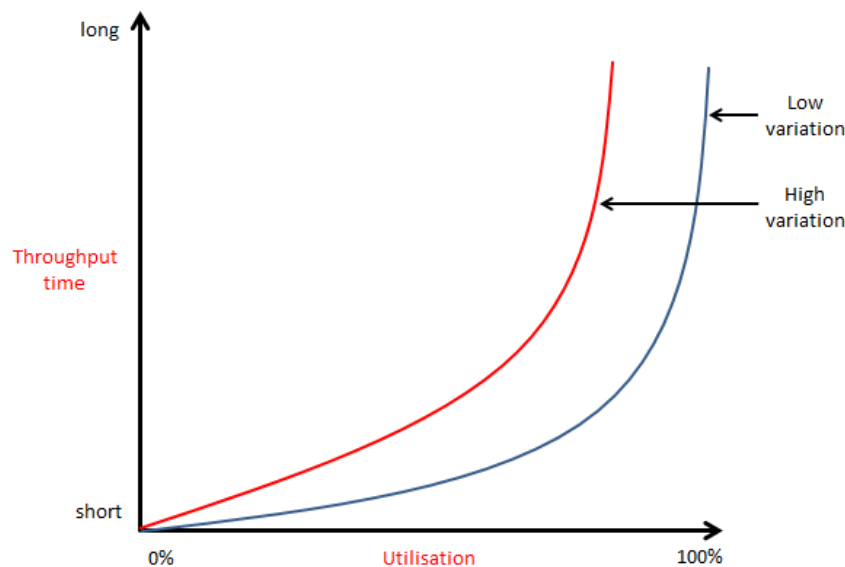


Figure 5: Graph of relationship between utilisation of resources, variation, and throughput time (Adapted from Modig & Ahlstrom (2012)).

The level of variation within an organisation determines the so-called, *Efficiency Frontier* shown as the dotted line addition to the Efficiency Matrix in Figure 6. The Efficiency Frontier is an invisible barrier that limits the organisation or operation's ability to progress towards the ideal state of maximum resource and flow efficiency (Modig & Ahlstrom, 2012).

What is critical for managers to realise, is the greater the types and level of variation in an operation or process, the further towards the bottom left of the matrix the efficiency frontier moves. This inherently moves the operation or organisation further away from the perfect state (Modig & Ahlstrom, 2012). This trend re-emphasises the need for managers to be process-focused so that they can fully understand the variation in their processes and take ownership of which variation types they can and can't control. By making decisions on eliminating and controlling variation, a manager can make the job of workers easier and better meet the needs of customers (Modig & Ahlstrom, 2012).

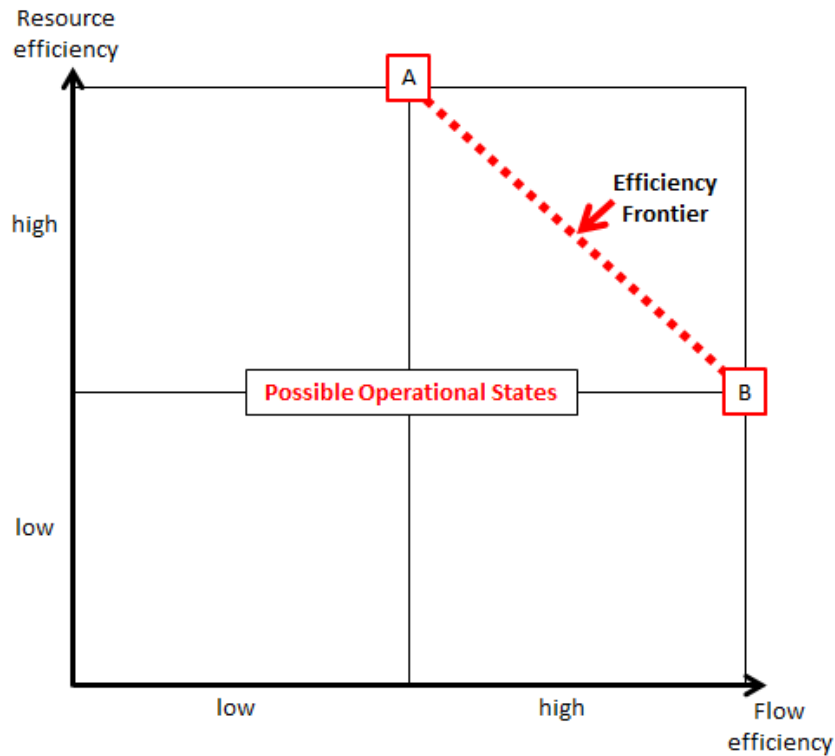


Figure 6: Efficiency Frontier located on the Efficiency Matrix (Adapted from Modig & Ahlstrom (2012))

2.4 Change Factors for People in a Process Improvement Approach

2.4.1 Introduction

The following sections of the Literature Review discuss factors that affect people through change and improvement initiatives relating to a process-improvement management approach. This draws relevance to the research question: “What was the employees’ experience of a process-focused, improvement initiative?” The following sections also summarise selected aspects of what literature discusses as key factors affecting people through change. The four selected change factors to be discussed were adapted from the Lean change iceberg in literature for their connection to change through a process-focused management approach. This literature review seeks to achieve research objective (1): *What are the key change factors affecting employees directly involved in the process-focused improvement initiative?* Key change factors are then used as a framework for research among employees of the chosen case study to meet research objectives (2), (3) and (4).

2.4.2 The Importance of Considering People in Change

In chapter 2.2 and 2.3, the need for management focus to be on process improvement was highlighted with the flow efficiency methodology selected as the focus approach for this research project. In the context of the labour-intensive, South African industry discussed in chapter 1, it is pertinent to understand how a change of management approach would impact the experience of workers in an operation or plant.

Bicheno & Holweg (2009) highlight the challenge in modern-day operations or plant is how to successfully implement change in a process that consists of both people and machines. Typically it can be relatively easy to change a layout, machines, and material flows but changing the people that operate these processes is challenging. Most manufacturing and service operations are ‘socio-technical’ systems where human beings and equipment must work together to achieve a desired outcome (Bicheno & Holweg, 2009). Aligning this socio-technical system is the challenge when it comes to implementing change according to Bicheno & Holweg (2009). Typically, addressing only a subset of the ‘socio-technical’ system will mean change efforts will fail. This is because any change to a physical process is likely to affect the people in some form and so people who do not co-operate with the new way of the process can become bottlenecks in a similar way that machines can (Bicheno & Holweg, 2009).

The analogy of change in a Lean environment can be visualised using ‘The Change Iceberg’ (Hines, et al., 2008) shown in Figure 7. Hines et al. (2008) found that below the water line (the large, invisible part of change) are people’s behaviours, leadership styles, and strategies. The portion below the water line is the informal organisation with its own styles, values and communication links.

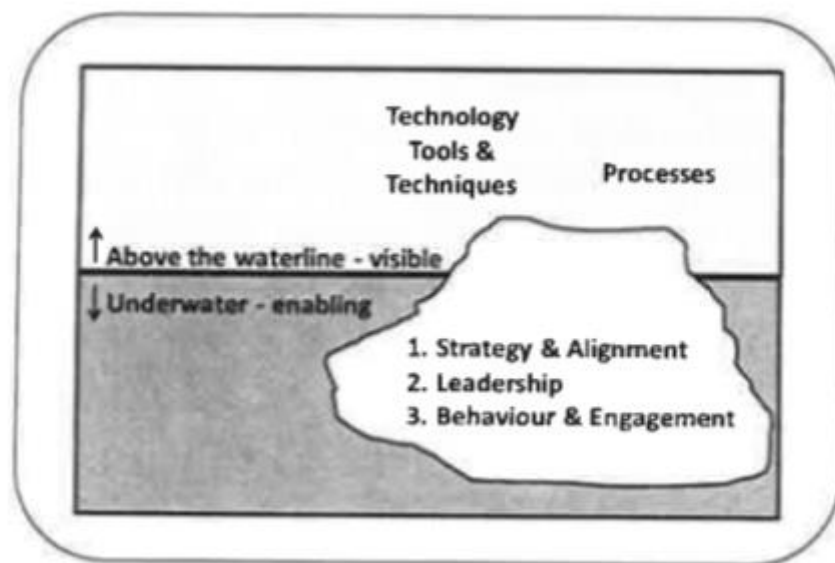


Figure 7: ‘Change Iceberg’ analogy illustration (Bicheno & Holweg, 2009).

2.4.2.1 Change Factors Selection

Bicheno & Holweg (2009) highlight that various authors in addition to Hines et al (2008), [Scholtes (1998) and Emiliani (2007)] use the change iceberg in Figure 7 to summarise change factors in Lean. The researcher has chosen the change iceberg as the foundation of selected change factors used in the research framework due to its simplicity and multiple references in literature. The researcher observes that the upper part of the change iceberg is synonymous with the process changes relating to the flow efficiency approach; yet the lower part incorporates the invisible aspects that employees would have valuable perceptions on. Selected change factors of the research framework would give valuable insight into the

visible and invisible aspects of the change iceberg in a scenario when the flow efficiency methodology is applied. The selected four change factors of the research framework stem from aspects of the change iceberg in literature but the researcher acknowledges that they are not necessarily inclusive of all literature around change.

Considering two of the three invisible parts of the change iceberg – ‘Leadership’ and ‘Behaviour & Engagement’, the researcher has chosen ‘Leadership Behaviour’ and ‘Employee Involvement & Empowerment’ as two change factors to include in the research framework. As the research is focused on the perceptions of affected front-line employees and supervisors, ‘Leadership Behaviour’ is chosen as a single change factor as it combines two parts from the change iceberg that could be viewed from the perspective of the employees. Perception elements ‘Leadership Commitment’ and ‘Coaching by Leaders’ are elaborated on from further literature in 2.4.3 as selected perception elements for the ‘Leadership Behaviour’ change factor. The ‘Engagement’ part of the change iceberg is broken into two parts by the researcher to become a change factor, ‘Employee Involvement & Empowerment’. Under this change factor are three perception elements considered by the researcher to be relevant literature for the labour-intensive, South African context. They are ‘Involvement in Solution’, ‘Involvement in Problem Resolution’ and ‘Escalated Issues Resolution’ to be elaborated on in 2.4.6.

Scholtes (1998) indicated that aspects below the surface of the change iceberg, including ‘Strategy & Alignment’, are what mainly determine the individual worker’s experience and perceptions of change. Hines et al. (2008) stated that a vital part of aspects below the surface of the change iceberg was policy deployment. Hines et al. (2008) indicated that policy deployment of buy-in and consultation is effective through communication and alignment. However, Hines et al. (2008) cautions that successful policy deployment relies on good execution of the policy. Considering this, the researcher has chosen a change factor, ‘Effectiveness of Change’ for this research framework. This change factor includes the perception element ‘Acceptance of Process Change’ which includes the communication and buy-in aspect of the change deployment. ‘Effectiveness of Change’ also includes the change factor ‘Quality of Process Change’, which considers the employees perceptions of the change iceberg’s visible aspects of: technology, tools, techniques, and processes. The researcher considers these as practical aspects that employees would have perceptions on resulting from process changes in the application of the flow efficiency approach.

Hines et al. (2008) describe the upper, visible part of the change iceberg to include aspects of: official roles, responsibilities, plans and standards. These aspects are similar to the key features that make up the ‘Social System’ of the socio-technical environment of machines and people described by Bicheno & Holweg (2009): work organisation, responsibilities, and performance measurement. The researcher has consolidated Hines et al. (2008) and Bicheno & Holweg’s (2009) identified parts of the change iceberg into a change factor ‘Social System Change’ for the research framework. The perception elements to be included in the research framework under the ‘Social System Change’ change factor are carried on from Bicheno &

Holweg's (2009) list as: 'Work Organisation', 'Roles & Responsibilities', and 'Performance Measurement'. These are elaborated on in 2.4.4.

Therefore, the selected four change factors and their perception elements for the research framework are discussed in further detail from 2.4.3 to 2.4.6. The consolidated research framework is summarised in Table 1 in chapter 2.5 of this report.

2.4.3 Change Factor: Leadership Behaviour

2.4.3.1 Leadership Commitment

Kotter (1995) found that a shared commitment by leadership in many departments and at all levels is required to lead change. Kotter (1995) even emphasised that when promoting managers, criteria for support of the new change approach should be included in the candidate selection process. This supports the importance of leadership commitment towards making a new, process-focused management approach successful. Bicheno & Holweg (2009) highlight that leadership commitment through empathy and support from the top level, signals that a change effort is serious and long-term. Similarly, Kumar (2006) found that change linked to process improvement was made more successful when management communicated upfront the benefits and problems to all employees in the case of implementing Lean Sigma.

Emphasising a new leadership behaviour beyond the two common leadership factors of employee-centeredness and production-centeredness; Ekvall & Arvonen (1991) found that a third, newer factor for successful leadership behaviour is around change-promotion by leaders. Ekvall & Arvonen (1991) found this to be a growing need in companies as they accelerate the rate of change in both products and services. Larsson & Vinberg (2010) found that along with the production-centeredness leadership factor, the change-orientation factor can be altered by leaders according to the situation they find themselves in. This relates to the fact that leadership commitment towards driving change can and should be present in times when a process-focused approach is taken.

2.4.3.2 Coaching by Leaders

Liker (2004) found that there is a need for management to create a strong culture in which values and beliefs are shared and lived by all employees. Liker (2004) suggests this is carried out through a culture of leaders coaching subordinates through principle 10 of 'Toyota Way': *'Develop exceptional people and teams who follow your company's philosophy'*. Liker (2004) found that continuous training of teams supports continuous flow and solving of problems while also empowers people to work together in teams towards common goals. Edmondson (2003) found that successful leaders are able to empower team members and overcome status differences by coaching employees and communicating motivating reasons for change. Liker (2004) emphasised this responsibility of leaders to coach employees further through Principle 9 which stated: *'Grow leaders who thoroughly understand the work, live the philosophy, and teach it to others'*. Rother (2010) emphasises the important role leaders at

all levels play to coach subordinates in achieving the process target conditions through the Coaching Kata – a method of coaching employees for improvement.

2.4.4 Change Factor: Social Systems Change

2.4.4.1 Work Organisation

Bicheno & Holweg (2009) describes the change in work organisation as including team structures, shift patterns and hierarchies. It is these structures that organise the current work, group people together and arrange who reports to whom. Bicheno & Holweg (2009) highlight that when implementing physical process changes, the social system also undergoes change. Majchrzak & Wang (1996) found that organisations that restructure their operations to break functional silos to better meet customer needs; tend to underestimate what is needed to ensure employees work and behave in a manner that supports this change. They found that the change from functional departments to process-complete teams doesn't automatically instil teamwork and drive people towards common goals. Among other factors, Majchrzak & Wang (1996) highlighted the need for managers to create an environment of teamwork by paying attention to factors such as: visible layouts where people can see each other's work; designing collaborative procedures; and group rewards.

2.4.4.2 Roles and Responsibilities

Bicheno & Holweg (2009) discusses that changing people's roles and responsibilities could include: changes in reporting line, and the level of employee decision making. This depends on the extent to which the responsibility for the process is cascaded down to the team level. The principle of giving front line employees more responsibilities is generally a good thing according to Bicheno & Holweg (2009). With reference to the change iceberg by Hines et al. (2008), roles and responsibilities sit alongside tools, technology and standards above the water line.

2.4.4.3 Performance Measurement

Bicheno & Holweg (2009) describe performance measurement in the context of how people are rewarded and incentives are given. They found that managers need to ensure measures given support the overall strategy, as people will always try look good on the performance measures given to them. In the context of a flexible production system, Macduffie (1995) found that innovative, human-resource practices affect performance of plant productivity and quality when they are integrated with manufacturing policies. This shows effectiveness of driving change through the way people's performance is measured. Bicheno & Holweg (2009) caution that making changes to a person's performance measures means making changes to their working space and procedures. The risk of not managing and aligning the performance changes to the process changes will mean the individual is likely to oppose or even sabotage the changes proposed. Majchrzak & Wang (1996) found that when management driving process-focused improvement gave employees overlapping responsibilities, it fostered collective responsibility of an overall process by the team members and led to reduced cycle times of the process.

2.4.5 Change Factor: Effectiveness of Change

Bicheno & Holweg (2009) discuss that the effectiveness of change (E), can be summarised by a simple formula: $E = Q \times A$, where Q is the quality of change and A is the acceptance of change. Both factors complement each other in achieving successful outcomes of driving change through improvement. They found that intrinsic motivators and self-drive are more sustaining over time versus pay, but are required to be nurtured in the right environment by management. This overview provides the basis for elaboration in 2.4.5.1 and 2.4.5.2 to follow.

2.4.5.1 Quality of Process Change

Aljunaidi & Ankrah (2014) highlight the need for management to first have a certain way of thinking before deciding on a solution to a process improvement. They found that process-focused management thinking should exist, that seeks to first understand its processes in detail, before making rash decisions on investment in technology. This finding is backed up by what Bicheno & Holweg (2009) found in the case of an Enterprise Resource Planning (ERP) implementation, where managers typically put the decision making in the hands of an ERP specialist. In this common case, Bicheno & Holweg (2009) found that when management tried to separate ERP implementation with a process-focused approach, the implementation often ends up as a failure.

In addition to requiring a process-focused approach before implementing solutions, the complexity and reliability of the solution is also found to be a contributor to the quality of a process change. Tyre & Hauptman (1992) found that the higher the level of complexity involved in a technical change to a production process, the *less* useful the overlap between engineering and manufacturing functions is. They found that this challenges the common assumption that cross-functional team collaboration in technical projects always should be maximized no matter the context. Viewing this finding from the inverse perspective, it suggests that in order to drive cross-functional involvement and teamwork, a process change solution should be kept as simple as possible. Supporting this, Liker (2004) found that technology selection should have criteria of being reliable, thoroughly tested, and should serve the people and process of the organisation. Liker (2004) highlights that technology should be used to support people and not replace people by stating that it is preferable to work out a process manually before adding technology to support the process. Despite these criteria, Liker (2004) found that management should still encourage employees to consider new technologies when striving for solutions to achieve flow in processes. Liker (2004) advises that if technology has been proven in trials to improve process flow, it should then be quickly implemented.

2.4.5.2 Acceptance of Process Change

It is found that process improvement can be achieved when management takes into consideration employees' buy-in towards its approach and solutions. This is backed up Pfeffer (1995) who found that when management views the workforce as a source of strategic advantage, and not just as a cost to be minimized, they are often able to successfully

outperform their competitors. Practically, this translates into the way management communicates with its employees around change. Bicheno & Holweg (2009) found that unless communication to employees is clear and frequent, change can be perceived as a threat. Kotter (1995) found that communication should be done via a guiding coalition that appeals to all stakeholders and employees, and goes beyond the numbers. Kotter (1995) also found that in order to influence employees to be willing to embrace and contribute towards change, communication needs to be credible and regular.

2.4.6 Change Factor: Employee Involvement and Empowerment

2.4.6.1 Involvement in Solution

The involvement of employees, who are affected by changes in their process area, is critical to obtaining the ownership by these employees and the success of the changes made. Rother (2010) highlights that leaders need to understand the work of the shop floor employees in detail and should involve them better to drive more effective solutions in a continuous improvement culture. Bicheno & Holweg (2009) also emphasise the importance of the involvement of people: People affected by the change need to feel ownership of the new process or else there is a temptation to revert back to the old ways of doing things. Kotter (1995) found that change requires the co-operation of many people; and without their contributions, the change will more than likely fail. Shadur et al. (1999) found that a supportive and committed management climate does contribute towards employee perceptions of, among others, participation in decision making and teamwork.

2.4.6.2 Involvement in Problem Resolution

Vidal (2006) found that worker empowerment can be limited when organizational routine is centred on an authority structure. They also found that in case studies where a company embarked on technical and social change, employee empowerment was limited due to the demands of standardisation and resistance among workers. It appears therefore that the manager's approach to employee involvement and empowerment can be related to what they themselves have experienced. This is backed up by Fenton-O'Creevy (2001) who found that middle managers' intentions to support employee involvement were positively related to the manager's own experience of being empowered.

2.4.6.3 Escalated Issues Resolution

Apart from the importance of an employee feeling empowered and involved, the researcher believes that it is important to consider if the employee feels, when they escalate a problem or issue, it is taken seriously and resolved. The importance of this is highlighted by Kotter (1995) who found that if senior management does not remove obstacles escalated by employees relating to the change vision, the change cannot move forward. Shadur et al. (1999) found that a supportive and committed management climate was a predictor of, among others, the employee involvement variable of 'communications'. This suggests that when management is committed and supportive they will take seriously the upward communication

and involvement of the employees when there is an issue to resolve that hampers the change from moving forward.

2.5 Literature Framework of Process Improvement Change Factors

The literature review section in chapter 2.4 has been consolidated into a table of ‘Process Improvement Change Factors’ and associated ‘Perception Elements’ in Table 1. Table 1 will be used as a framework for the questions in the research questionnaire to be used in the chosen case study. The open-ended questions, based on this framework, will be used to understand the experience of operational and supervisory employees affected by the flow efficiency methodology changes that took place.

Table 1: Summary of Process Improvement Change Factors and Associated Perception Elements.

Process Improvement change factor	Perception Element
Leadership Behaviour	Leadership Commitment
	Coaching by Leaders
Social System Change	Work Organisation
	Roles & Responsibilities
	Performance Measurement
Effectiveness of Change	Quality of Process Change
	Acceptance of Process Change
Employee Involvement & Empowerment	Involvement in Solution
	Involvement in Problem Resolution
	Escalated Issues Resolution

3. RESEARCH DESIGN & METHOD

3.1 Introduction

This section describes the overall research approach taken and the research methods chosen to accomplish the research objectives. It will give the background to the case study selected by the researcher and how this links to the research methods selected.

Buys & Walwyn (2014) state that there are three possible aspects to a research project:

- 1) Application of existing theories, models and methods to a ‘new’ problem
- 2) Testing of existing theories, models and methods
- 3) Building of new or improved theories, models and methods

For the chosen research question and objectives, the researcher believes this research project relates to aspect (2) by assessing the selected four process improvement change factors in the context of the application of the flow efficiency methodology in a labour-intensive, South African operation. The method used to achieve this was through qualitative data collection of the chosen case study to be discussed in 3.4. The qualitative data comprised of a sample of operational and supervisory employees from the chosen case study plant. Because each participant completed their own questionnaire, the unit of analysis was the individual workers.

3.2 Research Strategy

The research steps taken and the methods selected for this research project are summarised in Figure 8. The researcher consulted literature on the most appropriate research methods to use to achieve the desired research objectives in the context of the chosen case study. The sections to follow elaborate on each of the chosen methods and reasons for their selection.

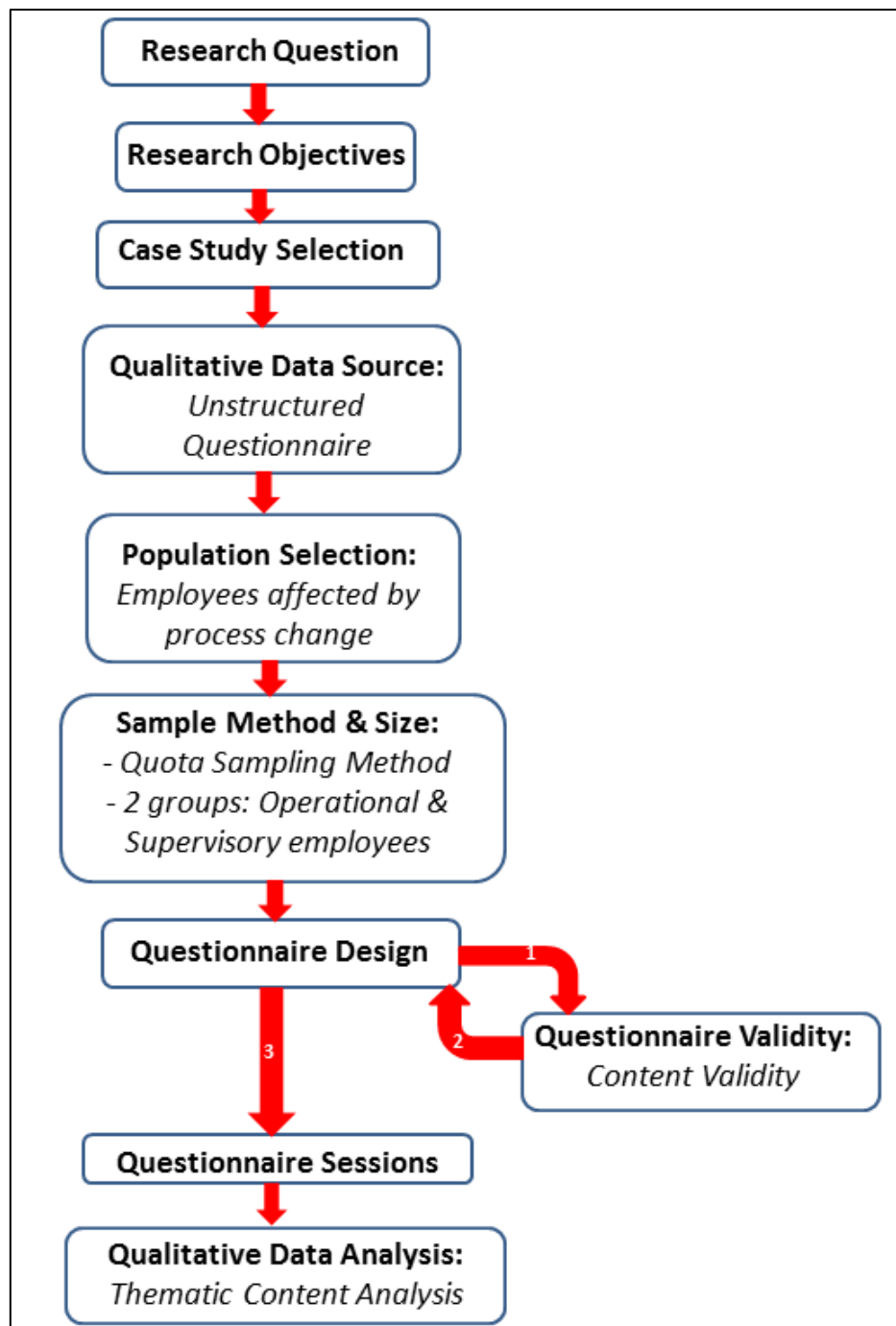


Figure 8: Summary of Chosen Research Steps and Methods

3.3 Case Study Selection

A case study approach was chosen as the researcher needed to consider time, access to information and cost of the research project. Bryman (1989) suggests that data from case studies can be used to check the validity of findings using the various forms of data collection. The chosen case study for the research is located at a multinational, dairy company plant in Gauteng, South Africa. The researcher is an employee at this plant and decided to use a flow improvement project in the plant as the case study for the benefits of:

- Access to detailed information and data
- The plant project involved the use of the flow efficiency methodology
- Access to workers in the plant for qualitative research
- Time and cost savings in conducting the research

Chapter 4, Case Study Background, elaborates on the details of the chosen case study.

3.4 Qualitative Methods

3.4.1 Introduction

A qualitative research approach was chosen because the people affected by changes made in a process improvement initiative have their own unique and valued perspective of the changes that were made in the process in which they operate. These perspectives are potentially blind to the researcher or management trying to resolve a flow problem in a process. This is backed up by Bryman (1989) who highlights that qualitative research reveals different emphases from quantitative research by obtaining the perspectives of the people being researched, rather than the perspectives of the researcher.

3.4.2 Qualitative Data Sources

Bryman (1989) states there are three main data sources available to researchers using qualitative research methods:

- Participant observation
- Unstructured and semi-structured interviewing
- Examination of documents

Participant observation and examination of documents will not be considered for the scope of this research report, as they don't align to research objectives (2), (3), and (4). The researcher aimed to obtain the employees' experience through understanding their perceptions and so evaluated the unstructured and semi-structured interviewing methods available.

3.4.3 Unstructured Questionnaire Method

It was decided that an unstructured, group-administered questionnaire method with a research assistant present would be the chosen qualitative measurement tool. The role of the research assistant is elaborated in further detail in 3.4.11. According to Bryman (1989), questionnaires allow the researcher to question people regarding their attitudes and perceptions of various aspects of their work environment. A questionnaire is beneficial over a series of interviews in

order to reduce the time and cost of the data collection, as cited by Bryman (1989). The researcher wanted to allow participants the freedom to answer the questionnaire in their own words and not be limited by set answers. This is validated by Goddard & Melville (2007), who state that open (unstructured), questionnaires allow participants to answer questions in their own words whereas closed questionnaires limit respondents to answer questions by ‘true or false’ or from a set list of alternatives. Bryman (1989) similarly highlights that the unstructured approach elicits respondents ‘ways of thinking’ or perceptions on a certain issue, thereby reducing any constraints to the participants’ answers.

The researcher aimed at designing a questionnaire with questions alluding to the perception elements in Table 1 derived from the literature review. A research assistant was used to facilitate the questionnaire sessions to: (1) answer questions for clarity from the participants whose literacy levels may be on a basic level; (2) translate questions and answers into participants’ home language if required; and (3) be a neutral facilitator of the sessions to ensure no bias if the researcher were running the sessions.

3.4.4 Ethical Considerations

Goddard & Melville (2007) highlight that respecting respondents as individuals and not subjecting them to unnecessary research, is an important ethical consideration for the researcher. The researcher is advised to keep the data confidential and that no names of employees should be published with the final research report. It’s also advised that people are given the right to privacy, and should not be subjected to physical or psychological harm. Based on this, the questionnaire would not request a participant’s name (therefore remain anonymous), and it would also be voluntary. Also, a research assistant was selected to facilitate the group questionnaire sessions. The research assistant used is an employee at the case study plant. They were briefed on the details and purpose of the study prior to facilitating the sessions. The ethics clearance number for this research project is: MIAEC 078/15.

3.4.5 Qualitative Research Population and Sampling

3.4.5.1 Qualitative Population Selection

A population is defined by Goddard & Melville (2007) as any group that is the subject of research interest. In considering who could be involved in a research survey, McNeill (1990) discusses the differences in population between surveying specific people, and people affected by an event. For the scope of this research project, where the researcher is interested in people affected by a process improvement ‘event’, the researcher defined the population as: the *operational employees* who work directly in the process where flow efficiency process changes were made; and the *supervisors* of these operational employees.

The operational employees in the population size of **96** (across **three shifts**) include:

- Production forklift drivers
- Empty pallet supply forklift drivers
- Secondary packaging supply forklift drivers

- Palletising general workers
- Spine controllers

It's important to note that the operational employees in the population consist of a combination of permanent employees and temporary employees from a labour broker. The researcher requested participants to state if they were permanent or temporary workers on their questionnaires for research purposes.

The supervisor population group size was 8 First-Line Managers.

3.4.5.2 Qualitative Sample Method Selection

With the population being clearly defined in chapter 3.5.6.1, McNeill (1990) acknowledges that the population is too large to be able to interview each person face-to-face, or involve all of them in the questionnaire. This means a sample of the population was required. According to Goddard & Melville (2007), a sample must be representative of the population being studied otherwise no general observations about the chosen population can be made. McNeill (1990) highlights that what is true for the sample, should be true for the population, or at least it should be possible to calculate the likelihood of it being true. Sample bias also needs to be taken into account, according to Goddard & Melville (2007). Considering the many number of sampling methods available in literature, the sampling method selected for this research project was the *Quota Sampling Method*. This is because the Quota Sampling method was most applicable to the context and constraints of the chosen case study.

The Quota Sampling method, according to McNeill (1990), is similar to the Stratified Random Sampling method but has an important differentiation. Like in Stratified Random Sampling, a researcher breaks the population into groups (or strata), as described by Goddard & Melville (2007). The researcher would then decide how many people to sample within each group (stratum). The differentiation of Quota Sampling is that, instead of selecting samples at random using Simple Random Sampling within each group, the researcher would go look for the right number of people in each group until the quota is filled McNeill (1990).

The application of the Quota Sampling method to this research project is that the researcher has chosen two groups (strata) in the population – (1) the operational employees who work directly in the process where flow efficiency changes were made, and (2) the supervisors of these operational employees. Quota sampling is more applicable than Stratified Random Sampling to the chosen case study, as the population of employees is distributed over three shifts, which will make logistics difficult if participants were selected randomly. Quota Sampling saves time in obtaining the required number of samples as the researcher can gather willing participants based on who is on shift. The researcher doesn't foresee bias in the Quota Sampling method versus the Stratified Sampling method based on knowledge of the employees in the population.

3.4.5.3 Sample Size

The Quota Sampling method allows freedom for the researcher to determine and select a reasonable number of samples per group, according to McNeill (1990).

For the operational employees group (stratum) of the population, a sample size of 32 was selected by the researcher. This was based on a one-third (33.3%) ratio of sample-to-population size. The sample size was chosen by the researcher as a reasonable percentage of the population for discussion on the results, considering the accessibility to, and availability of workers across the three shifts. The researcher also considered the following in selecting the sample size: the chosen open/unstructured questionnaire method; and time availability of the research assistant to run the sessions. The questionnaire was anonymous and voluntary for participants. Should a participant have pulled out of a session, the researcher would have requested a substitute, willing participant in order to make up the chosen sample size. It must be noted that no participant left a session once they had started completing their questionnaire.

For the supervisory employees group (stratum) of the population, a higher ratio of sample-to-population size was desired by the researcher. This was because this group of the population was much smaller (8) than the operational employees group (96). The researcher determined a sample size for supervisory employees to be 5, which gave a sample-to-population size of 62.5%. The reason for a higher ratio than the operational employee sample size was that a 33.3% ratio would have given a sample size of 3 (rounded up). This would have been considered too small by the researcher to obtain enough responses on supervisors' perceptions for discussion.

3.4.6 Questionnaire Design

Table 1 in Chapter 2.5 is the consolidation of the literature review for the perception elements to be surveyed by the unstructured questionnaire. Each perception element was categorised into one of the selected four process improvement change factors. Table 1 is reshowed below for easy reference.

Table 1: Table of Process Improvement change factors and associated Perception Elements.

Process Improvement change factor	Perception Element
Leadership Behaviour	Leadership Commitment
	Coaching by Leaders
Social System Change	Work Organisation
	Roles & Responsibilities
	Performance Measurement
Effectiveness of Change	Quality of Process Change
	Acceptance of Process Change
Employee Involvement & Empowerment	Involvement in Solution
	Involvement in Problem Resolution
	Escalated Issues Resolution

In designing an unstructured questionnaire that aimed to ask open questions to participants to achieve objectives (2), (3) and (4), some common errors in questionnaires were considered as highlighted by Mouton (2008):

- No piloting or pre-testing is done
- Using ambiguous or vague words
- Using double barrelled questions that combine two questions in one
- No thought into sequence of questions
- Asking about matters which the respondents have no knowledge of
- Asking questions that leads the respondent towards a certain response
- Poor layout of questionnaire
- Length of questionnaire too long
- Using threatening or sensitive questions

Considering the above, common errors and the perception elements to be surveyed in Table 1, a draft questionnaire was compiled as seen in Appendix A. The questions for operational employees and supervisory employees were separated due to the potentially sensitive question regarding the participant's manager (or leader). To avoid participant confusion, questions were separated so that the participant answered the questions referring to their direct line manager. For clarity, the operational employee's manager was the first line manager and the first line manager's manager was the cell manager. Cell managers were not included in the scope of the research. All questions were the same, apart from the sensitive manager differentiation in question 1 of Appendix A.

3.4.7 Questionnaire Validity

In order to ensure validity of the unstructured questionnaire in Appendix A, three approaches as outlined by Goddard & Melville (2007) were considered:

- Criterion-related Validity
- Construct Validity
- Content Validity

Content Validity was chosen as the most applicable method of testing the questionnaire's validity. Criterion-related and Construct Validities are more applicable to a structured questionnaire with variables and comparable instruments respectively according to Goddard & Melville (2007). Goddard & Melville (2007) also highlight that the content validity method is applicable when the researcher has no related, qualitative instrument with which to compare the selected instrument. Goddard & Melville (2007) recommend the researcher to gather expert opinion on each question in the chosen instrument to determine whether or not it actually tests what it is supposed to. Goddard & Melville (2007) also advise that the expert should agree that the questions, as a whole, constitute a valid and representative test.

The researcher decided to obtain opinion feedback from both external and internal experts. The researcher felt that using an external, credible expert would be sufficient in ensuring the

questions were valid as a research tool to investigate the perception elements. The credentials to back this view of the external expert are given below. The researcher also notes that he didn't have any other Master's level experts in reach that could offer a secondary, external critique of the draft questionnaire. The researcher was of the view that the two internal experts would especially contribute in assessing the validity of the questionnaire relative to the literacy and capability levels of the operational and supervisory employees of the case study.

3.4.7.1 External Expert Feedback

The first external opinion was received by a friend of the researcher who is an Industrial Psychologist at the South African Military Psychological Institute. This expert holds a Masters in Arts (MA) in Industrial Organisational Psychology, and has 4 years of experience in the field of Industrial Psychology. The external expert was selected based on their deep understanding of employee behaviours and leadership traits. They were also selected based on their experience of research methods in their own Master's degree.

Appendix B shows the external expert's feedback on each question in the right hand column, followed by the researcher's updated questions in red text that resulted from the feedback. In terms of an overall feedback on the questionnaire, Appendix C shows the email response from the external expert, with comments on the research proposal and the questionnaire in general.

3.4.7.2 Internal Experts Feedback

The researcher conducted a feedback session with two Performance Engineers who work in the plant of the chosen case study. They were chosen to provide feedback on the adjusted questionnaire based on their experience in improvement initiatives, and close interaction with operational employees in the plant. The researcher asked them to check the questionnaire for sensitivity of the sequence of questions and to ensure the questions were not threatening or inappropriate to the target participants. These requests were made by the researcher based on Bryman (1989) suggesting that the researcher be sensitive to the order of questions so as to ease the respondent into the questionnaire through simple, non-threatening questions. The researcher also requested the internal experts to specifically check the appropriate sequence of the questions in the questionnaire. This was to allow the participants' to ease into the start of the questionnaire with simple questions, before more complex questions appeared.

Key feedbacks from the pilot study were the sequencing changes to the order of questions, and the edit to the original question 3. Feedback on proposed changes to the draft questionnaire from the internal experts is shown in Appendix D.

3.4.8 Reliability

Malhorta (2007) refers to the extent to which a scale produces consistent results if repeated measurements are made. Similarly, Phelan & Wren (2006) describe reliability as the degree to which an assessment tool produces stable and consistent results. Trueman (2016), states

that although unstructured questionnaires are beneficial in allowing participants to say in their own words what is important to them, a limitation is that the data is difficult to measure. Trueman (2016) indicates that understanding the responses can be done by allocating the answers to categories (or themes) by linking participants' responses that are not identical. Trueman (2016) cautions that the unstructured questionnaire method could be considered unreliable if: (1) the procedures to collect the data are unsystematic; (2) the results are not quantified; and (3) there is no way of replicating the qualitative study.

Considering the above limitations of the unstructured questionnaire method to reliability, the researcher implemented the following counter measures to ensure as high reliability as possible:

- The questionnaire sessions each followed a systematic, repeated process in a consistent environment as described in detail in 3.4.11. This process is repeatable if the questionnaire were to be used in future case studies.
- Participants' answers were allocated to themes and sub-themes for each question relative to the perception elements tested. This step ensured participants' answers were measurable and comparable.
- Results were quantified by displaying the theme and sub-theme occurrences in Manhattan charts in the Results chapter.
- The researcher believes the allocated themes were succinct enough that they can be re-used if the questionnaire was used in a different case study. An example is the theme: 'Teamwork Improved'.

3.4.9 Final Questionnaire Design

Following the two-stage questionnaire validity steps, the final questionnaires to be used in the questionnaire sessions are shown in Appendices E and F for operational and supervisory employees respectively. The researcher selected the questions shown in Table 2 to assess the perception elements for the corresponding process improvement change factors. These questions were specifically chosen based on the literature review and research objectives. The researcher's background knowledge of the chosen case study plant was also a factor in the final questionnaire design. Questions were worded as open as possible, to give the participants' freedom to state their unbiased perceptions in their own words.

As seen in Table 2, questions 2 and 7 were used to assess more than one perception element. For example question 7: 'If you raised a problem with the new process, how well was the problem dealt with? Please give an example.' In this question, *Leadership Commitment* was assessed as an employee would typically escalate a problem to their supervisor (i.e. their first line manager or cell manager) and await some action. By asking how well it was dealt with, the researcher could assess whether the leader was involved in resolving the problem within

the new process or not, according to the participant. The perception element of *Escalated Issues Resolution* was also assessed through question 7, by simply noting whether an employee's escalated problem was resolved or not. This would assess how an empowered employee perceived his/her escalation to be taken seriously or not.

A further double-purpose question is Question 2: 'How was the up-front communication to you before the process changes were made?' This question assessed the perception elements of: *Acceptance of Process Change* and *Involvement in Solution*. The acceptance of the changes communicated, and the perception of involvement in the solution were to be assessed.

Table 2: Questions used to assess Perception Elements of Process Improvement change factors.

Process Improvement change factor	Perception Element	Question Number
Leadership Behaviour	Leadership Commitment	13, 7
	Coaching by Leaders	3
Social System Change	Work Organisation	9
	Roles & Responsibilities	8
	Performance Measurement	10
Effectiveness of Change	Quality of Process Change	1, 4, 5, 11
	Acceptance of Process Change	2, 12
Employee Involvement & Empowerment	Involvement in Solution	2
	Involvement in Problem Resolution	6
	Escalated Issues Resolution	7

3.4.10 Questionnaire Sessions

Questionnaire sessions were split between supervisory and operational employees. The researcher made use of a research assistant to facilitate the questionnaire sessions. The researcher coached the research assistant on the questionnaire and the research project in general to ensure she was equipped to answer any questions. The researcher joined the first questionnaire session at the introduction of the questionnaire to ensure the research assistant was comfortable to proceed. The researcher was not present during the actual answering of the questionnaires but was available should the assistant have needed to clarify anything. For the remaining sessions, the research assistant managed the sessions independent of the researcher.

Due to the participants working shifts, multiple questionnaire sessions were held with groups of between 4 and 10 for operational employees. Two sessions were needed to cover the 5 supervisory participants. Questionnaire sessions were held in a meeting room in the case study plant with the research assistant present at all times during the sessions. The research

assistant handed participants a participant letter of consent as seen in Appendix G. This letter of consent was necessary for ethical reasons, and emphasised that the questionnaire was anonymous and voluntary. The research assistant was tasked by the researcher to read through the participation letter of consent with the participants and to answer any questions of uncertainty. The research assistant was also tasked to emphasise that the questionnaire was voluntary, anonymous and for the purpose of research only. The research assistant was then tasked to hand willing participants their own questionnaire in an individual envelope. Appendix E shows the questionnaire for operational employees and Appendix F shows the questionnaire for supervisory employees.

Although the questionnaire was typed in English (the business language of the case study company), the research assistant was requested by the researcher to translate questions into the participant's first language if they didn't properly understand a question or felt more comfortable in their mother tongue. The research assistant reported that for some employees this was necessary, but that the majority were comfortable with English. The research assistant also reported that there was an incidence where she transcribed a participants' answer from their first language into English on the questionnaire as the participant was not literate in English. This service given by the research assistant ensured all questionnaires had English answers, but gave participants comfort in understanding and answering the questions in their first language, if they preferred to do so.

Participants were given as much time as they needed to write their open, unstructured responses to the 13 questions. The research assistant reported that sessions ranged from 25 to 60 minutes, with supervisory employees typically finishing quicker than operational employees. The research assistant was tasked to ensure that once participants completed their questionnaires, they placed them back in the envelopes, sealed them, and handed them to her.

3.4.11 Qualitative Data Analysis

The selection of the unstructured, open questionnaire method, as discussed in 3.4.3, gave the opportunity for participants to answer questions in their own words, as highlighted by Goddard & Melville (2007). This method of data collection required a different approach to the analysis of the data in comparison to the structured questionnaire method that would use a scale system to easily classify and statistically analyse participants' answers. In evaluating the literature for the most appropriate method to analyse the participants' open, unstructured answers, the researcher selected the Content Analysis method with specific use of Thematic Content Analysis.

According to Bryman (1989), Content Analysis involves the quantification of themes in wordy documents in order to establish their frequency and variation in relation to other variables. McNeill (1990) states that when material needs to be considered systematically, the most common way of doing it is through Content Analysis. According to McNeill (1990), it is a method of analysing contents of documents or other non-statistical material in a way that

statistical comparisons can be made between them. The researcher applied the Thematic Content Analysis method to this research project in the following steps:

1) Written answers to the questionnaire, by the 32 participating operational employees, were captured into a spreadsheet that included details of: the date completed by the participant; job title; and status of permanent or temporary employment. The 5 supervisory employee's questionnaire answers were captured in a similar, but separate spreadsheet with only the date of completion captured along with answers to all 13 questions. These raw answers are found in the two respective tables of Appendix J.

2) The researcher classified the participants' answers into themes relative to the relevant perception element for a particular question. Table 3 shows examples of how operational employees' answers to questions 7 and 9 were allocated themes by the researcher. These themes were derived from the researcher's own interpretation of the answers given relative to the perception element/s tested in the questions. In certain questions where participants elaborated in detail, the researcher wanted to represent this detail in more than just a theme but felt it inappropriate to report the detail in long phrases. The researcher therefore chose to add sub-themes to questions where this was the case. The process of tallying these sub-themes and presenting them as Manhattan charts was the same as for themes. This process was repeated for all operational and supervisory participants' answers. [Please note that the answers and themes in Table 3 were not the only answers and themes for these questions and are merely used to explain the process of theme allocation by the researcher.] All theme occurrences summed to the participant totals of 32 and 5 respectively, unless stated explicitly ahead of a certain graph in the Results chapter.

Table 3: Example of Method of Thematic Content Analysis Applied to Questionnaire Results

Question	Perception Element Tested	Participant Answers	Researcher Allocated Theme
7) If you raised a problem with the new process, how well was the problem dealt with? Please give an example.	<i>Leadership Commitment</i>	"Very well. We had to add people on the machine - two packers and two rappers in a rotating manner to make it easy to do the job."	Leadership Commitment Evident
		"It went well as my FLM called me to meet our manager and project team to let us know that we must have own printer to avoid printing wrong labels".	Leadership Commitment Evident
		"I have a problem to report on the spine because our line manager never take something written on Q form."	Leadership Commitment Lacking
		"We raised issues but they were ignored."	Leadership Commitment Lacking
9) What impact do the process changes have on teamwork in the 'spine'?	<i>Work Organisation</i>	"We going high because we take the work seriously and rely on team-work"	Teamwork Improved
		"We are working together to change everything."	Teamwork Improved
		"The team-work with the spine is not good because communication is bad."	Teamwork is Bad
		"There is no team-work when the spine controllers have gone for recharge of batteries of the forklift they don't let us know."	Teamwork is Bad

3) Once themes were allocated to each participant's answer, a tally figure of "1" was allocated next to each theme occurrence in MS Excel. Table 4 shows the tally table of question 9, as an example of the tally allocation to themes from answers to all 32 operational participants' questionnaires. This process was repeated for all 13 questions for both operational and supervisory employees respectively. Where an answer was interpreted by the researcher as 'misunderstood', the researcher allocated them as 'Misunderstood Question' and highlighted it in red text.

Table 4: Example of Tally Table of Theme Occurrence for Operational Employees' Answers to Question 9.

Participa	Operational Themes	Count
1	Misunderstood Question	1
2	Teamwork Improved	1
19	Teamwork is Bad	1

4) The frequency of theme occurrence's per question for operational and supervisory employees were then pulled into their own respective pivot tables in MS Excel. Each pivot table was filtered from highest frequency to lowest for data used for display as a Pareto-style, Manhattan chart. Table 5 shows an example of the pivot table to theme occurrence frequencies to question 9 for operational employees. The Pareto-style, Manhattan charts are displayed for each question for operational and supervisory employees in the Results chapter of this report.

Table 5: Example of Pivot Table for Theme Frequency of Operational Employees' Answers to Question 9.

Row Labels	Sum of Count
Teamwork Improved	24
Teamwork is Bad	4
Misunderstood Question	4
Grand Total	32

3.5 Limitations to the Methodology

According to Goddard & Melville (2007), the advantages of questionnaires over interviews are that: (1) the respondents may not be as inhibited in answering sensitive questions; and (2) they are easier to obtain feedback from multiple respondents. However, in the case of the selected, unstructured questionnaire method with the research assistant present, the research assistant would need to be aware of answering questions from participants in a way that encourages the actual perception of the participant to be written. A risk highlighted by Goddard & Melville (2007), is that questionnaires don't always guarantee participant honesty. The researcher aimed at encouraging a relaxed, objective atmosphere of the questionnaire sessions by using a neutral research assistant. This was to avoid any perceived manipulation of participant feedbacks and avoid potential participant dishonesty. The researcher is aware that although a research assistant is used to run the questionnaire sessions, it is a limitation to the results that the researcher is also an employee in the case study plant. This limitation is the negative side to the opportunity highlighted for savings on research time and cost.

The researcher acknowledges that the sample participants each have their own unique perceptions – an unavoidable limitation within the chosen research methodology. This means that a different group of participants, of the same sample size, within the same population,

wouldn't yield exactly the same themes, sub-themes, and occurrences thereof. This limitation leads to a further limitation that the case study participants are not an exact reflection of the plant population or the South African, labour-intensive industry as a whole. However, as previously discussed it provides an insight into an example where this approach has been used and the surveyed participants' perceptions.

Some of the questions were open ended enough that participants may not have given responses that could be linked to the tested change factor and perception elements. To offset this limitation such that the results could reflect this limitation, the researcher classified a participant's answer as 'Misunderstood Question'. In a particular perception element to be discussed in the results section, the researcher explicitly stated that the entire question did not yield results for the perception element to be tested.

The process of theme and sub-theme allocation by using the thematic content analysis method is an additional limitation of the study. The researcher and literature acknowledge this but felt that it was the most applicable method of analysing long, wordy answers to an unstructured questionnaire. To mitigate this limitation, the researcher selected succinct and repeatable themes and sub-themes when processing the participants' wordy answers.

4 CASE STUDY BACKGROUND

4.1 Introduction

The chosen, case study plant produces the majority of the company's dairy products that the Central Business Unit (CBU) supplies to its Southern African market. The plant has 17 packaging lines that supply an outsourced, chilled and ambient warehouse through two tunnels in the wall separating the plant and the warehouse.

Management identified a need to resolve a bottleneck area in the plant where pallets of finished product were congesting between the production lines and the outsourced warehouse. This congestion also caused problems in the business ERP system that accounted for pallets produced and pallets received by the outsourced warehouse. The next sections seek to describe the context, changes made, and operational outcomes of the improvement project.

4.2 Initial Process Conditions

This section seeks to describe the context and problems experienced in the area of the plant in focus before flow efficiency methodology changes took place.

Figure 9 shows a representation of the initial conditions of the area of the plant in focus. The geographical scope of the process to be improved was as follows: Palletisation of the finished products was done by manual labour, and transport of the pallets through to the outsourced warehouse was done by the company forklifts through the '*spine*' (passage behind the packaging lines) to the staging area in the two tunnels. Information flow (aligned to pallet flow) took place through the use of a sticker label unique to each pallet of finished product. A '*spine controller*' operator would initiate the printing of a unique pallet label by a mobile, scanner device. He would walk to the four available sticker label printers to collect the sticker labels and stick them on the allocated pallet. The four printers were spaced across the initial 15 packaging lines, behind the palletising areas of each line. Two spine controllers controlled the pallet label application of the original 15 packaging lines. One spine controller would be responsible for the packaging lines either side of the tunnels. The company forklift driver would collect the pallet of finished product from the palletising area of a packaging line; scan the label on the pallet with their mobile scanner device; place the pallet of finished product against the wall in the spine first or take it straight to the tunnel. The decision of either taking the pallet of finished product to the wall in the spine, or straight to the tunnel, lay with the company forklift driver. The warehouse forklifts on the discharge end of the tunnel would collect the pallets of finished product, and place them in the storage bays of the chilled and ambient warehouse according to the warehouse management system's allocated storage location.

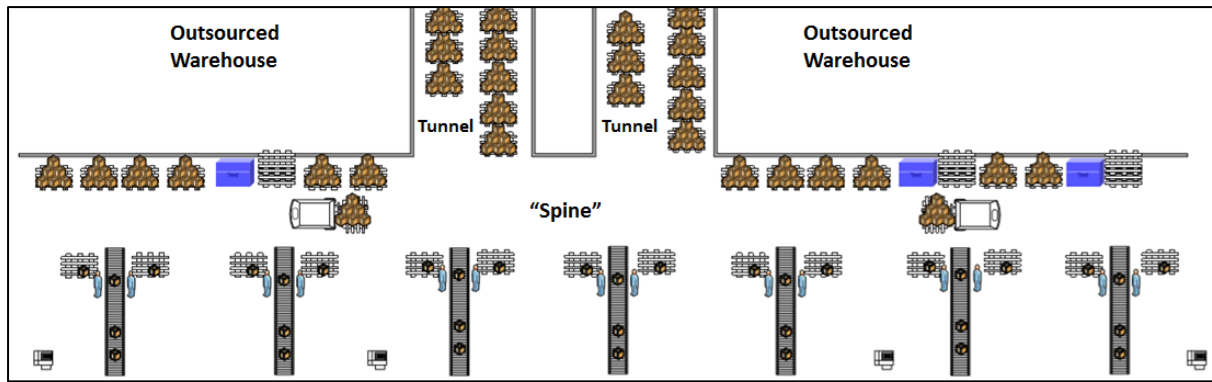


Figure 9: Diagram of Initial Conditions of Plant “Spine” Area.

4.3 Flow Problem Description

Figure 10 shows the flows of finished product pallets, empty pallets and palletising materials before any changes were made by plant management. The flow of finished product is represented by the red arrows. The flow of palletising materials is represented by the brown arrows, while the flow of stacks of empty pallets is represented by dark blue arrows.

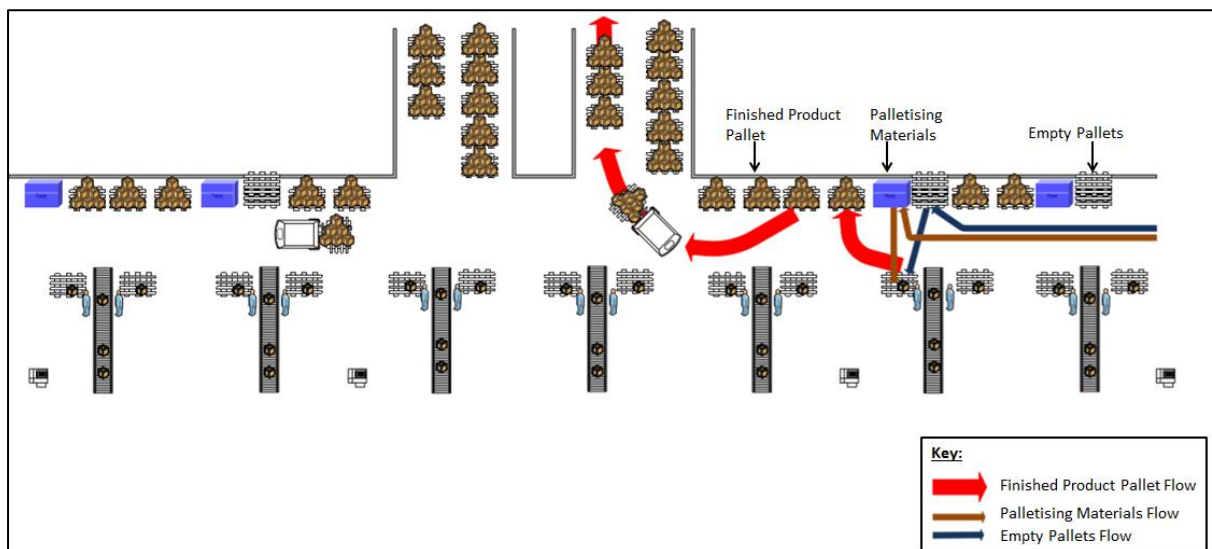


Figure 10: Diagram of Initial Condition Flows in ‘Spine’ Area.

There were two main problems identified by plant management that occurred in the initial conditions flow:

- Problem 1:** Poor flow of pallets between the palletisation area of each packaging line, and the tunnel discharge, where the outsourced warehouse forklifts collected finished product pallets. Many pallets were placed in an unofficial buffer area against the wall in the spine causing unwanted pallet congestion. This congestion also resulted in an unsafe area in the spine for all people working or passing through.
- Problem 2:** Printing of pallet sticker labels was out of control. Too many of the wrong labels were printed and applied to pallets. Many labels were also overprinted leading to misalignment of physical pallets to what was declared on the company ERP

system. This led to approximately R4million of unaccountable 'system' losses of finished product in the financial (also calendar) year of 2014. This problem led to a large amount of time being spent on a daily basis by Front Line Managers and Cell Managers to investigate and fix, where possible, the incorrect system information flow.

4.4 Flow Problem Root Causes

To solve problems 1 and 2, management embarked on a series of systemic, problem solving sessions. A multi-level, problem solving team was formed in August 2014 involving: cell managers, first line managers, general workers, forklift drivers, spine controllers, and members of the plant finance and performance teams. The systematic method that plant management used to find the root causes of the flow problems comprised of the following steps:

- Define the problem using 5W1H (Bicheno & Holweg, 2009)
- Establish current and target conditions for the process (Rother, 2010)
- Draw/map out the process flow
- List possible root causes using fish bone (*Ishikawa*) diagram (Bicheno & Holweg, 2009)
- Conduct 5 Why analysis on verified possible causes (Bicheno & Holweg, 2009)

From the problem solving process, the problem solving team found the following root causes to problems 1 and 2:

- 1) **Crates Packing Orientation:** The orientation of pallets when general workers were packing returnable crates was 90 degrees to that of the tunnel access orientation. This was because it was more efficient for a general worker to pack a pallet in this way, but led to pallets being temporarily stored against the spine wall. This required the forklift to rotate the pallet of finished product 90 degrees before transporting it to the tunnel.
- 2) **High Walking Time:** The time taken for the spine controller to collect a printed sticker label, and place it onto the pallet of finished product, before a company forklift could collect the pallet, was too long. The limited number, and inefficient location of printers, was found to cause the high amount of walking.
- 3) **Poor Palletising Ergonomics:** Excessive bending and walking around a pallet by general workers was time consuming and had poor ergonomics. This resulted in high variation of palletising times across packaging lines and different general workers.
- 4) **Poor Storage of Palletising Materials:** The allocated area for palletising materials storage caused clutter against the wall of the spine, as it mixed with empty pallets and finished product pallets. This chaotic situation also meant general workers had to walk across the spine to collect empty pallets and palletising materials.

- 5) **Waiting and Double Handling of Finished Product Pallets in Tunnel:** Pallets of finished product, waited varied periods of time in the tunnel before being collected by the outsourced warehouse forklifts. This would cause the company forklifts to place pallets against the wall in the spine as a buffer for the downstream bottleneck. In addition, double-handling of pallets occurred in the tunnel by company forklifts, as they pushed the pallets along the floor in the tunnel to make them available to the outsourced warehouse to collect.

4.5 Flow Problem Solutions

After identifying the root causes to the two problems identified, the problem solving team decided to follow the flow efficiency methodology for its proposed solutions. This was a newly shared methodology to the problem solving team, although relatively simple to understand. An ‘initial conditions’ time study was conducted for the flow times of pallets from randomly selected packaging lines through the affected plant area. Appendix I shows the results of the initial pallet time flow data collected by the problem solving team.

Following the time study, five changes were proposed and later implemented by the plant management team, with support from the initial problem solving team. The changes made are represented by the numbers and green component highlights in Figure 11. The descriptions and reasons for each change proposed were as follows:

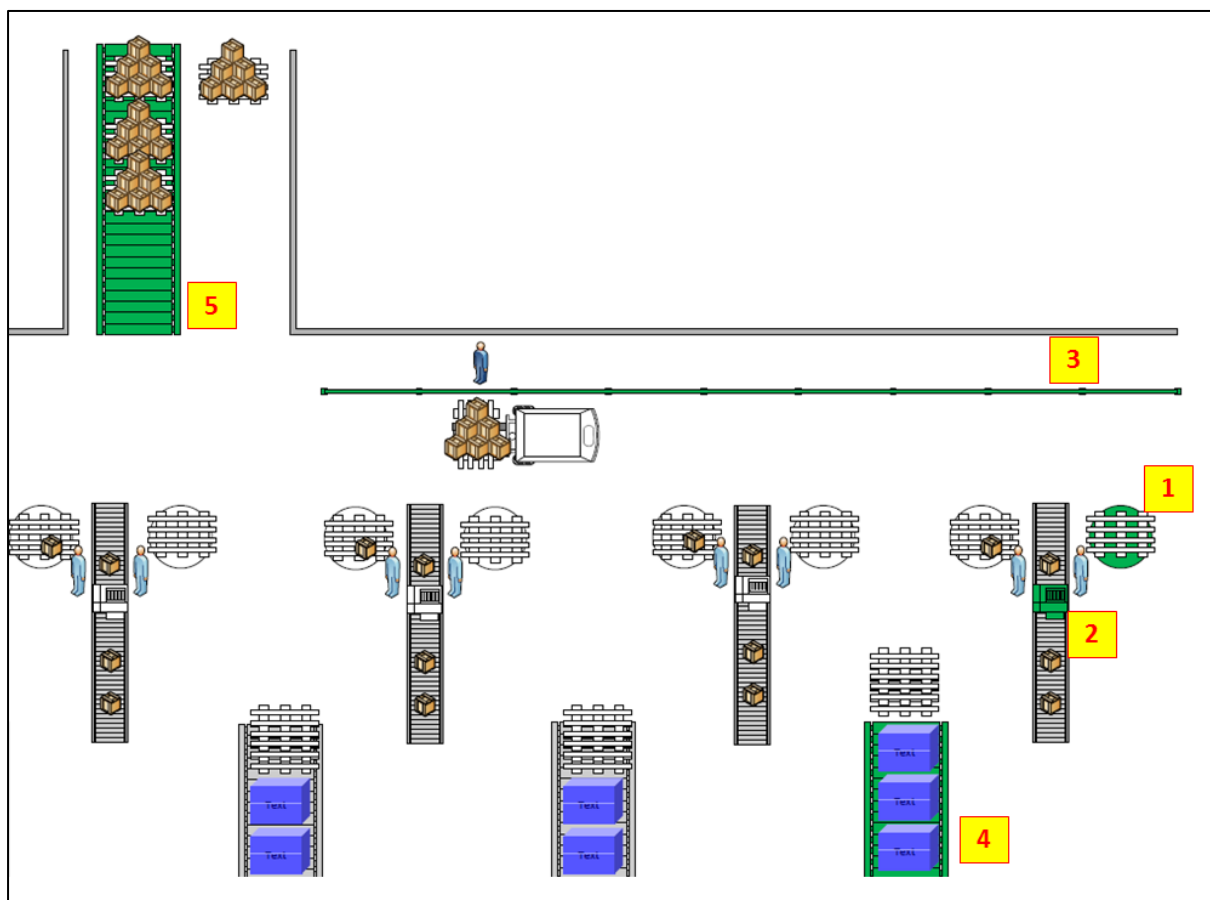


Figure 11: Diagram of Changes made in Spine Area.

1) Palletpal: Each packaging line would have a '*Palletpal*' device which improves ergonomics and reduces time of the manual palletising operation. This would save on overall palletising time and reduce operator strain. This solution was intended to be a counter-measure for root cause (3).

2) Sticker Label Printer: Each packaging line would have its own sticker label printer mounted above the final packaging line conveyor. This was intended to minimise mistakes of the wrong label being printed, when initially only 4 printers were available across 15 packaging lines. The task of sticking labels on pallets was transferred to the general workers. This would eliminate the walking around by spine controllers to collect and stick labels to finished-product pallets. This solution was intended to be a counter-measure for root cause (2).

3) 'Spine' Barrier: The spine passage would have a series of bollards (poles) forming a barrier approximately one pallet width away from the wall. This would serve two purposes: the first was to prevent pallets being stored against the wall as an unofficial buffer between the palletising area and the tunnel - thereby ensuring direct transport from palletising to the tunnel by forklift. The idea was that there would be no space for the forklift to move, should the driver decide to drop a pallet in the passage next to the barrier. The second purpose was to create a safe walkway through the spine passage for pedestrians. This solution was intended to be a counter-measure for root cause (4).

4) Materials Conveyors: To install light-duty, gravity feed roller conveyors between each packaging line that would hold palletising materials (such as cardboard layer boards) and empty pallets. This was necessary as empty pallets and pallets of palletising materials were initially stored against the wall, which caused obstruction to flow. These also reduced the distance between supplied materials and the palletising general workers. This solution was intended to be a counter-measure for root cause (4).

5) Heavy-Duty Tunnel Conveyors: To install 4 x heavy-duty, gravity-feed, roller conveyors into the tunnels – 2 per tunnel. Each heavy-duty conveyor would have accumulation space of 5 pallets (the same accumulation space as without it). This would allow for gravity-flow of pallets between the infeed and discharge of the tunnel. They would also reduce the time, and potential product damage, spent by the company forklifts pushing pallets through the tunnel, along the floor. This solution was intended to be a counter-measure for root cause (5).

Root cause (1) was resolved by a separate project outside the scope of the case study spine improvement project. The capex project of conversion to one-way packaging across all packaging lines resolved root cause (1) by a change in the way pallets of finished products were packed.

It must be noted that the combination of the five physical flow changes was intended by management to improve the flow of pallets through the scope of the process. The five

changes had to work together to strive towards management's desired result of improved flow and more accurate printing of sticker labels. Figure 12 shows an overview of the improved flow of finished product pallets, palletising materials and empty pallets in the spine area.

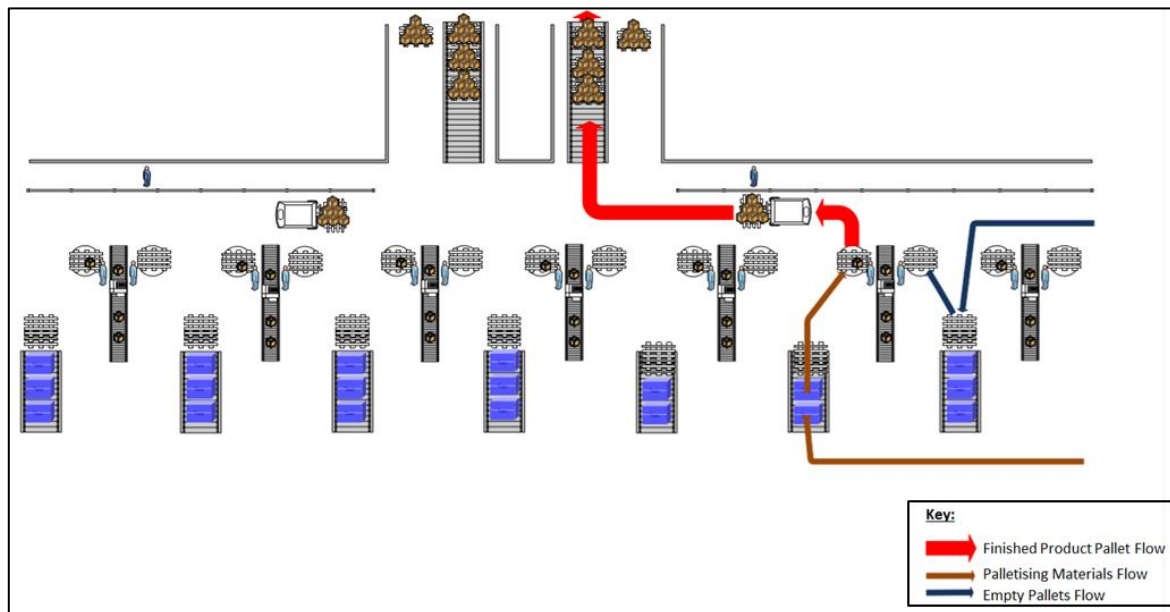


Figure 12: Diagram of Flows after Process Changes in Spine Area.

It must be noted that between August 2014 (the time of initial conditions) and November 2015: two additional packaging lines were installed at one end of the packaging hall, and one was moved laterally 30m to join the two new packaging lines. The five process changes were implemented across the three affected packaging lines, except for the 'palletpals' which were included only on one of the three. Palletpals had been implemented on 5 packaging lines out of a total of 17 due to limited capex. The remaining packaging lines were expected to receive their allocated palletpals in February 2016. Similarly, only one heavy-duty conveyor per tunnel was installed due to limited capex funds. All remaining changes were implemented across all packaging lines by November 2015.

4.6 People Change Communication

Changes to general workers, spine controllers, and forklift drivers tasks were outlined in 3.3.5 as part of the process flow changes. Management embarked on a change management communication roadshow to inform these employees on the changes to come, purpose of the changes, and to get their feedback. See Appendix H for the change presentation that was presented in January and February 2015, first to the union shop steward committee for buy-in. Thereafter, the presentation was presented to approximately 80% of the spine controllers, general workers and forklift drivers working in the spine. All employees were not covered due to time constraints and rotating shifts, making availability of employees limited in some cases.

4.7 Process Conditions after Changes

Management conducted a follow up time study in November 2015 on pallet flows after the five process changes were made. Appendix I contains the time data for the random samples of pallet flows through the process, after process changes were made. Appendix I also shows the median time data of the pallet flows through the process before and after the process changes were made. Further calculations of flow efficiency per sample-pallet are graphically displayed in graphs in Appendix I for 'before' and 'after' the process changes.

Management made the following process observations when reflecting on the process changes:

- Average time of pallet transfer through the process generally decreased
- Flow efficiency of pallets generally increased
- Variation of pallet transfer times generally decreased
- Accuracy and control of the printing of sticker labels improved

Management were happy with improved process performance as they had more control over the process, both physically and on the ERP system. Management noted visible improvements in the spine area by observing less bottlenecks and improved housekeeping.

5 RESULTS

5.1 Introduction

This section includes the analysis of results of the thematic content analysis performed on the answers to the questionnaire completed by operational and supervisory employees of the given case study. Although the research method used was a qualitative method of an unstructured questionnaire, the researcher chose to display common themes and sub-themes per perception element in the form of Manhattan charts. The researcher split themes from sub-themes in the data of certain questions based on the relevance of the answers to the questions asked. Therefore, where responses were directly related to the question, they were categorized as a 'Theme'. Where responses had additional details that were of interest but not directly related to the question asked, they were then categorized as 'Sub-Themes'. Theme and sub-theme charts are aimed at providing clear overview of the type and prevalence of themes and sub-themes present in the matrix of responses in Appendix J. The researcher felt this approach was necessary to make sense of the 32 operational and 5 supervisory employees' responses to the 13 questions. These analysis results will lay a foundation for the discussion with reference to the research motivation and objectives to follow in the Discussion of Results chapter to follow.

5.2 Process Improvement Change Factors

5.2.1 Process Improvement Change Factor: Leadership Behaviour

Leadership Behaviour is one of the selected four Process Improvement change factors identified in Table 1 of the Literature Review that was to be researched through the questionnaire. It consists of two perception elements: *Leadership Commitment* and *Coaching by Leaders*.

5.2.1.1 Leadership Commitment

Leadership Commitment was assessed through questions 7 and 13. Results of the common themes for the answers to question 7 are shown in Figures 13 and 14 for operational and supervisory employees respectively. Similarly, results of the common themes for the answers to question 13 are shown in Figures 15 and 16.

A reminder of question 7: 'If you raised a problem with the new process, how well was the problem dealt with? Please give an example.' For the top theme of 'Leadership Commitment Evident', many of the responses from operational employees described how they had an obstacle preventing them from doing their job effectively, and this problem was resolved through some solution that would have needed leadership's support in executing. For 'Leadership Support not Explicit', operational employees' responses showed that they had a problem but they didn't explicitly describe if and how it was resolved. This may indicate that, either they resolved the problem among themselves (without leadership support), or they were still living with the problem. This is different to the theme 'Leadership Support Lacking', where the employees' responses explicitly describe cases where they needed

support from leadership in resolving a problem, but they got no feedback or the problem was not resolved.

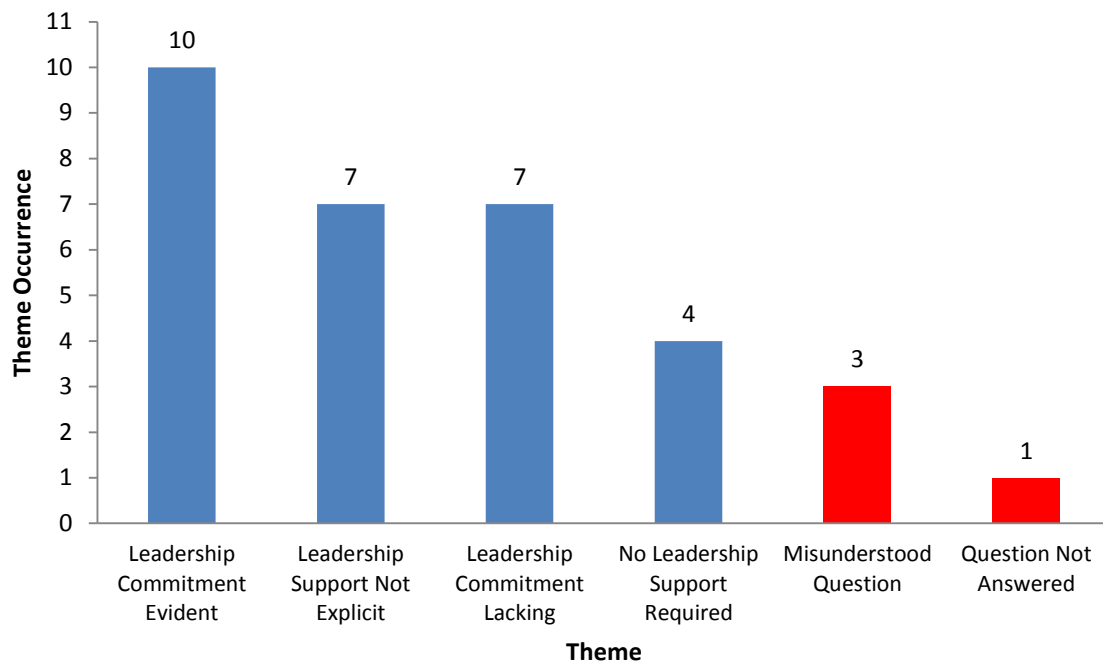


Figure 13: Common Themes for answers by Operational Employees to Question 7.

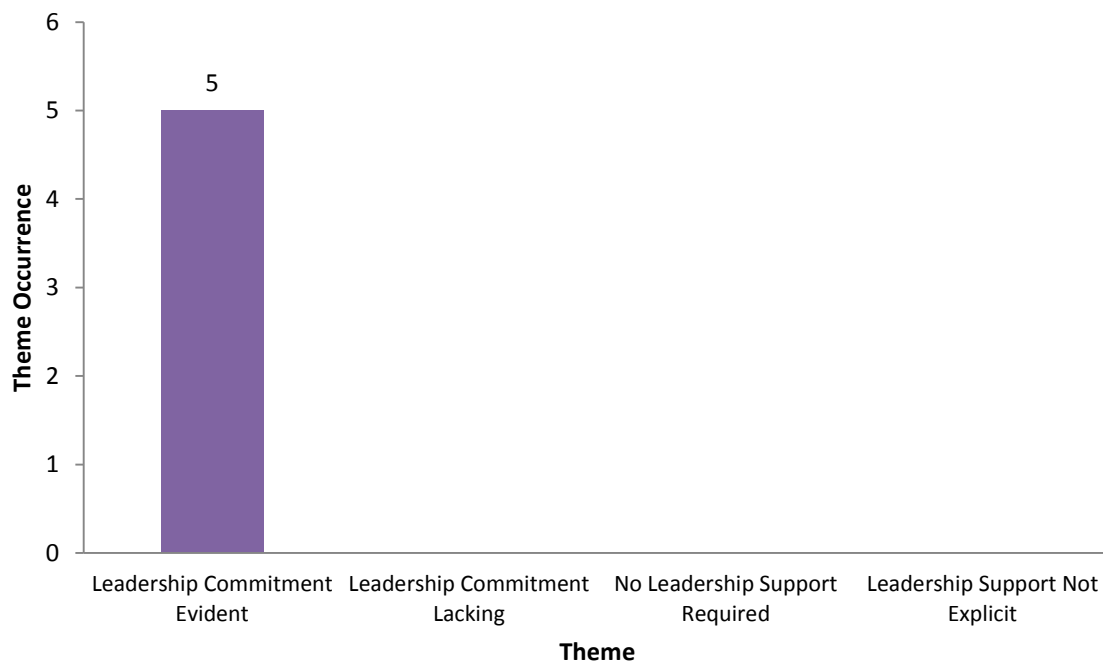


Figure 14: Common Themes for answers by Supervisory Employees to Question 7.

For supervisory employees' responses to question 7, it was clear that each of them had a scenario to describe where they had leadership support in implementation of changes or resolving a problem. Each of the five supervisory employees elaborated on the scenario and how it was resolved.

A reminder of question 13 for the operational employees' questionnaire: 'How was your *cell manager's* attitude towards the process changes?' For supervisory employees, question 13 was worded as: 'How was your *first line manager's* attitude towards the process changes?' For the top operational employee's theme of 'Leadership Commitment Evident', many of the employee's responses alluded to their supervisor helping and encouraging them. These responses typically followed statements regarding their supervisor having a positive attitude towards the changes. For those responses that were categorised as 'Leadership Commitment Lacking', many of the employees' responses alluded to them feeling overworked and their supervisor not showing concern for this by not adding extra people to help. This perception by these employees led them to making statements about their supervisor having a bad attitude or treating them harshly.

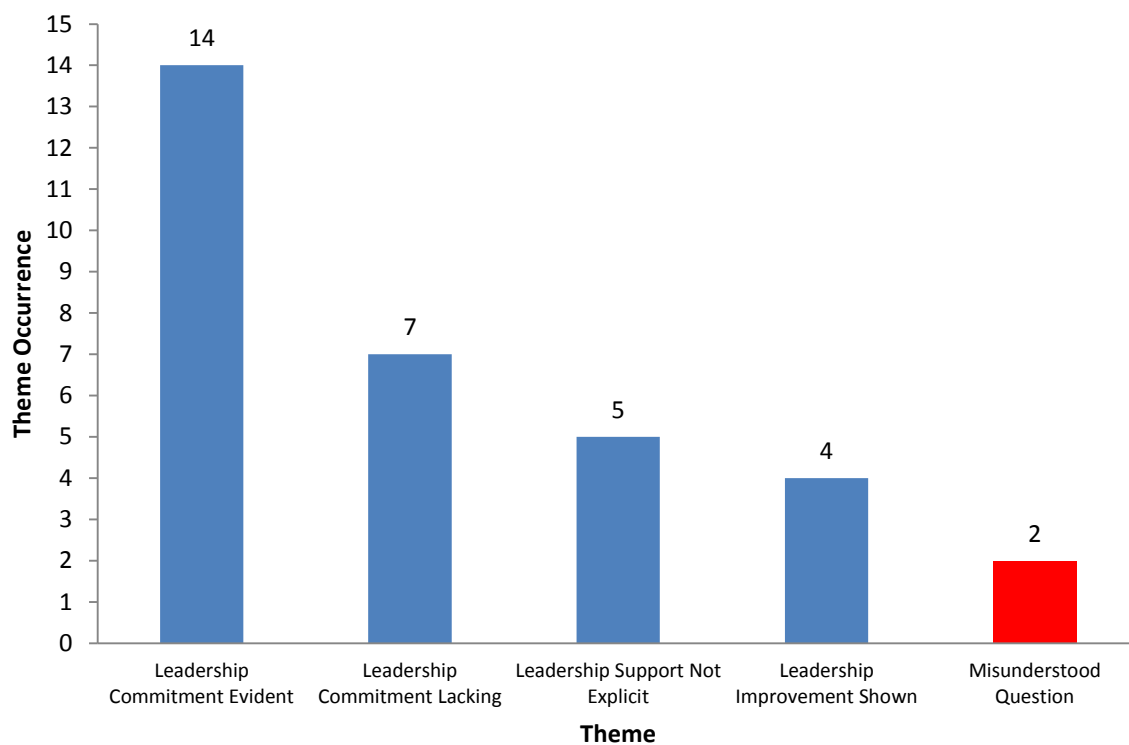


Figure 15: Common Themes for answers by Operational Employees to Question 13.

For supervisory employees' unanimous theme to question 13, 'Leadership Commitment Evident', the perception of feeling supported and guided in the changes by their managers was evident in all five responses. Supervisory employee's didn't give explicit examples, but just described their general feeling towards their managers' support.

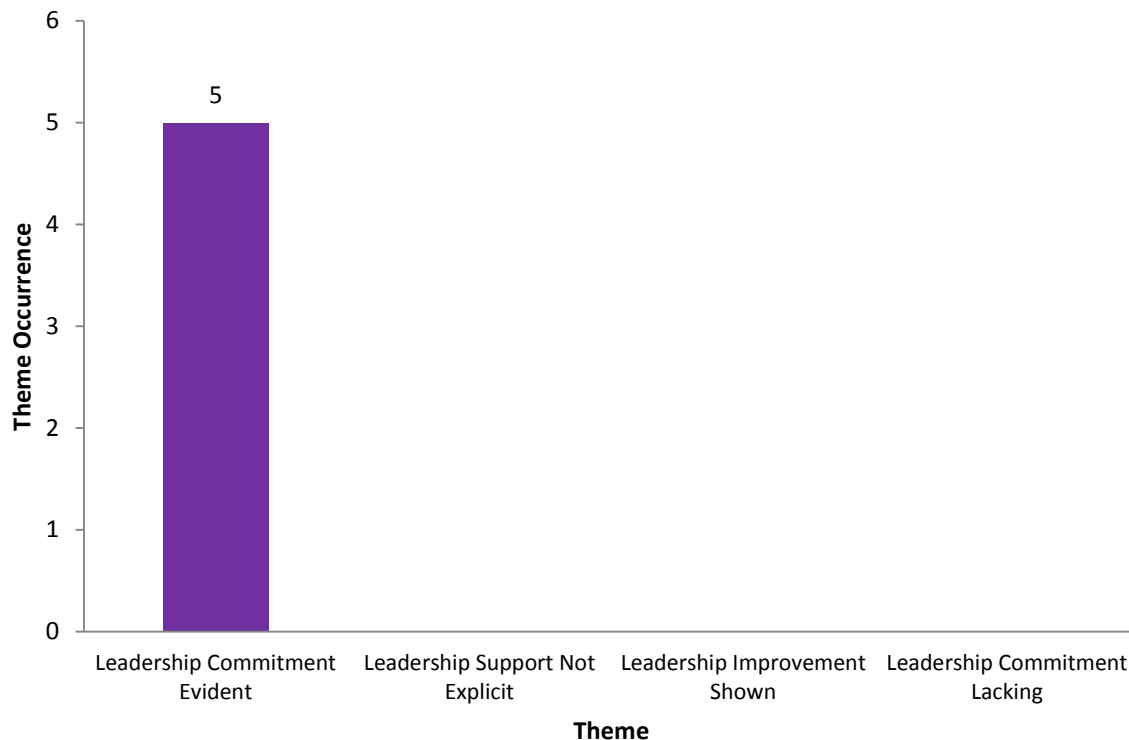


Figure 16: Common Themes for answers by Operational Employees to Question 13.

5.2.1.2 Coaching by Leaders

Coaching by Leaders was assessed through question 3. Results of the common themes for the answers to question 3 are shown in Figures 17 and 18 for operational and supervisory employees respectively.

A reminder of question 3: ‘How did you learn to use and work in the new process?’ The researcher intentionally left out a reference to leaders in Question 3 in order to allow for open, unscripted responses. Despite this, the top operational employees’ theme of ‘Leaders did Coaching’ included responses that the changes became easy through either training by the project leaders in a classroom setting, or coaching on the job from their supervisors/leaders. Many of these responses included details of the tasks they perform, and that they felt capable to do it since the training or coaching received. There was a relatively high occurrence of the theme ‘Misunderstood Question’ from operational employees to this question. Some responses talked about why the process is hard for them (therefore not indicating if and how they learnt the new process); one response indicated the question was too open for them; while another discussed his self-improvement life lessons.

For supervisory employees’ top theme of ‘Leaders did Coaching’, the responses described how either project leaders or their managers coached them. Some responses indicated the tools of the new process they were coached on that enable them to do their job better.

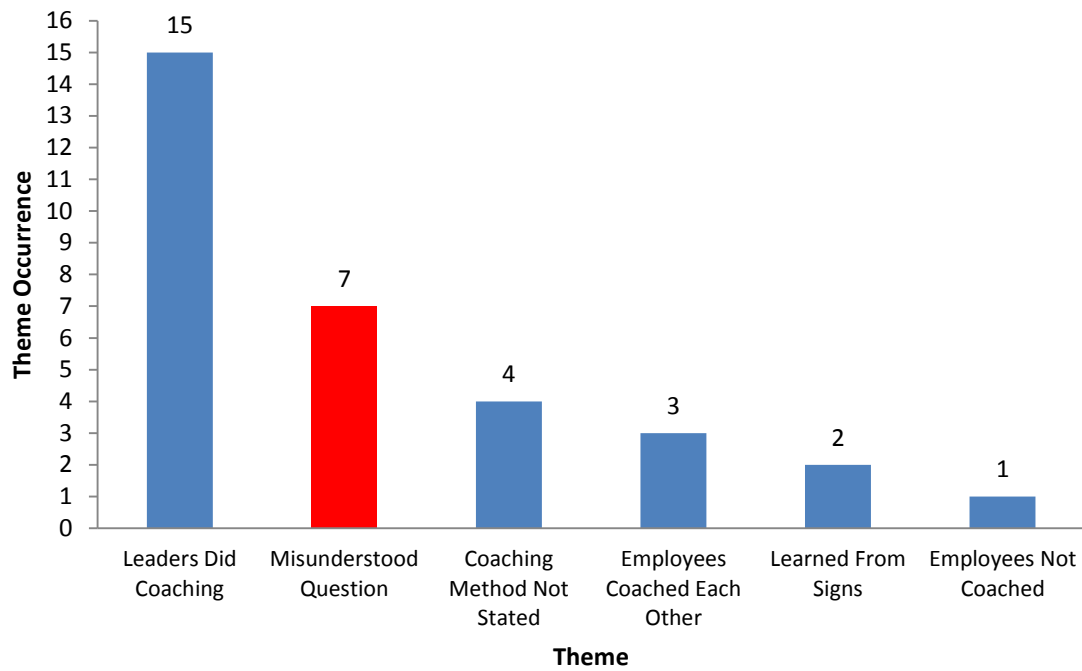


Figure 17: Common Themes for answers by Operational Employees to Question 3.

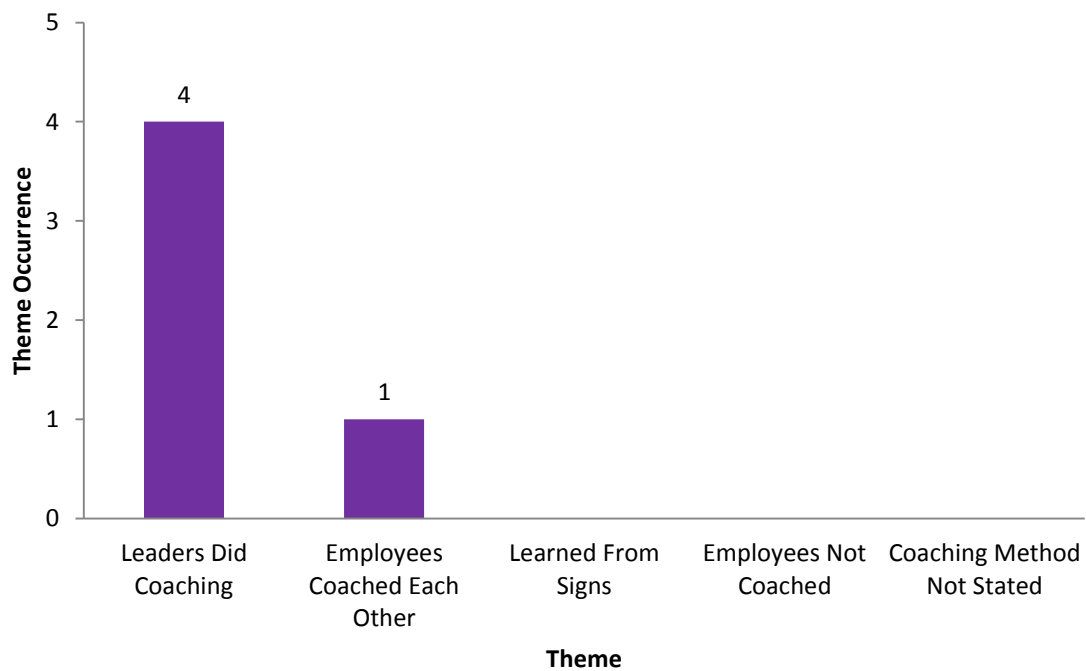


Figure 18: Common Themes for answers by Supervisory Employees to Question 3.

5.2.2 Process Improvement Change Factor: Social System Change

Social System Change is the second of the selected, four process improvement change factors, identified in Table 1 of the Literature Review, that was to be researched through the questionnaire. It consists of three perception elements: *Work Organisation*, *Roles and Responsibilities*, and *Performance Measurement*.

5.2.2.1 Work Organisation

Work Organisation was assessed through question 9. Results of the common themes for the answers to question 9 are shown in Figures 19 and 20 for operational and supervisory employees respectively. Figure 19a shows the sub-themes identified for those operational employees' responses that elaborated beyond the common themes shown in Figure 19.

A reminder of question 9: 'What impact do the process changes have on teamwork in the 'spine'?' For the top theme of 'Teamwork Improved' by operational employees in Figure 19, employees' responses described various ways how they experienced improved teamwork. Some responses described specific examples of when teamwork is especially better. For those who misunderstood the question, they referred to particular problem or improvement in the process but didn't allude to its link to teamwork improving or not. The researcher note that some responses' alluded to underlying sub-themes. As seen in Figure 19a, 4 participants described examples of improved communication between team members. These were associated under the main theme of 'Teamwork Improved' by the researcher in the analysis. Similarly, the sub-theme of 'We Work Safer' was also associated by the researcher under this same main theme. On the contrary, the sub-theme of 'Communication Can Improve' was associated under the main theme, 'Teamwork is Bad'.

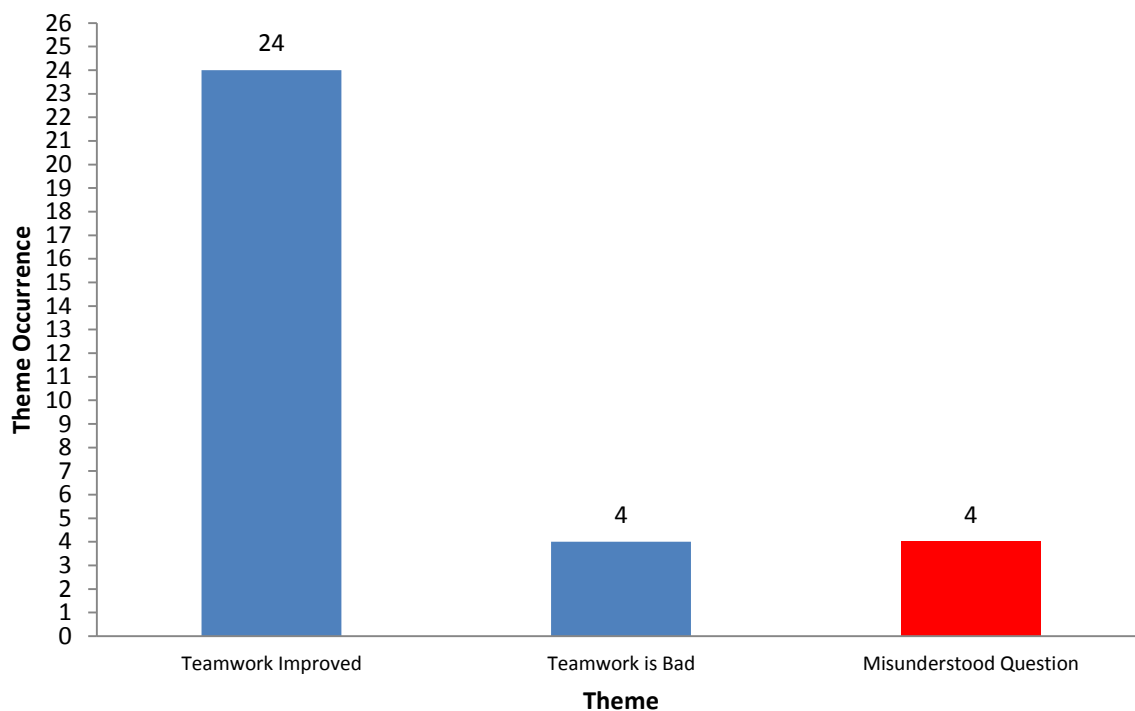


Figure 19: Common Themes for answers by Operational Employees to Question 9.

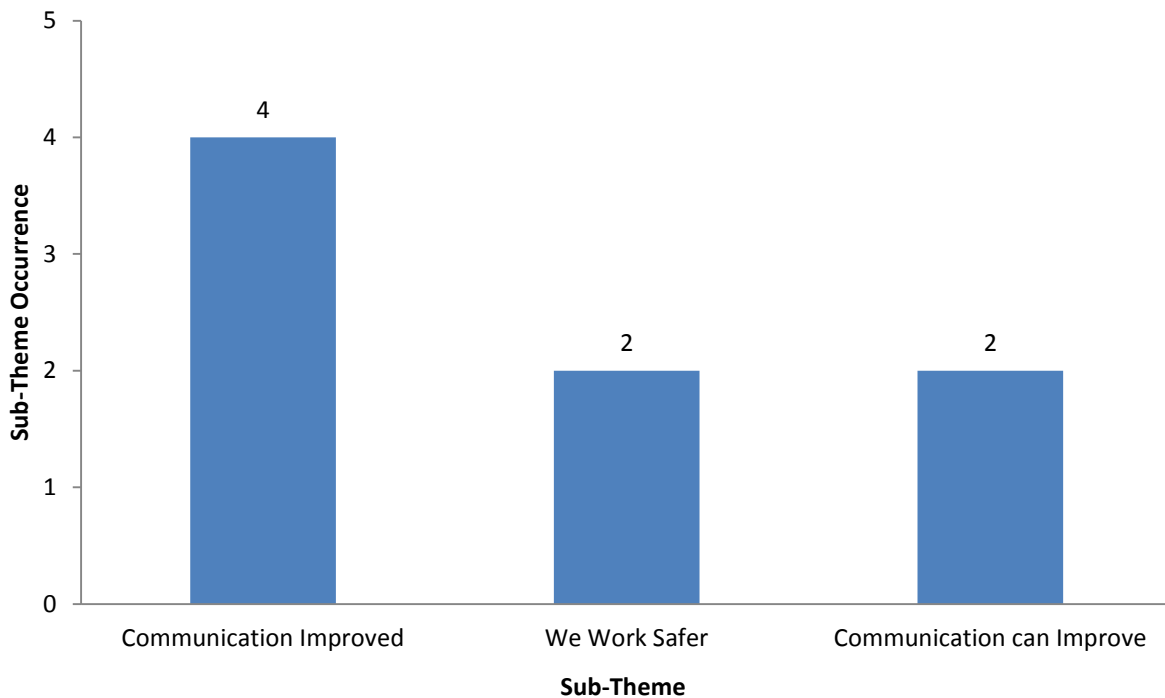


Figure 19a: Sub-Themes for answers by Operational Employees to Question 9.

For supervisory employees' unanimous theme of 'Teamwork Improved', the responses gave specific examples where they observed their team members having better teamwork than before the process changes. The supervisors generally took a helicopter view of the different roles in their team, and alluded to how they typically interacted better and more efficiently to improve teamwork.

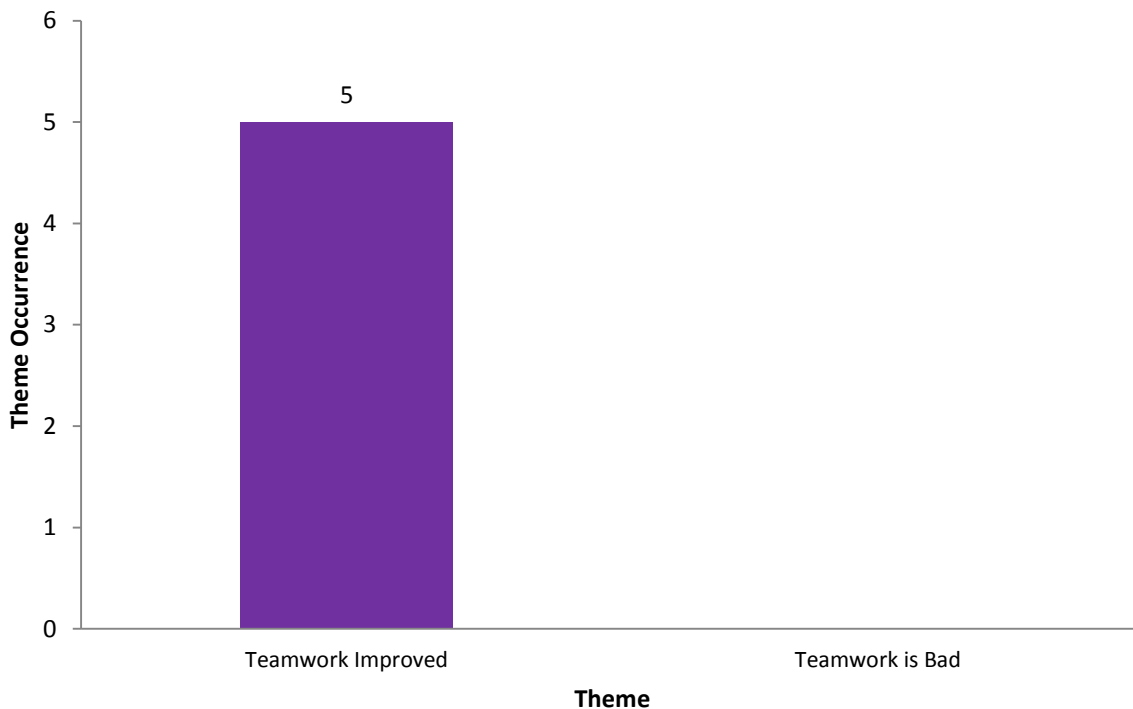


Figure 20: Common Themes for answers by Supervisory Employees to Question 9.

5.2.2.2 Roles and Responsibilities

Roles and Responsibilities were assessed through question 8. Results of the common themes for the answers to question 8 are shown in Figures 21 and 22 for operational and supervisory employees respectively. Sub-themes for operational and supervisory employees are shown in Figures 21a and 22a respectively.

A reminder of question 8: ‘How have your roles and responsibilities been affected since the process changes?’ For operational employee’s top theme of ‘Job Made Easier’, most of the responses gave examples of how the tasks within their roles were easier to do since the process changes, and not necessarily that their responsibilities had changed. For those who didn’t understand the question, their responses varied from observations they made of the product to customer complaints decreasing. It was difficult for the researcher to assign these responses to a theme correlating to the roles and responsibilities. For the top occurring sub-theme ‘Have to Work Harder’, most for the 5 responses in this theme described how the changes have made the process faster. Participants described how they had to work harder with no additional people to help. It is noted that 4 of the 5 responses for this top sub-theme came from general workers whose role it is to build the finished-product pallet.

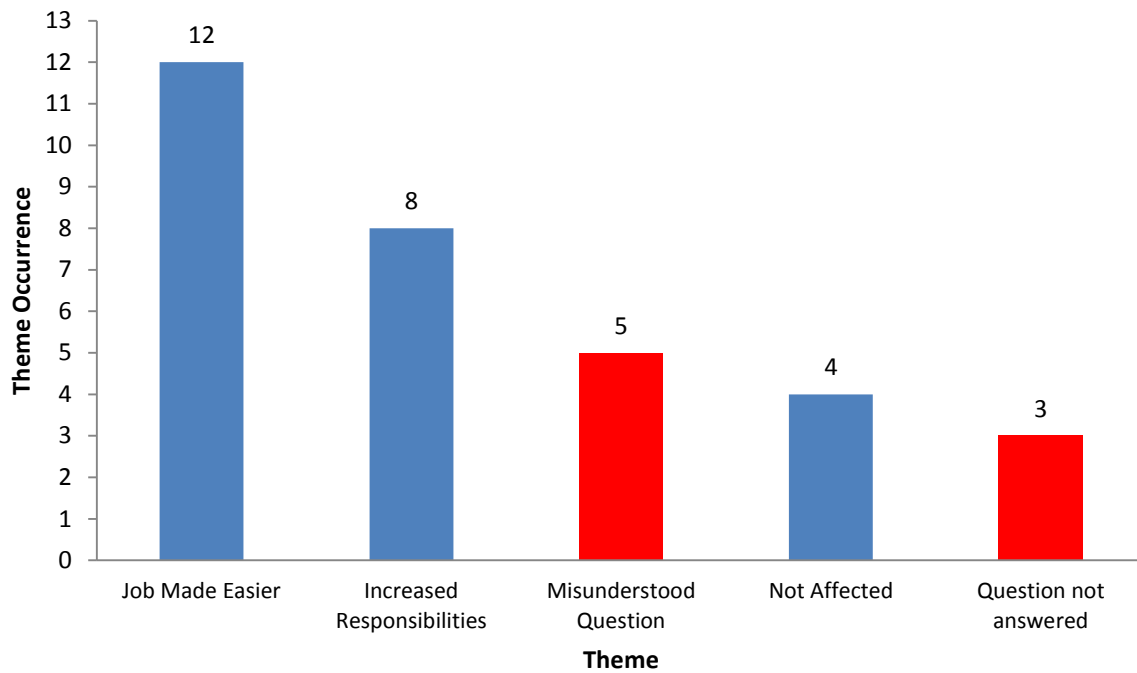


Figure 21: Common Themes for answers by Operational Employees to Question 8.

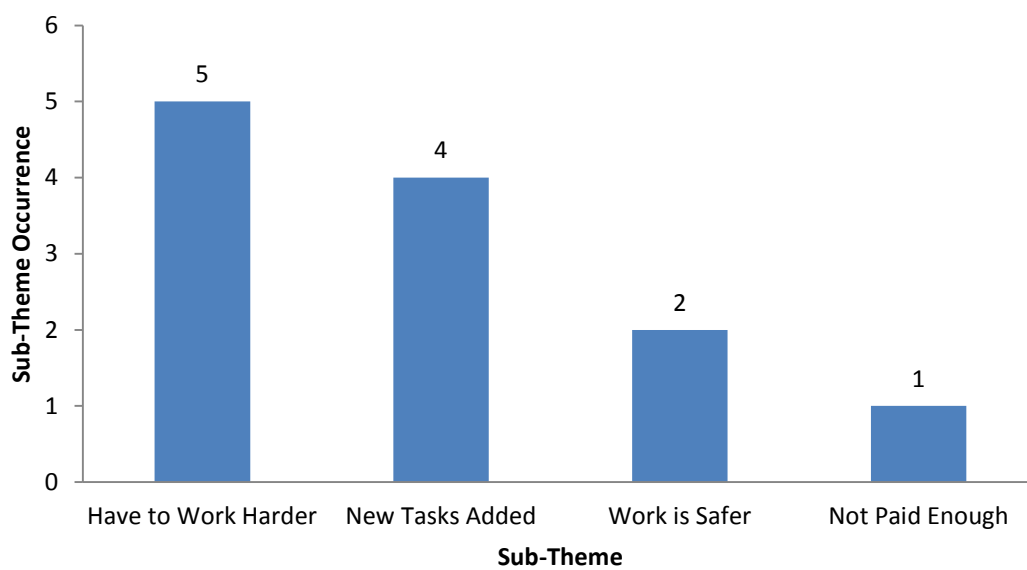


Figure 21a: Sub-Themes for answers by Operational Employees to Question 8.

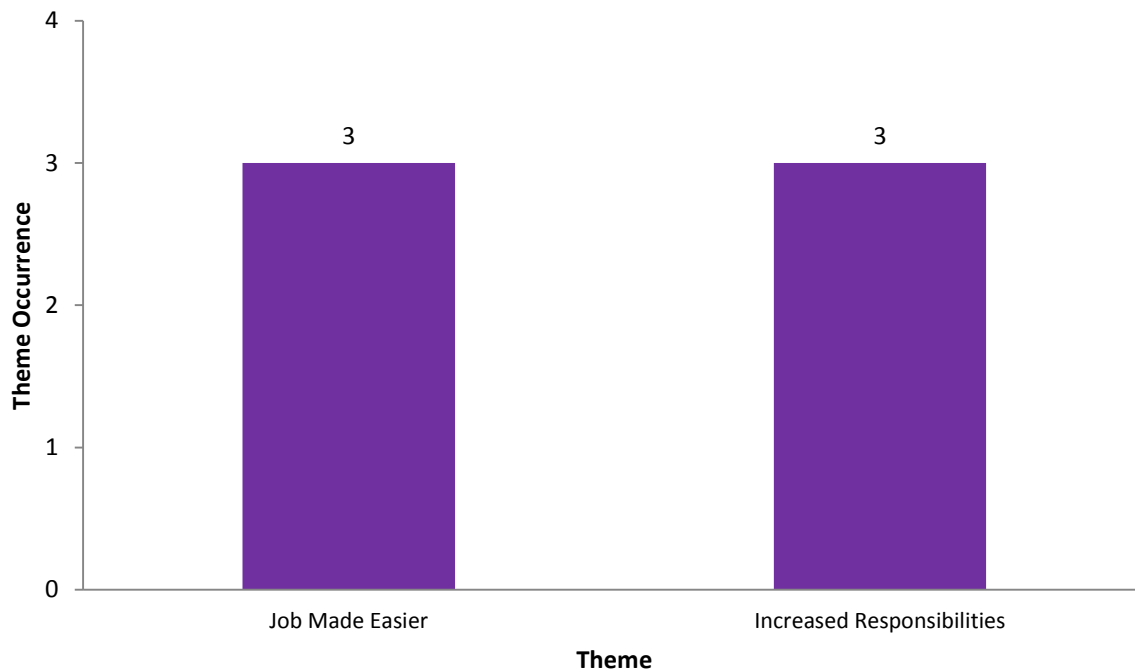


Figure 22: Common Themes for answers by Supervisory Employees to Question 8.

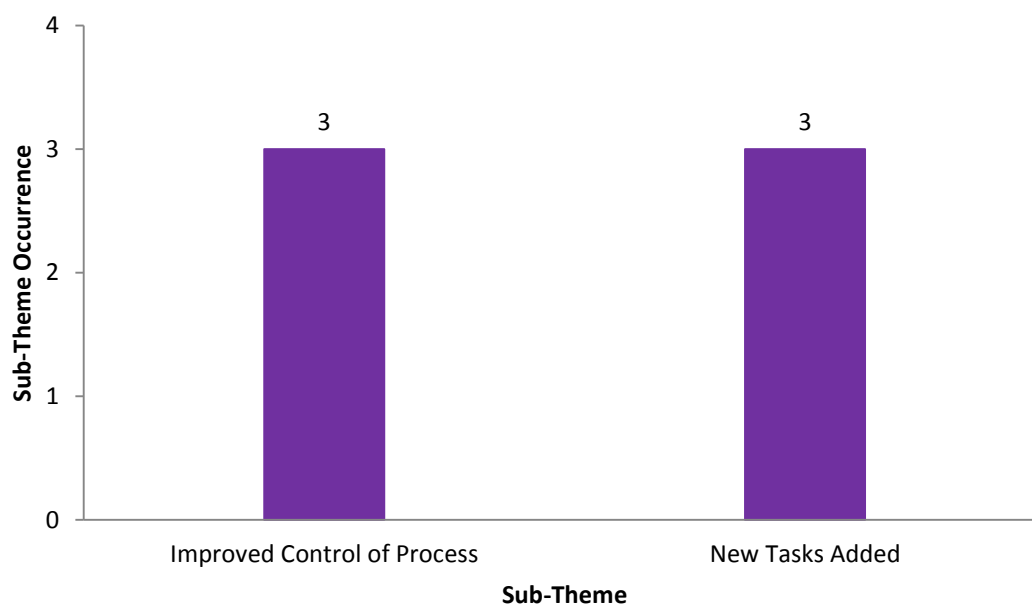


Figure 22a: Sub-Themes for answers by Supervisory Employees to Question 8.

For Supervisory employees' theme of 'Increased Responsibilities', they described how the process changes gave them new tasks to do, but that these gave them improved responsibility through a better approach to managing the area where the process changes took place. This is represented in sub-theme 'New Tasks Added'. For the theme 'Job Made Easier', supervisors explicitly described the report that enabled them to better control and manage the information flow of pallets through the specific area of the plant. This is expressed by the sub-theme 'Improved Control of Process'. Note that a total of 6 themes and sub-themes are tallied as one

of the supervisory participants gave an elaborate response that could be categorised across both themes and sub-themes.

5.2.2.3 Performance Measurement

Performance Measurement was assessed through question 10. Results of the common themes for the answers to question 10 are shown in Figures 23 and 24 for operational and supervisory employees respectively.

A reminder of question 10: ‘How has your individual performance measurement been affected by the process changes?’ For the top operational employees’ theme of ‘My Performance Improved’, responses ranged from indicating only that their performance had improved, to giving examples of specific process changes that enabled them to have better performance. Some responses even indicated that they were enjoying their jobs more since they felt their performance had improved. For those responses allocated the theme ‘My Performance Dropped’, most employees felt they were under more pressure since the process changes, and had less time to rest which resulted in them perceiving their performance to have dropped.

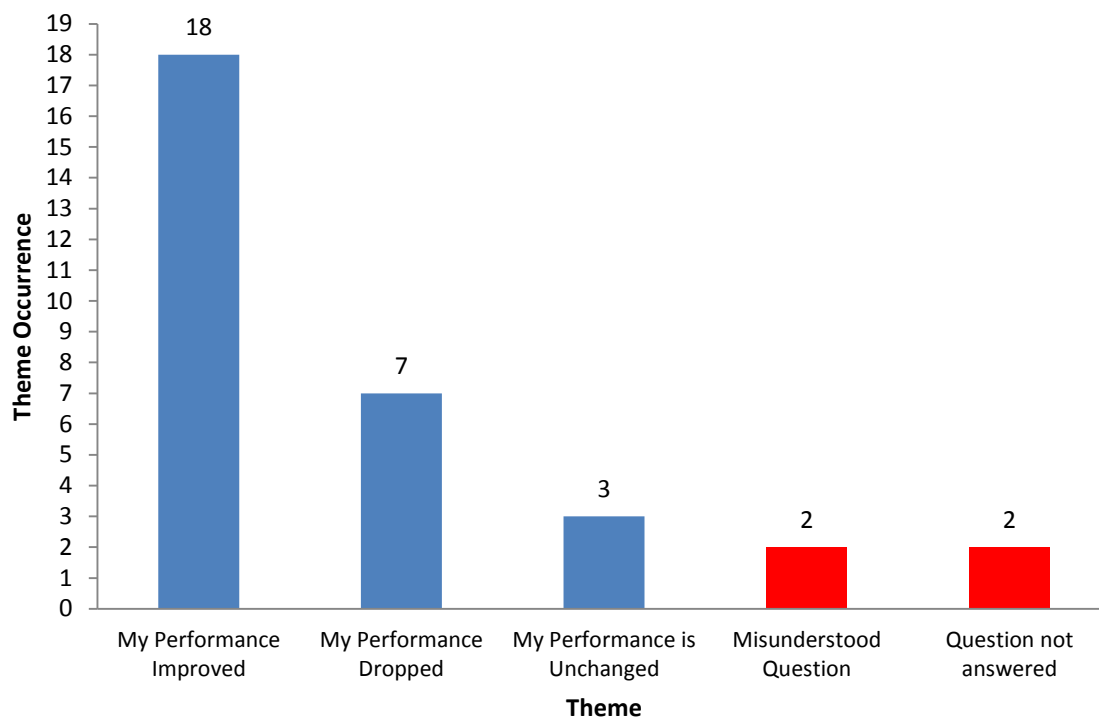


Figure 23: Common Themes for answers by Operational Employees to Question 10.

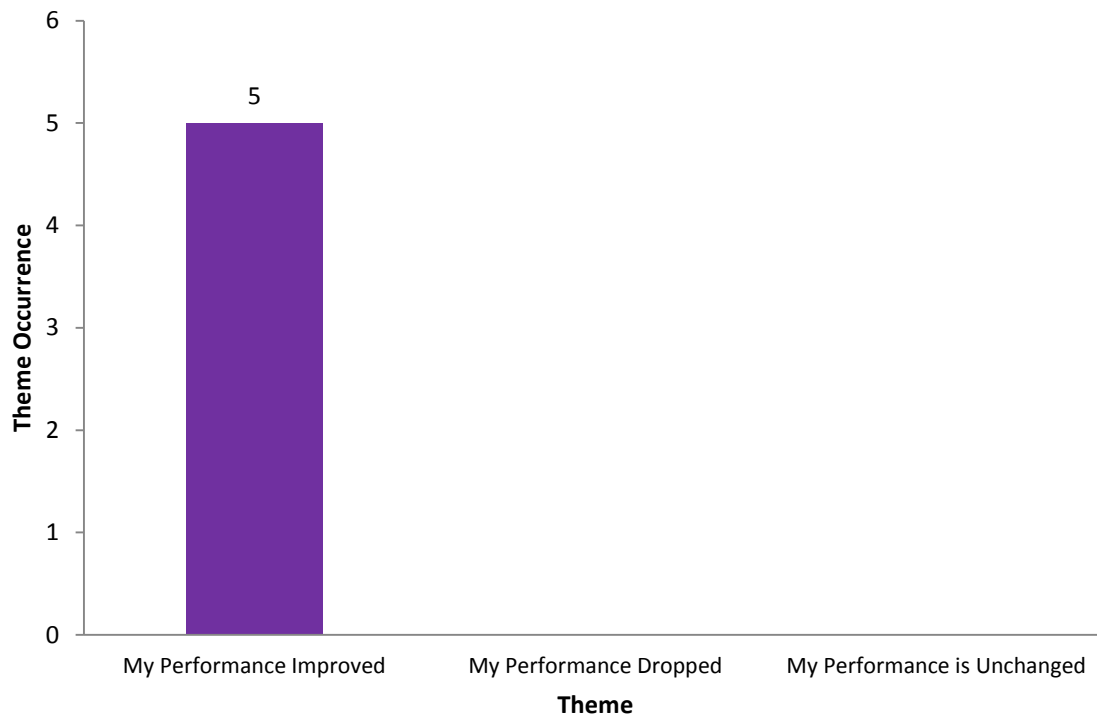


Figure 24: Common Themes for answers by Supervisory Employees to Question 10.

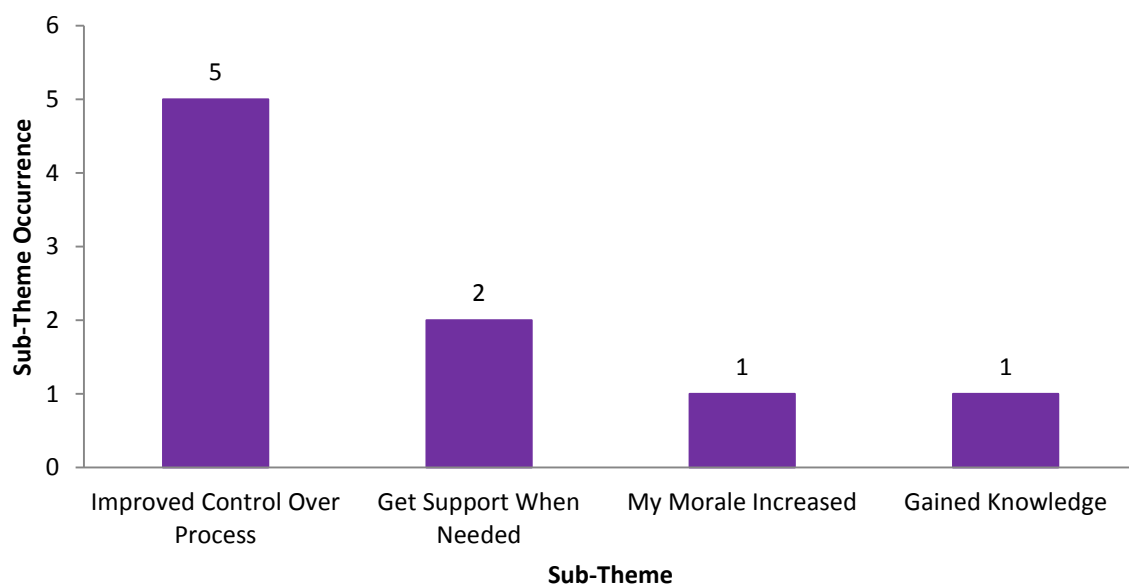


Figure 24a: Sub-Themes for answers by Supervisory Employees to Question 10.

For supervisory employees' theme of 'My Performance Improved', supervisors elaborated on various examples of how their performance improved. These are displayed as Sub-Themes in Figure 24a. The examples given ranged from technology improvements, to reduced losses and better monitoring of the information flow. Note that some supervisors gave more than one example of how their performance improved and hence the sum of sub-themes doesn't add up to 5.

5.2.3 Process Improvement Change Factor: Effectiveness of Change

Effectiveness of Change is the third of the selected four process improvement change factors, identified in Table 1 of the Literature Review that was to be researched through the questionnaire. It consists of two perception elements: *Quality of Process Change* and *Acceptance of Process Change*.

5.2.3.1 Quality of Process Change

Quality of Process Change was assessed through questions 1, 4, 5, and 11. Results of the common themes for the answers to questions 1, 4, 5, and 11 are shown in Figures 25 to 32 for operational and supervisory employees respectively. Sub-themes for question 4 are shown in Figures 27a and 28a for operational and supervisory employees respectively. Sub-themes for question 5 are shown in Figures 29a and 30a for operational and supervisory employees respectively.

A reminder of question 1: ‘What was the purpose of the process changes?’ It must be noted that many participants gave elaborate answers to this question leading to multiple themes for most participants. The researcher felt it appropriate for the nature of question 1, to collate all themes together without splitting responses into sub-themes. Therefore, as an anomaly in comparison to other questions, the sum of theme occurrences in question 1 does not add up to the sum of 32 and 5 operational and supervisory employee participants respectively. For the top operational employee’s theme of ‘Improve Flow’, most responses included statements about pallets moving faster, or pallets not waiting around in the process since the changes were made. Some gave specific examples of the area in the process where they observed this to occur. For the second top theme of ‘Make Job Easier’, employees were less descriptive. The responses typically just included the perception that the work is easier, but didn’t allude to many examples of what made it easier. It must be noted that many employees gave responses indicating both ‘Improve Flow’ and ‘Make Job Easier’ themes.

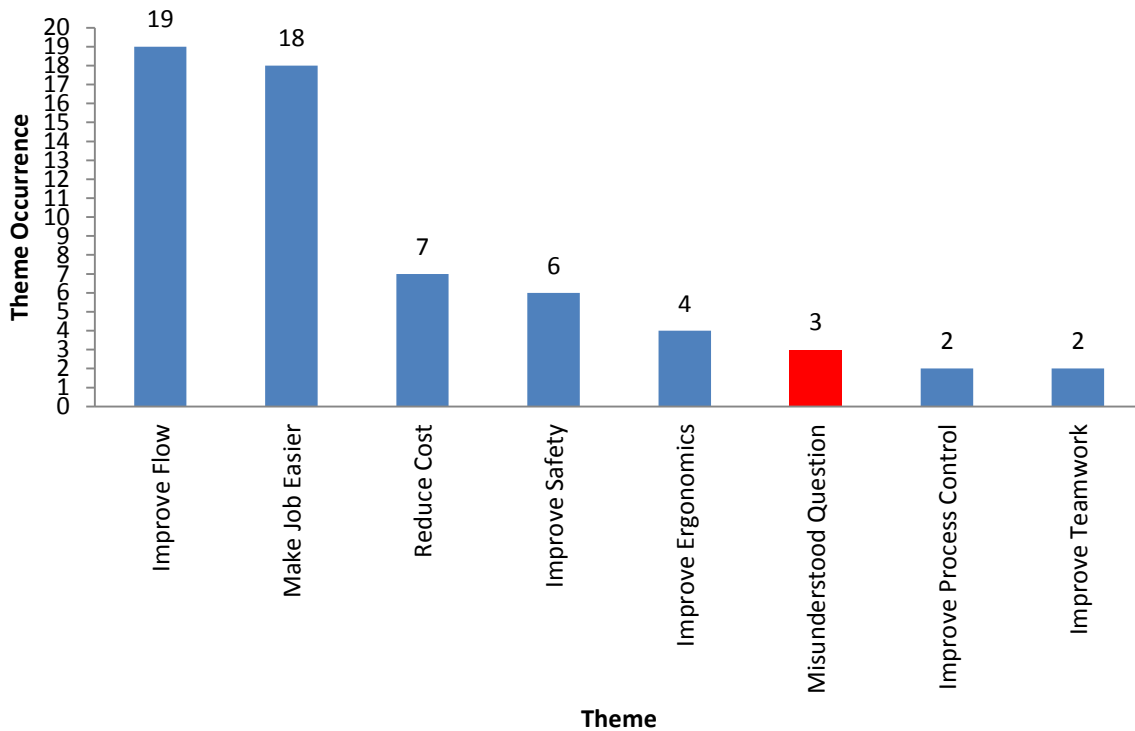


Figure 25: Common Themes for answers by Operational Employees to Question 1.

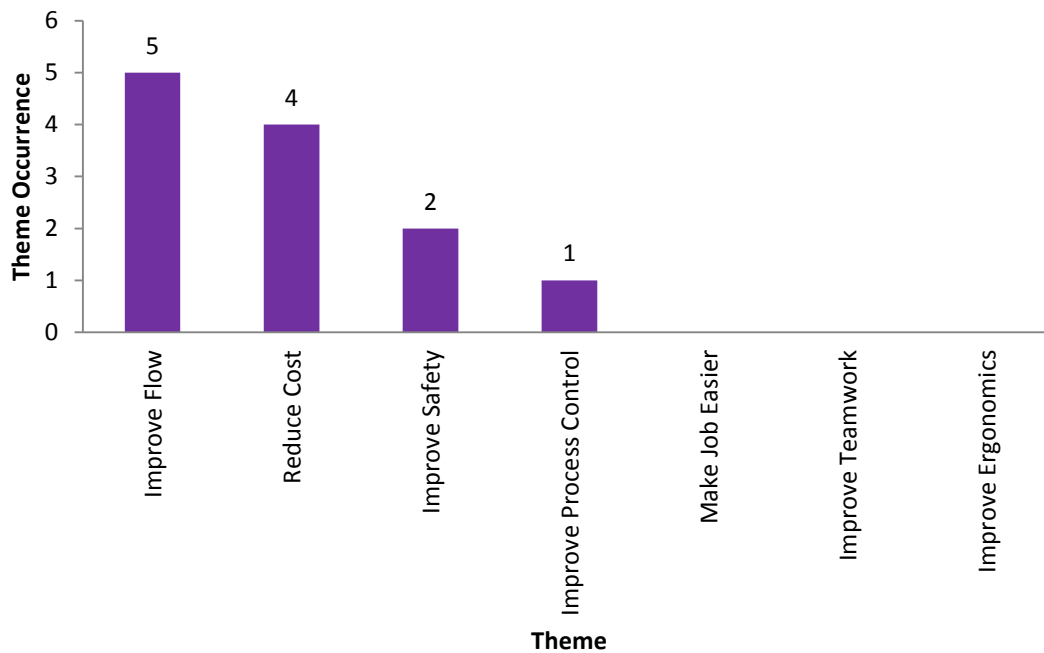


Figure 26: Common Themes for answers by Supervisory Employees to Question 1.

For supervisory employees' responses, they included statements regarding improved flow of pallets and all gave examples of how this was made possible in the process. Most responses linked the themes of 'safety' and 'reduced cost', as examples given of secondary benefits to the improved flow observed.

A reminder of question 4: ‘What impact has the process changes made on the flow of pallets from palletising to IDL?’ Similar to question 1’s responses, the top theme was unanimously ‘Improved Flow’. Operational employee’s responses were this time more descriptive of how the flow was improved, by citing examples of how the pallets actually flow better through the process. The elaborations to the operational employees’ answers are shown in the sub-themes of Figure 27a. These sub-themes indicate many of the operational employees had a detailed understanding of the impact of process changes (such as the introduction of gravity roller conveyors) as they could accurately describe its contribution towards better pallet flow. This particular question’s responses, suggested to the researcher that when decisions using a flow efficiency approach directly benefit the visible movement of material, operational employees can easily understand and acknowledge the benefits it has to the process. This is evident by the top sub-theme, ‘Reduced Clutter’ as some employees cited the impact of the improved flow they perceived.

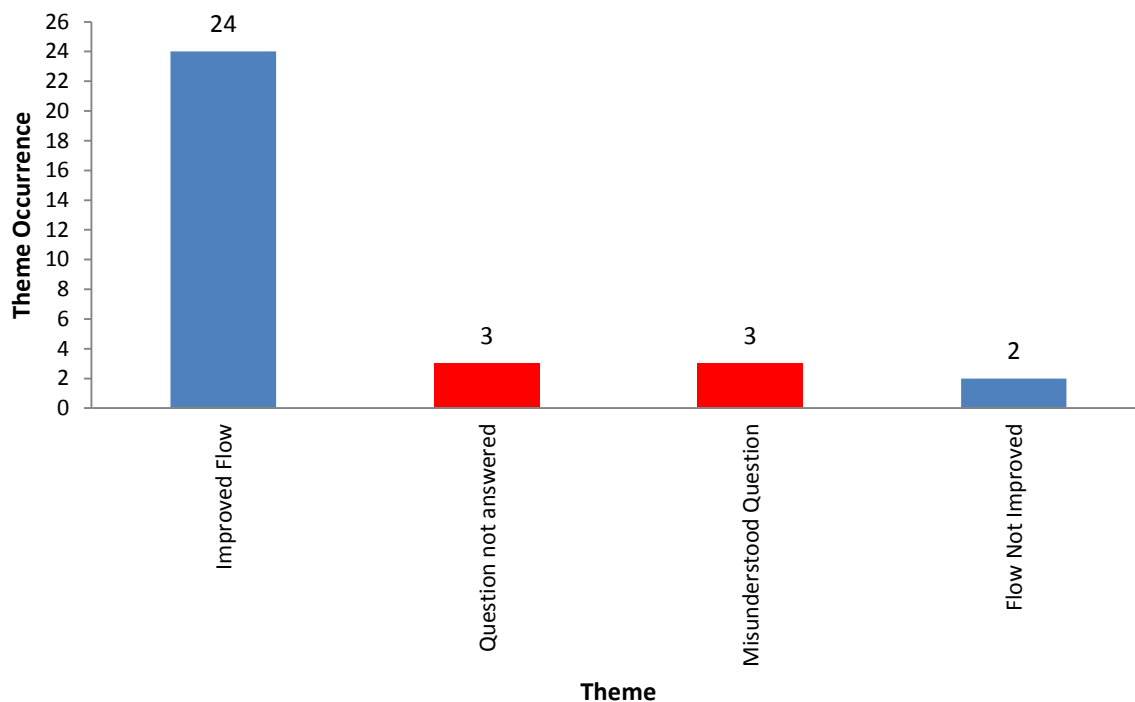


Figure 27: Common Themes for answers by Operational Employees to Question 4.

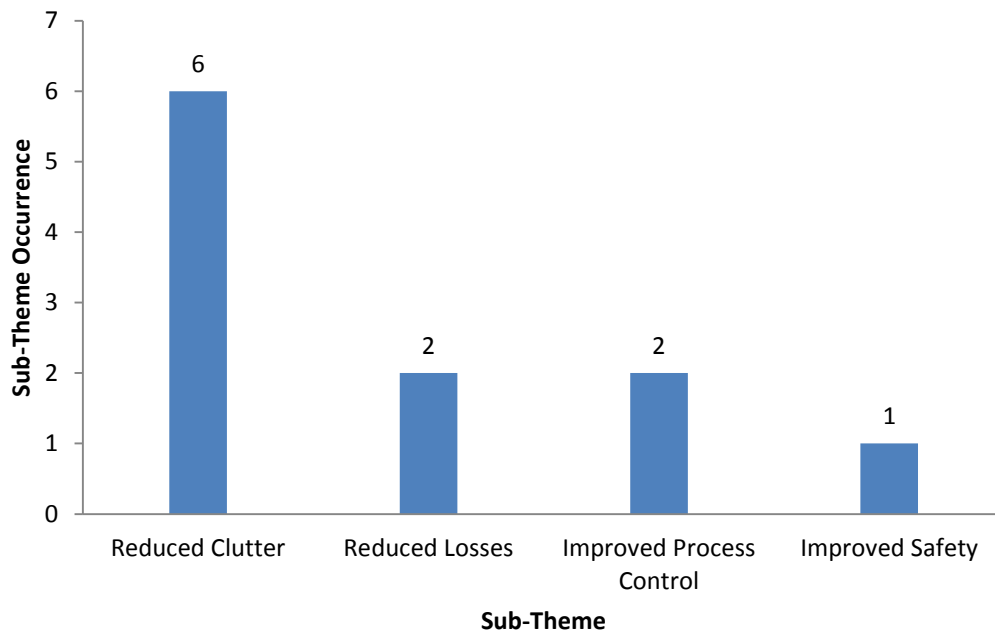


Figure 27a: Sub-Themes for answers by Operational Employees to Question 4.

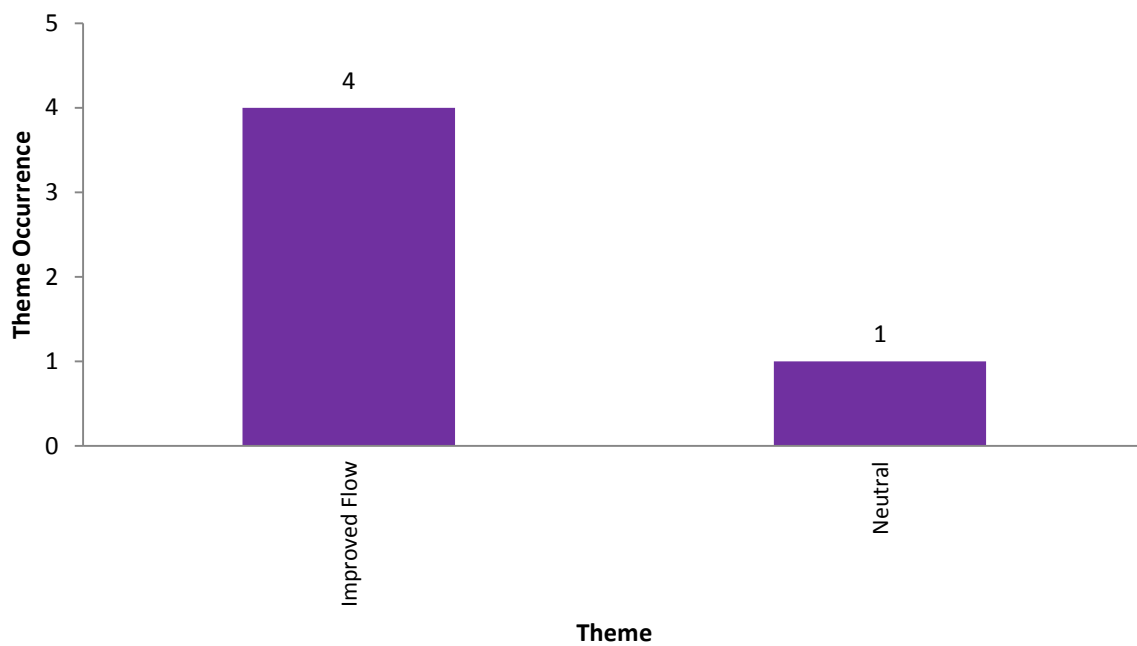


Figure 28: Common Themes for answers by Supervisory Employees to Question 4.

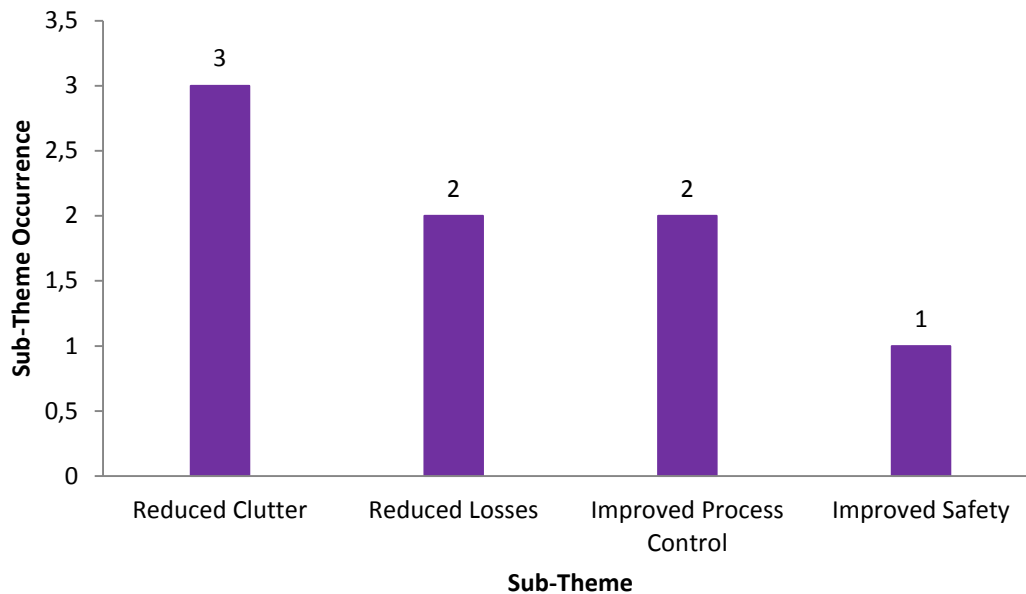


Figure 28a: Sub-Themes for answers by Supervisory Employees to Question 4.

For supervisory responses, the prevailing theme was again ‘Improved Flow’. One supervisory employee responded with a mix of perceptions of improved and unimproved flow. The researcher decided to allocate a ‘Neutral’ theme to this response. Through the sub-themes shown in Figure 28a, supervisory employees acknowledged improved flow through examples of reduced clutter and well as better information flow through the technology they had been provided with (‘Improved Process Control’). ‘Reduced Losses’ and ‘Improved Safety’ were sub-themes of responses that highlighted additional perceived benefits to the improved perception of physical and information flow.

A reminder of question 5: ‘What impact has the process changes had on the Tekdan scanner system?’ This question aimed at assessing perceptions specifically related to the technology aspect of the changes made in the affected process area. Operational employees’ top theme was ‘Improved Flow’ with top sub-theme of ‘Job Made Easier’. The ‘Improved Flow’ alluded to how the technology changes helped the physical flow of the process improve. In this question, the researcher decided to allocate the ‘Job Made Easier’ responses to a sub-theme as it was not directly related to the nature of question 5. However, for the singular sub-theme, participants indicated examples of how the technology changes led to them doing less walking and/or improved accuracy of printing labels for each pallet. Both of these descriptions made their job easier and so were bucketed as one sub-theme, ‘Made Job Easier’.

For the theme ‘System Sporadically Bottlenecks’, operational employees highlighted how the system is sometimes too slow in allowing labels to be printed quick enough for alignment to the flow of physical pallets. This theme highlights the risk of adding technology that is meant to support physical flow. The theme highlights that if technology is not reliable and fully effective, it can actually hamper physical flow and cause unnecessary frustration among front-line employees.

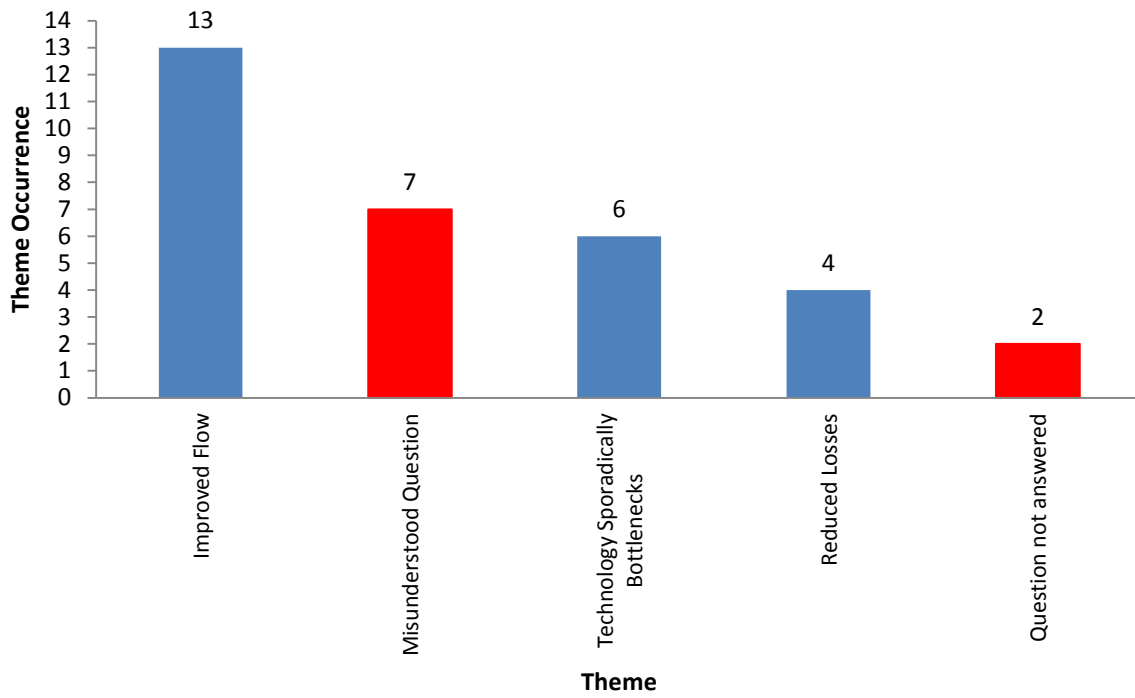


Figure 29: Common Themes for answers by Operational Employees to Question 5.

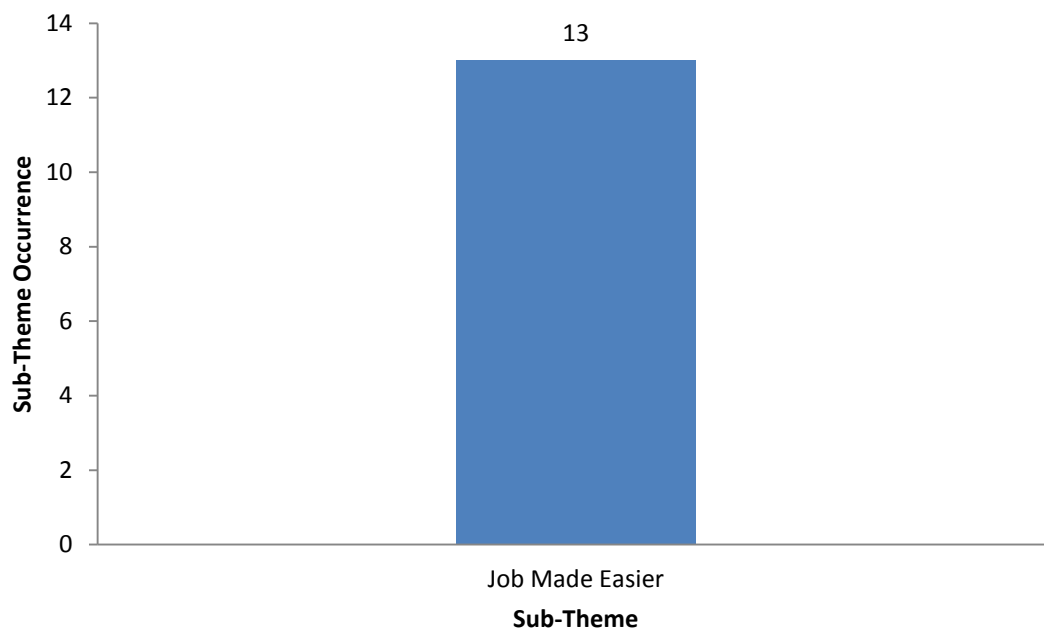


Figure 29a: Sub-Themes for answers by Operational Employees to Question 5.

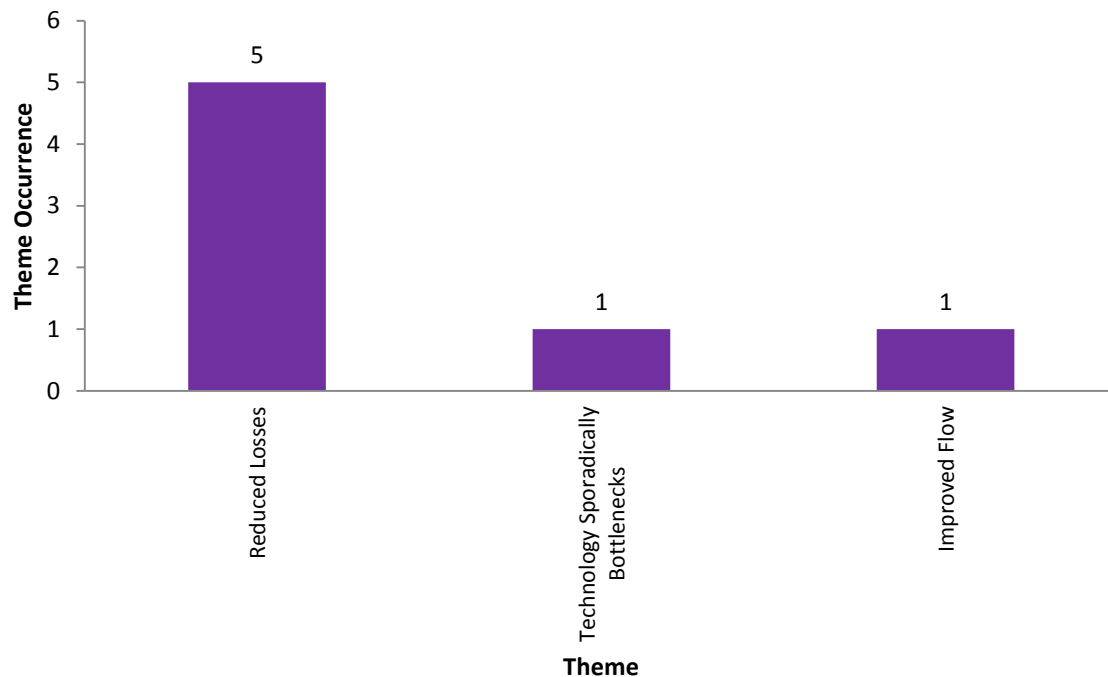


Figure 30: Common Themes for answers by Supervisory Employees to Question 5.

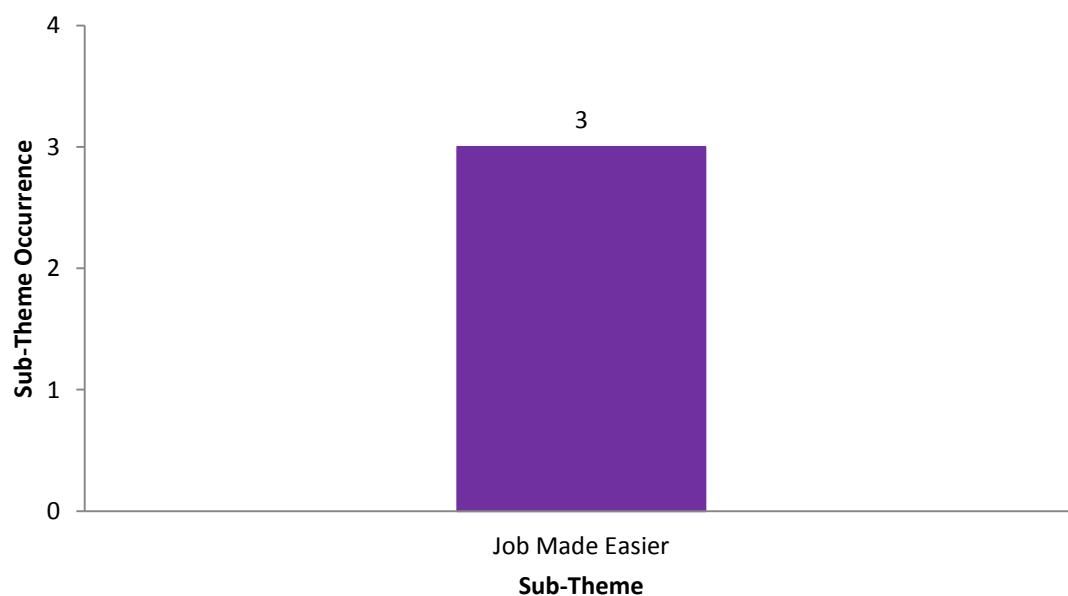


Figure 30a: Sub-Themes for answers by Supervisory Employees to Question 5.

For supervisory employees top theme of 'Reduced Losses', they all gave examples of how the technology helped reduce system losses through reduced ghost pallets being declared on the information system. Some cited examples of how this then made their jobs easier (as shown in the sub-theme 'Job Made Easier' in Figure 30a). It is noted that two of the supervisory employees gave additional themes to the 'Reduced Losses' theme and hence the sum total of theme occurrence is 7 and not the total of 5 participants in question 5.

A reminder of question 11: ‘Have the process changes made your job easier? In what way is your job easier or more difficult?’ Themes for operational and supervisory employees are shown in Figures 31 and 32 respectively while sub-themes to these questions are shown respectively in Figures 31a and 32a respectively.

For the top operational employees theme, ‘Job Made Easier’, most employees gave examples of them doing less, waiting for either forklifts or labels, and this is how their job has been made easier. Other employees gave examples of how the actual tasks they perform are easier since the changes. The sub-themes ‘Improved Ergonomics’ and ‘Improved Safety’, were added by some participants to highlight the examples given by employees of how their jobs were made easier. For those employees who indicated their job was not easier, sub-themes ranged from the process being faster, to feeling overworked and wanting more employees to help. The sub-theme ‘Not Enough People’ corresponded with the theme ‘Job Not Easier’ as a specific sub-theme relating to the responses that indicated why their jobs were not easier.

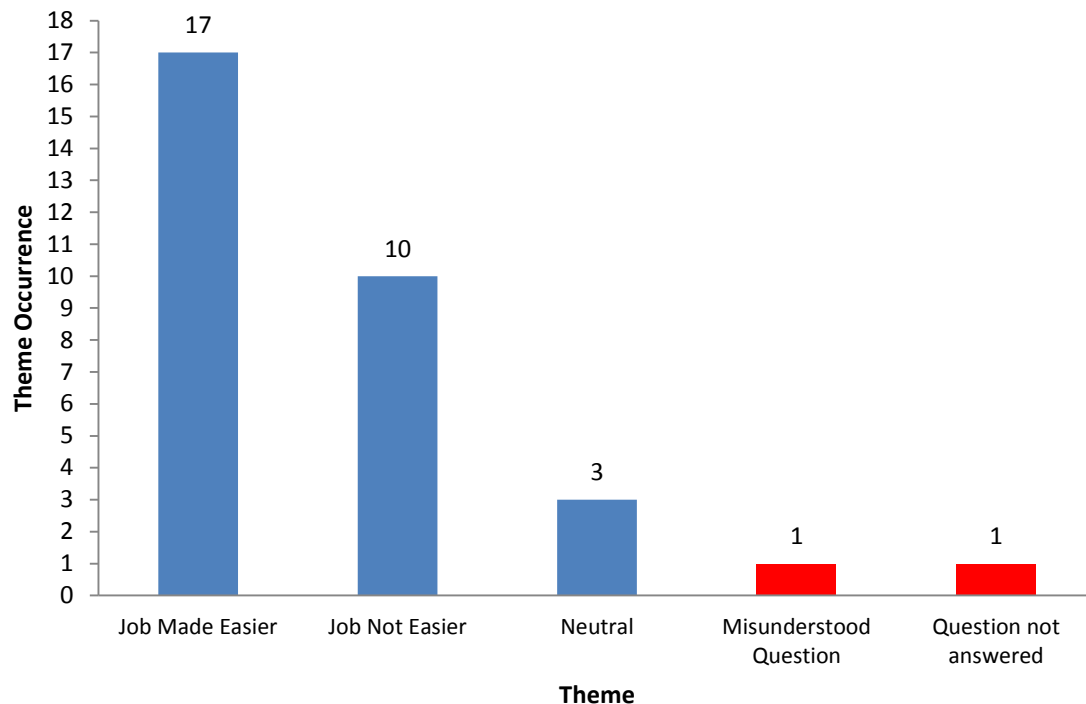


Figure 31: Common Themes for answers by Operational Employees to Question 11.

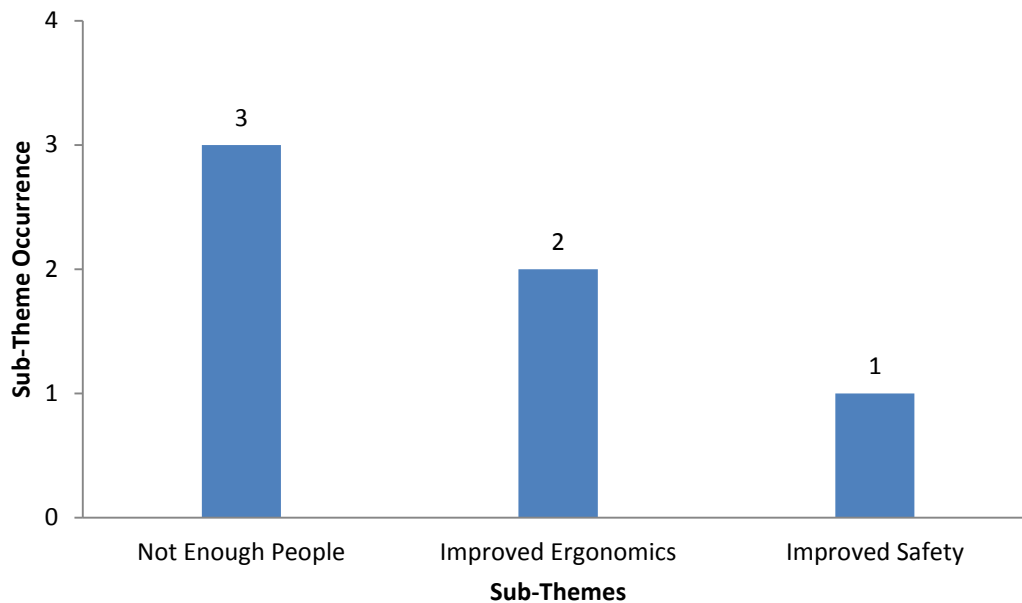


Figure 31a: Sub-Themes for answers by Operational Employees to Question 11.

For supervisory employees, the top theme to question 11 was 'Job Made Easier' with the corresponding sub-theme 'Improved Process Control'. 4 of the 5 participants who indicated these gave examples of how either physical process flow had improved (which allowed for less time wasted dealing with issues on the floor) or that they experienced better monitoring of the information flow. These responses also linked the information flow improvement to improved accuracy of pallet flow that gave them better control the process leading to making their jobs easier. It is noted that one of the supervisory employees gave a neutral response as they felt they had to compromise certain tasks to manage the new process. This is shown by the 'Neutral' theme in Figure 32 and the 'Some Tasks Compromised' sub-theme in Figure 32a.

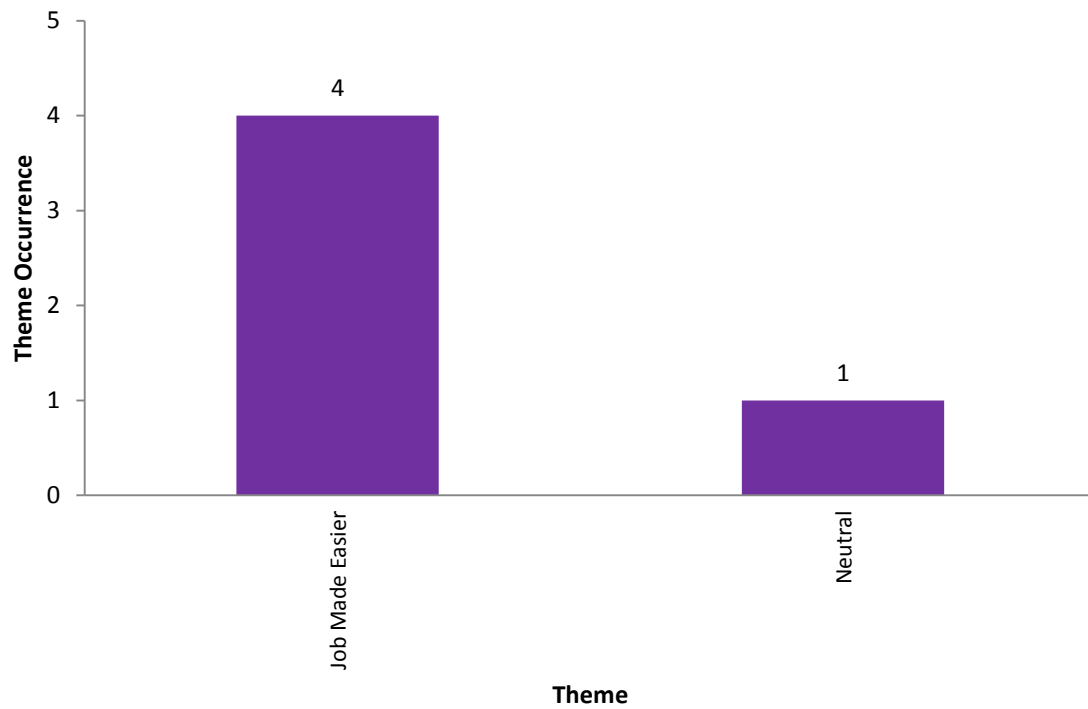


Figure 32: Common Themes for answers by Supervisory Employees to Question 11.

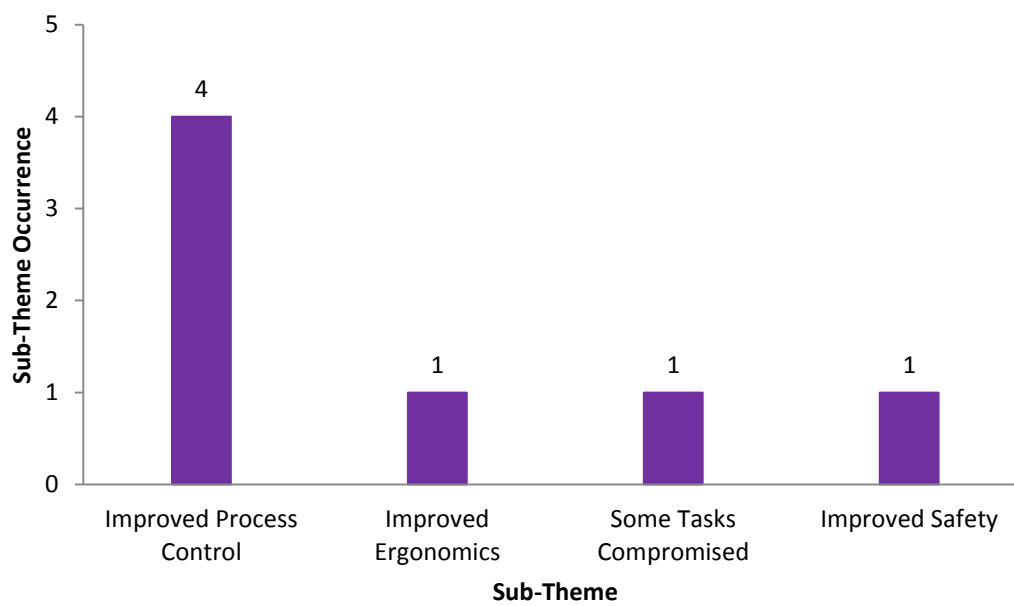


Figure 32a: Sub-Themes for answers by Supervisory Employees to Question 11.

5.2.3.2 Acceptance of Process Change

Acceptance of Process Change was assessed through questions 2 and 12. Results of the common themes for the answers to questions 2 and 12 are shown in Figures 33 to 36 for operational and supervisory employees respectively. Sub-themes to question 2 are shown in Figures 33a and 34a for operational and supervisory employees respectively.

A reminder of question 2: ‘How was the up-front communication to you before the process changes were made?’ The researcher acknowledges that question 2 was more open-ended than originally intended. This led to participants generally understanding the question in either of the following ways: (1) how well was the communication given? (2) In what way was the communication given? For the sake of clarity of the results, where participants’ responses alluded to understanding (2), the theme ‘Misunderstood Question’ was allocated. The researcher took this decision based on less occurrences of understanding (2) versus (1).

For the top operational employees’ theme of ‘Good Communication’, many (not all) of the responses included examples of sub-themes ‘Communication Addressed Purpose’ and ‘Communication Given Upfront’. It is noted that one operational employee indicated they were not working in the area at the time of the communication and so the researcher allocated the theme ‘Neutral’. For the operational employee who indicated they received communication but that their suggestions given were not used, the researcher assigned the theme ‘Neutral’ and sub-theme ‘Suggestions Not Used’. The reason for this theme allocation is that the researcher believes communication should be a two direction approach and hence it would be unfair to allocate this response to ‘Good Communication’ if the participant felt their upward feedback was not considered.

For those responses allocated the theme ‘Poor Communication’, it appears that most of these employees didn’t receive the communication upfront regarding the process changes. Their responses clearly indicated that communication was not good, and some indicated examples of where in the process the lack of communication had affected them. There were 6 responses that didn’t relate to anything regarding how well communication was given and were therefore difficult for the researcher to interpret. These 6 responses were allocated the theme ‘Misunderstood Question’ for reasons discussed earlier.

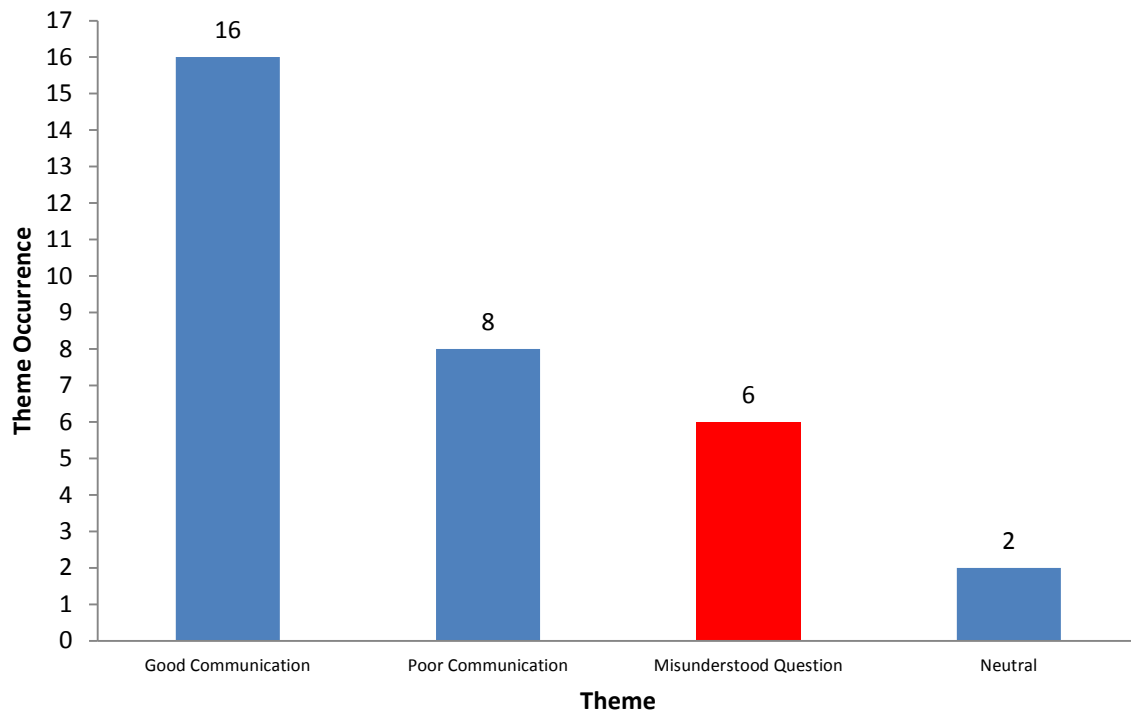


Figure 33: Common Themes for answers by Operational Employees to Question 2.

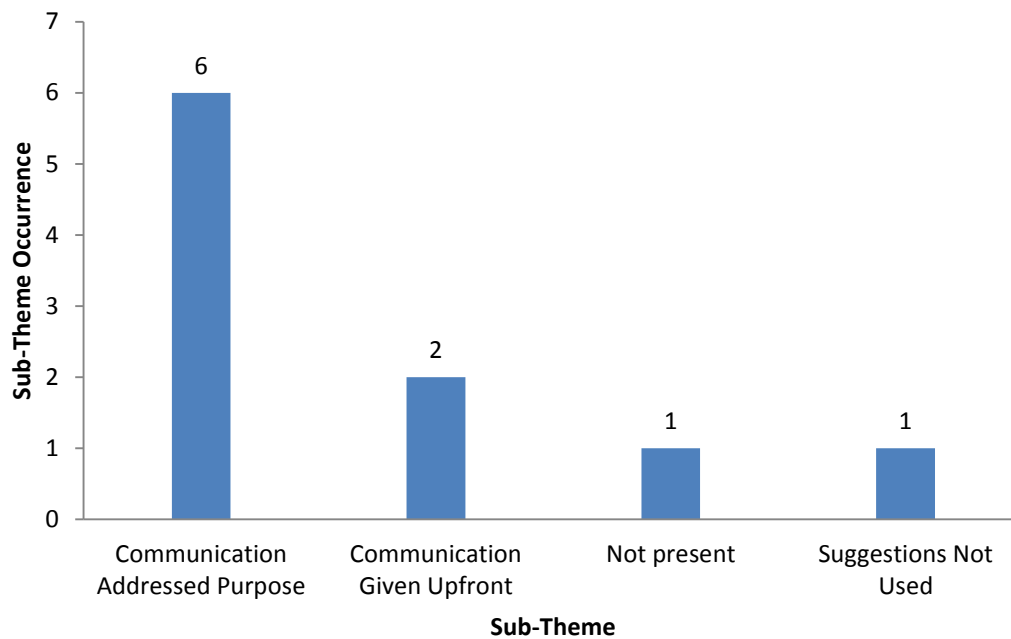


Figure 33a: Sub-Themes for answers by Operational Employees to Question 2

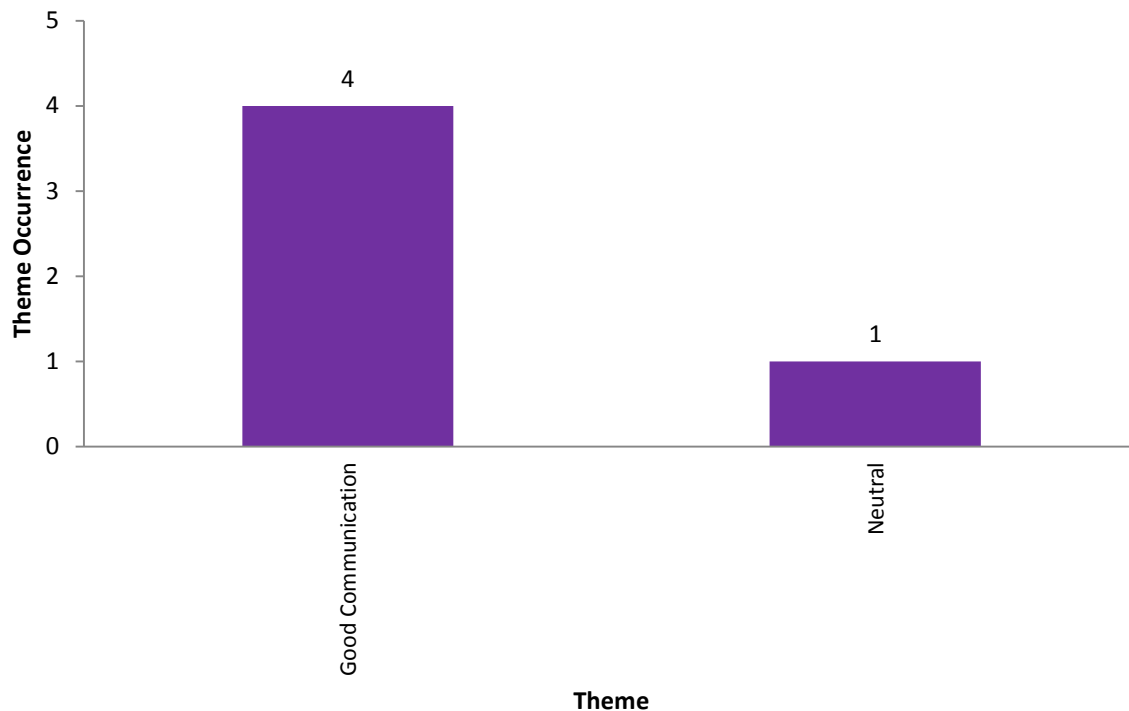


Figure 34: Common Themes for answers by Supervisory Employees to Question 2.

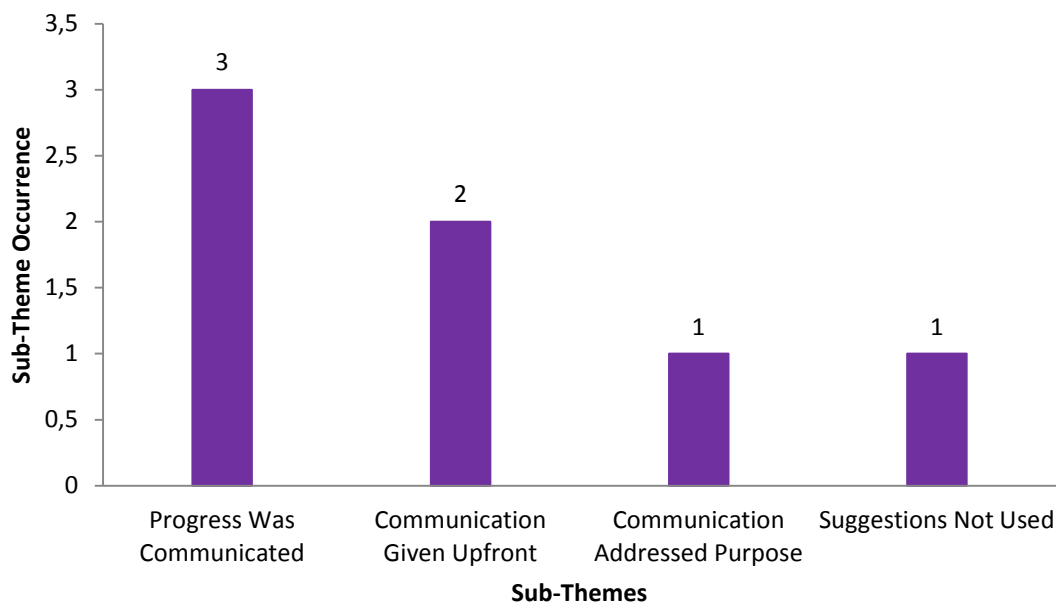


Figure 34a: Sub-Themes for answers by Supervisory Employees to Question 2.

For supervisory employees, the top theme was ‘Good Communication’. Through the top 3 sub-themes, supervisory employees indicated that the communication helped them understand what was going to be changing, and also what the different phases of the changes would be. This showed a more systemic view from supervisory employees, compared to operational employees perceptions which were more short term and task-focused. It is noted that one supervisory employee gave mixed responses to whether the communication was

good or not while even stating their suggestions were not used. For this response, the researcher decided to allocate the response to theme ‘Neutral’ and sub-theme ‘Suggestions Not Used’.

Analysing the themes and sub-themes for responses by operational and supervisory employees to question 2 shows no clear correlation to the perception element tested, *Acceptance of Process Change*. The researcher acknowledges that the use of question 2 to assess the perception element *Acceptance of Process Change* was not an effective question at understanding employees at both levels’ perceptions. This observation is made despite valuable data being gathered about the effectiveness of communication done. The researcher therefore acknowledges that no reliable results or conclusions can be made regarding this perception element through the research method employed.

A reminder of question 12: ‘How long do you think the process changes will last?’ For the top theme of ‘Change Will Last Long’, employees indicated the changes would last for long period of time but were not clear how long this period might be. For those participants who explicitly stated that the change would last for a period of years, their responses were allocated to a separate theme of ‘A Few Years’. For the two employees who felt the changes wouldn’t last long, one didn’t state reasons why he felt this, but the other attributed it to lack of communication around one of the process changes that affected him.

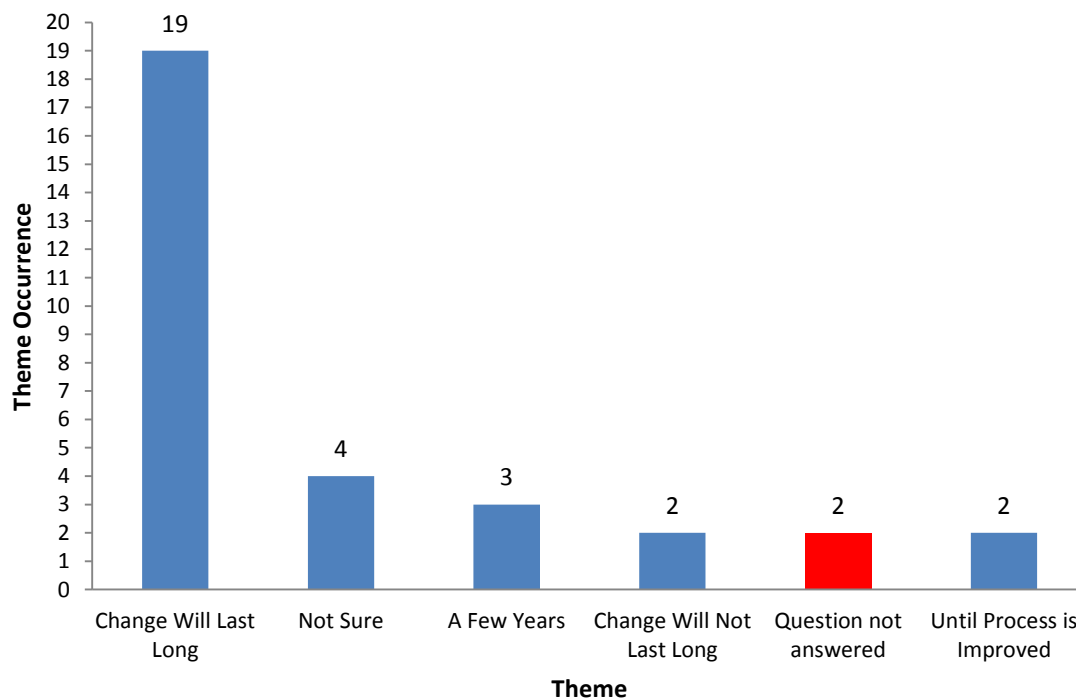


Figure 35: Common Themes for answers by Operational Employees to Question 12.

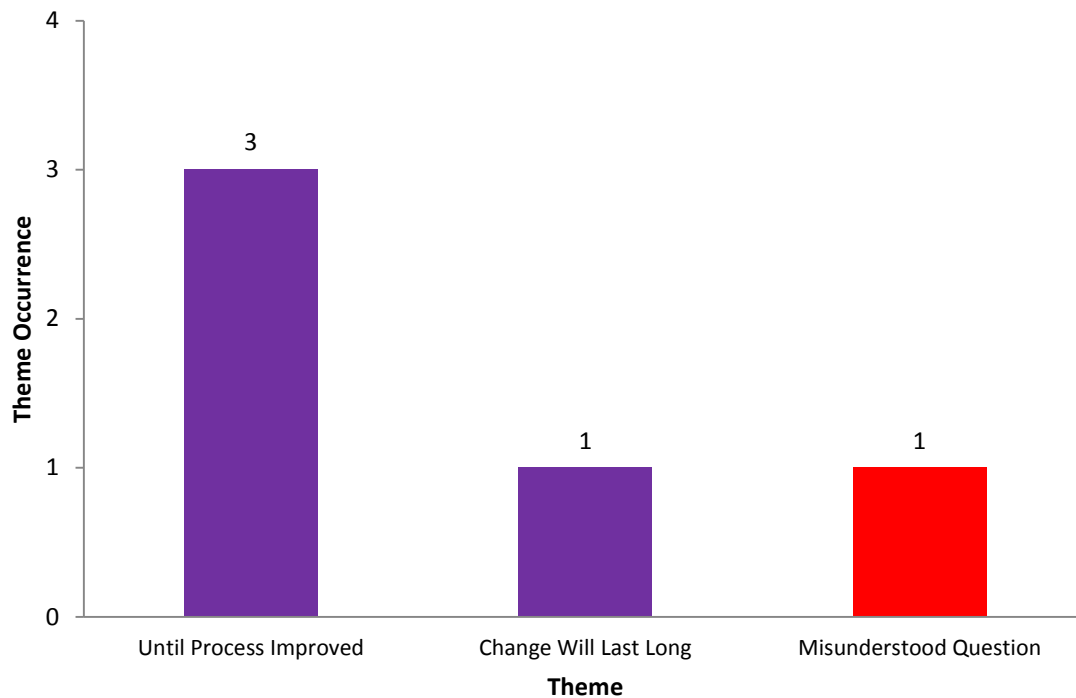


Figure 36: Common Themes for answers by Supervisory Employees to Question 12.

For supervisory employees, the top theme was ‘Until Process Improved’. 3 of the 5 supervisors indicated the changes would last until further process improvement is made. Some indicated they could see the process improvements for themselves. This researcher notes that the top theme shows that supervisors see process changes were a part of a greater continuous improvement approach, and they acknowledged changes for improvement were likely to occur in the future.

5.2.4 Process Improvement Change Factor: Employee Involvement and Empowerment

Employee Involvement and Empowerment is the last of the selected four process improvement change factors identified in Table 1 of the Literature Review. It consists of three perception elements: *Involvement in Solution*, *Involvement in Problem Resolution* and *Escalated Issues Resolution*.

5.2.4.1 Involvement in Solution

Involvement in Solution was also assessed through same results of question 2, as was the perception element *Acceptance of Process Change*. The intention this time, was to see if any themes emerged of participants contributing towards planned changes during up-front communication sessions held. Results of the common themes for the answers to question 2 are shown in Figures 37 and 38 for operational and supervisory employees respectively. The sub-themes of operational employees’ responses are shown in Figure 37a. These figures are copied below from section 5.2.3.2 for easy reference.

A reminder of question 2: ‘How was the up-front communication to you before the process changes were made? For operational employees, only one response made reference towards

contributing towards proposed solutions upfront. This was allocated to the theme 'Neutral' and sub-theme 'Suggestions Not Used', where the employee explicitly highlighted that their proposed contribution was not considered. For responses allocated the theme, 'Misunderstood Question', responses were difficult for the researcher to draw relevance to the question asked. However, one of the responses noted the employee's perception that the old process was better as it created more jobs for temporary employees. The researcher notes that this response regarding job stability for permanent or temporary employees was of minimal occurrence throughout the questionnaire responses.

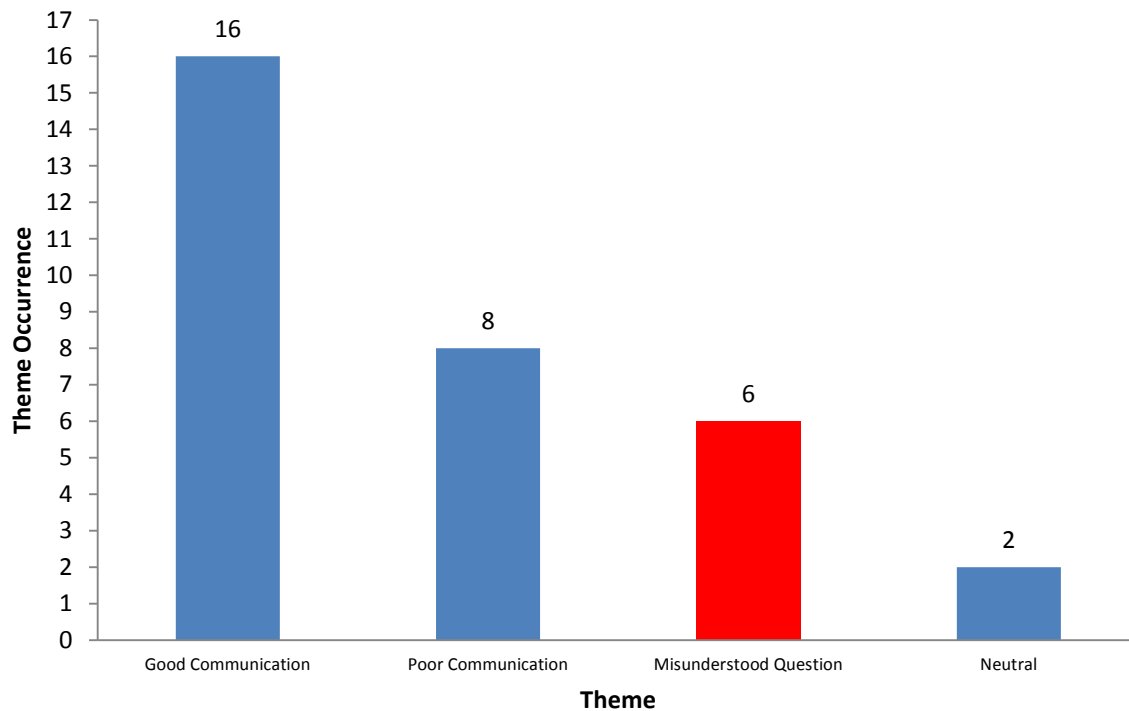


Figure 37: Common Themes for answers by Operational Employees to Question 2.

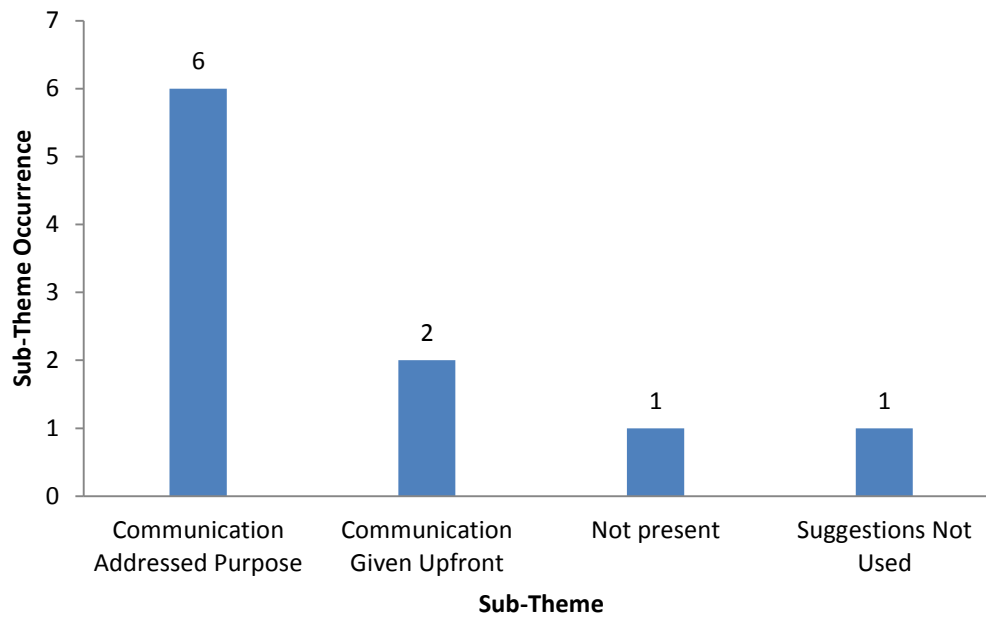


Figure 37a: Sub-Themes for answers by Operational Employees to Question 2.

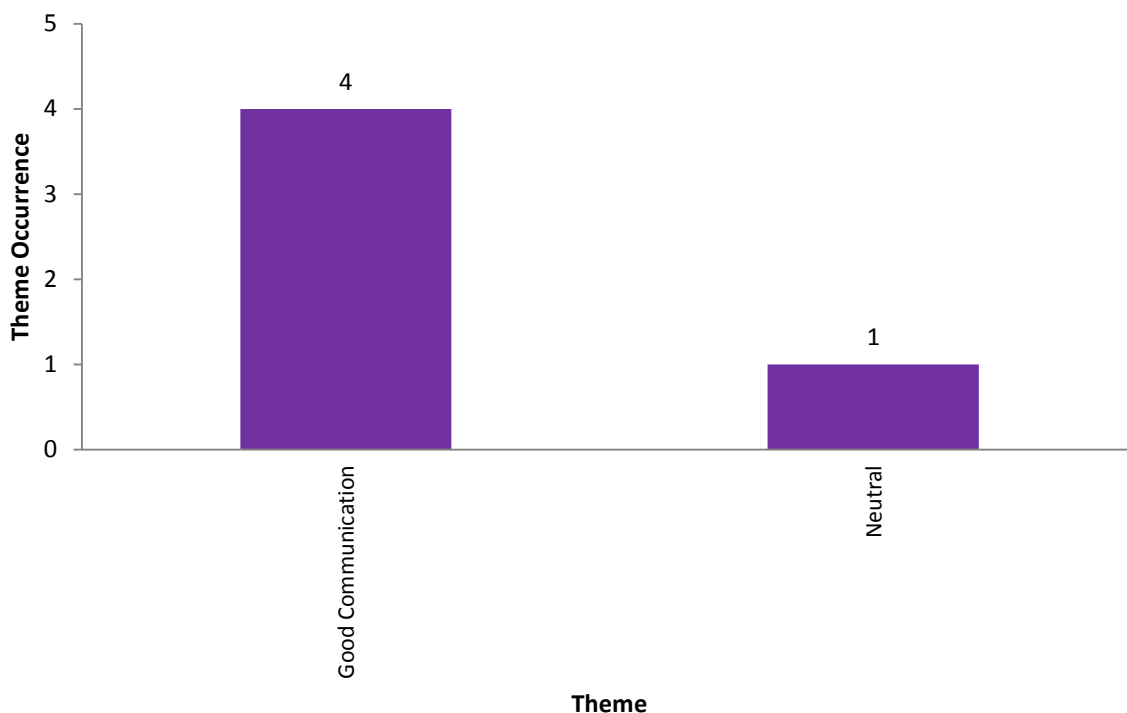


Figure 38: Common Themes for answers by Supervisory Employees to Question 2.

For supervisory employees, the top occurring themes were ‘Progress Was Communicated’ and ‘Good Communication’. Unfortunately, none of the responses explicitly indicated any indication that the supervisors contributed towards the proposed solutions upfront. The researcher acknowledges that the use of question 2 to assess the perception element *Involvement in Solution*, was not an effective question at understanding employees at both

levels' perceptions. No reliable results or conclusions can be made regarding this perception element through the research method employed.

5.2.4.2 Involvement in Problem Resolution

Involvement in Problem Resolution was assessed through question 6. Results of the common themes for the answers to question 6 are shown in Figures 39 and 40 for operational and supervisory employees respectively.

A reminder of question 6: 'Were you involved in resolving problems within your area? Please give an example of when you had a problem and how you were involved or not.' For operational employees, the top theme of the responses was, 'Was Involved'. Almost all responses indicated clearly that the employee felt involved, and then followed by giving examples of what the problem in their area was, and how it was resolved. For the 6 employees who felt they were not involved in problem resolution, most of them just indicated they were not involved without stating details. The researcher however notes one of the responses indicated they were not involved due to the way their supervisor treats people working in his area.

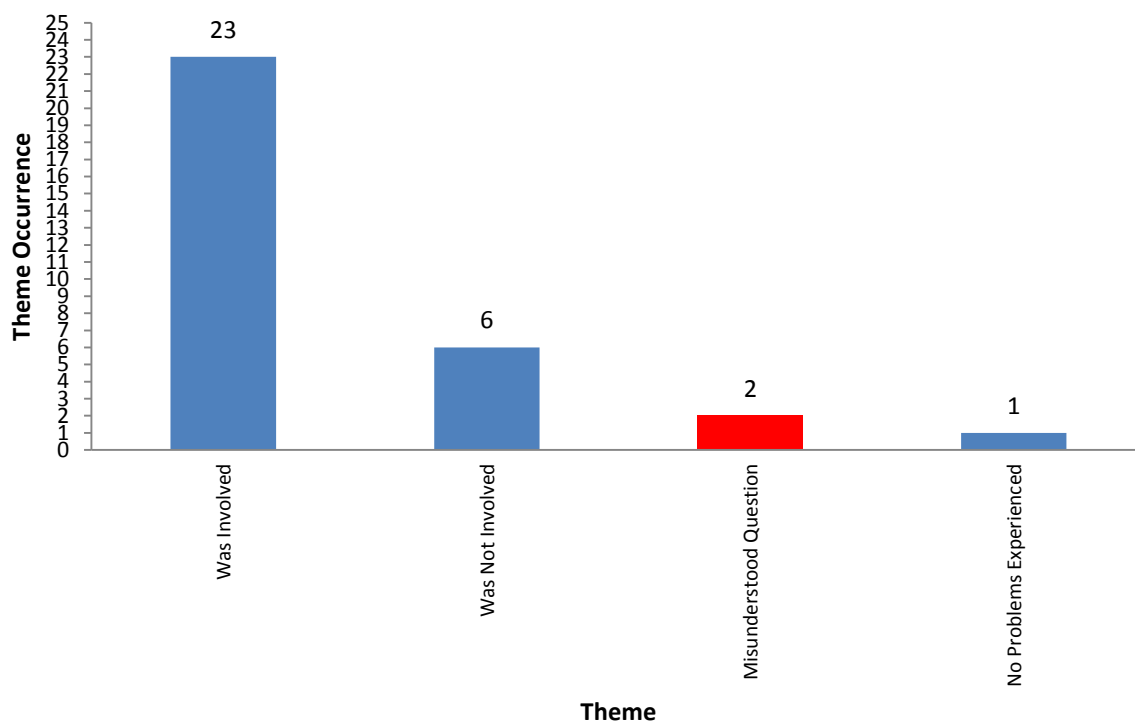


Figure 39: Common Themes for answers by Operational Employees to Question 6.

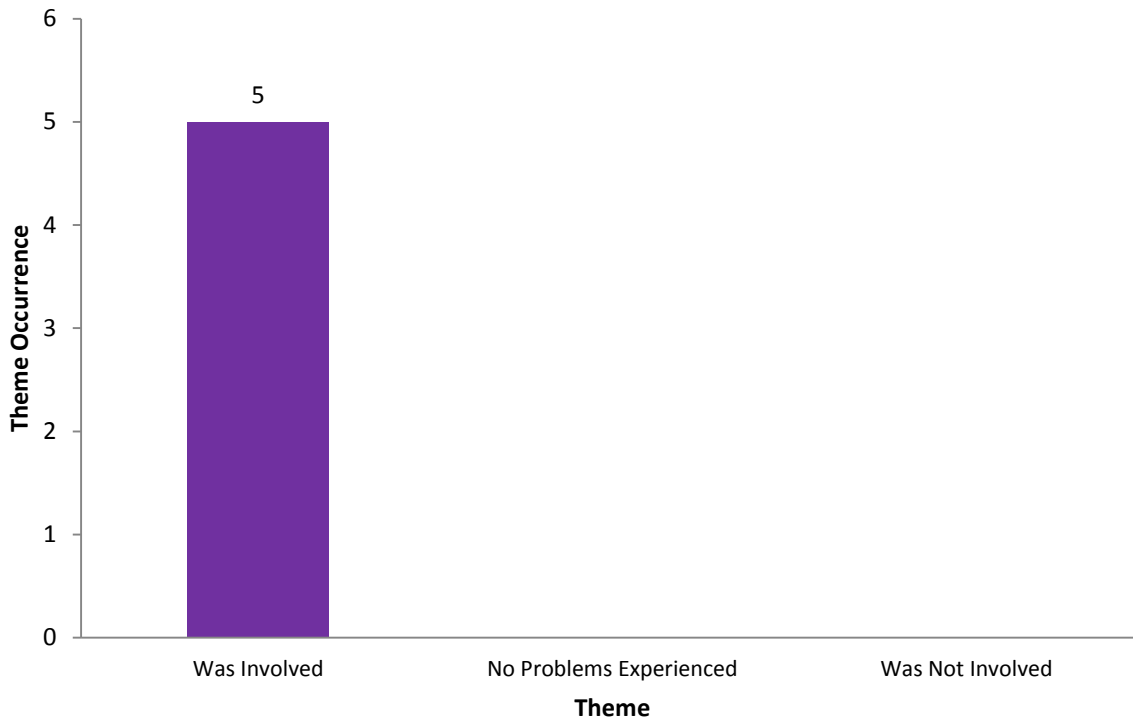


Figure 40: Common Themes for answers by Supervisory Employees to Question 6.

For supervisory employees, there was a unanimous perception theme, ‘Was Involved’. All supervisors clearly indicated various operational examples where they were involved in resolving the problem. By the extensive details of the descriptions given, the confidence and empowerment experienced by the supervisors in being involved in owning and resolving problems is noted by the researcher.

5.2.4.3 Escalated Issues Resolution

Escalated Issues Resolution was also assessed through question 7, along with the perception element *Leadership Commitment*. For this perception element analysis, different themes were allocated to the same set of responses, but with reference to the perception element, *Escalated Issues Resolution*. This question specifically aimed at assessing the perceptions of employees when they escalated an issue that they themselves could not resolve. Results of the common themes related to the resolution of escalated issues for the answers to question 7 are shown in Figures 41 and 42 for operational and supervisory employees respectively.

A reminder of question 7: ‘If you raised a problem with the new process, how well was the problem dealt with? Please give an example.’ For operational employees, the top theme was ‘Issue Resolved’. Most responses gave examples of what solution was put in place to the problem they escalated. Some responses only indicated the impact that the solution given to them had. The responses in this theme suggest that the loop was closed when an operational employee escalated a problem. In other words, there escalation was heard and a plan was put in place to help the employee and they see the benefit of this help to fixing their issue. This is subtly different to the scenario where they may have escalated an issue, felt someone was

listening to their need, but received no perceived solution. For the responses that were allocated the theme ‘Issue Resolution Unclear’, most responses described the operational problem they experienced, but the actual resolution thereof was not stated. For the responses allocated the theme ‘Issue Not Resolved’, employees explicitly stated their problem at hand, and indicated that they were still waiting for feedback, or that they were still struggling with the problem raised. Four of the employees stated they had no issue to escalate for resolution. These 4 responses were allocated the theme ‘No Issue Escalated’.

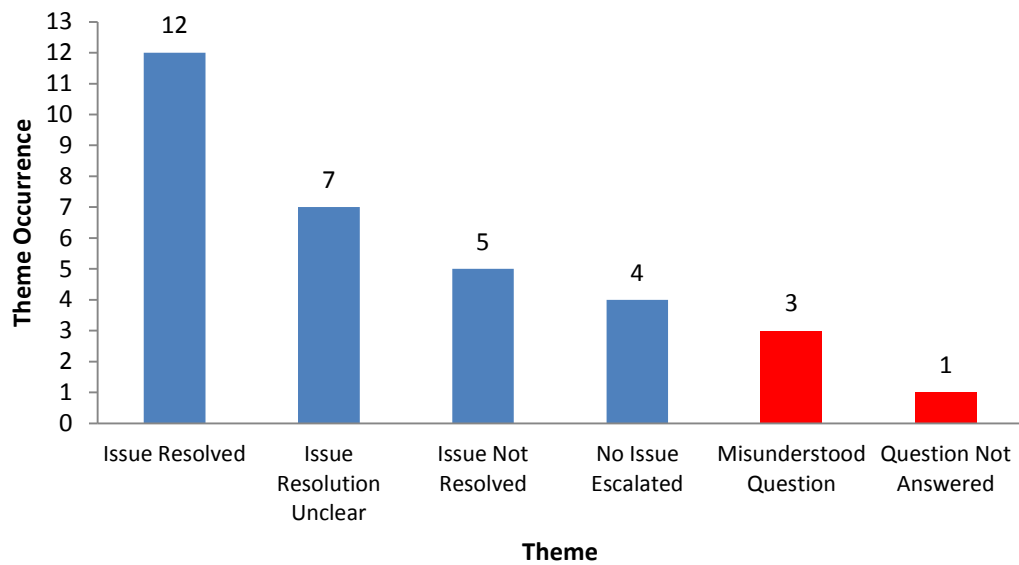


Figure 41: Common Themes for answers by Operational Employees to Question 7.

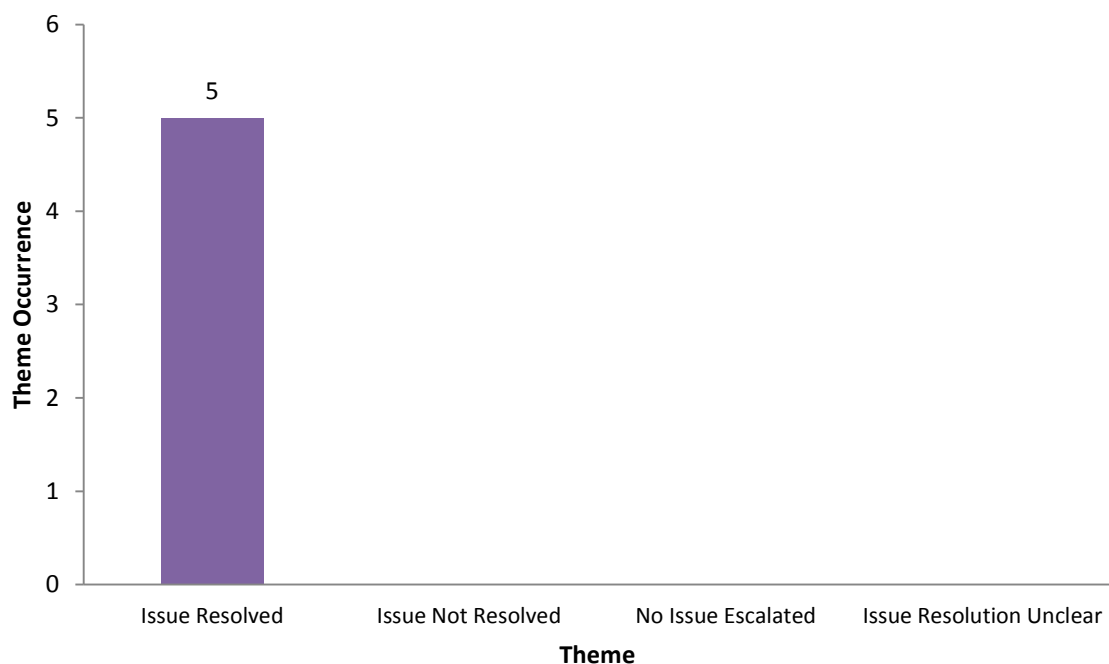


Figure 42: Common Themes for answers by Supervisory Employees to Question 7.

For supervisory employees, there was a unanimous theme of 'Issue Resolved'. Supervisors' responses included details of an operational problem they escalated, followed by how it was resolved. It was again noted by the researcher, that supervisors appeared to have significant influence in escalation of issues through their clear perception of feeling empowered, to resolve a problem through obtaining support.

6 DISCUSSION OF RESULTS

6.1 Introduction

This section seeks to discuss the results of the qualitative research performed to achieve research objectives (2), (3), and (4). Results and analysis of the 13 questions of the questionnaire are shown in the Results chapter of the report. The discussion will include reference of the results to the literature review, as well as the significance of the results in light of the research purpose and motivation.

6.2 Shortcomings of Results

As previously discussed, the method of an unstructured questionnaire, combined with thematic content analysis to analyse participants' answers, has unique shortcomings. During the questionnaire sessions, using a research assistant was helpful in explaining to the operational employees the purpose of the survey, and the meaning of the questions in a language most comfortable for them. Due to all participants' not having English as their local language, it was noted when capturing the questionnaires that some participants didn't fully understand some of the questions in the questionnaire. The researcher had to interpret this for himself when allocating themes and sub-themes to answers during the thematic content analysis. In this event, the answer was categorised as 'Question misunderstood' which can be seen in some of the results charts in the Results chapter of the report. These scenarios resulted reduced validity due to the sample size being diluted for questions where this was the case.

A further shortcoming was in capturing the answers from paper to the spreadsheet. The legibility, grammar and spelling of some of the operational employees' answers made some of the answers difficult to understand. When this was the case, the researcher chose to capture the answers exactly as seen, and later on interpret the answers as best as possible when conducting the thematic content analysis. In these events, it is possible the researcher could have misunderstood the answers, but could not verify them with the participants due to the anonymous nature of the questionnaire. Fortunately this scenario was the exception and not the norm for the participants' answers.

The researcher also notes that the responses by the supervisory employees were of a mainly positive nature. The researcher observes with caution that the supervisors might have felt the need to make more positive statements than what they may have actually felt. However, there was no evidence to support this caution. With the questionnaire being voluntary, and anonymous, the researcher believes nothing further could have been done to avoid this risk.

The researcher notes that because there were 32 operational participants versus 5 supervisory participants there is risk of reduced reliability of the results when comparing the two groups themes and sub-themes for each question. However, it must be noted that the researcher was aware of this risk when selecting the sample size by intentionally sampling a higher percentage of the supervisory population (62.5%) versus the operational population (33.3%).

This was done to add reliability to the results for comparison of the two groups' responses within the uncontrolled constraints of the two groups' population sizes of 96 and 8 respectively.

Lastly, the researcher acknowledges that the validity of question 2 in testing the perception elements 'Acceptance of Process Change' and 'Involvement in Solution' was very low. The themes in Figures 33, 34, 37 and 38 as well as the sub-themes in Figures 33a, 34a and 37a were interesting in general but could not draw sufficient links to the perception elements intended to be tested. In retrospect, the researcher acknowledges that two separate, more direct questions could have been devised to better test these two respective perception elements.

6.3 Results in Relation to Research Objectives

This sub-section discusses the results of each of the selected four change factors in relation to the literature and research objectives (2), (3), and (4).

6.3.1 Leadership Behaviour

It was found that both operational and supervisory employees perceived leadership commitment to be evident. This was evident through the top common theme for both groups being, 'Leadership Commitment Evident', which indicated that leadership was committed to resolving problems and having a positive attitude towards the process changes. The difference between the two groups was that supervisory employees unanimously felt that leadership commitment was evident, while there were some operational employees who felt that leadership commitment was lacking. It was also prevalent that leadership was involved in coaching employees, both at operational and supervisory levels during the process changes. No significant differences in themes of the two groups were found in terms of leadership behaviour of coaching employees.

The majority of the results on Leadership Behaviour align to what Bicheno & Holweg (2009) highlight as the need for leadership to show empathy and support in ensuring employees in the socio-technical environment feel the importance of change. The results also indicate that it was leadership at both levels, from production and projects departments, that were prepared to coach and show a positive attitude towards the changes. This aligns to the importance Kotter (1995) found regarding the need for a shared commitment by leadership, in all levels and many departments, to lead change successfully. In addition, the results from Leadership Behaviour confirm the presence of Ekvall & Arvonen's (1991) third factor for successful leadership behaviour – 'change-promotion'. This was evident by the explicit comments made by many employees that their line manager supported and had a positive attitude towards the changes. The results on the coaching conducted by leaders, amplified the important role leaders should play in driving change as emphasised by Liker (2004), Edmondson (2003), and Rother (2010).

6.3.2 Social System Change

Both operational and supervisory employees were found to have a strong perception that teamwork had improved in their area of work, after the process changes took place. The only difference between the two groups was that a minority of operational employees felt teamwork was bad. The strong perception of improved teamwork for both groups suggested indirectly that employees felt they had personally benefitted from the process changes. Bicheno & Holweg (2009) indicated that social system changes, including teamwork dynamics, will occur when physical process changes take place. The results on teamwork suggest that employees did perceive this to be the case with the process changes they experienced. However, Majchrzak & Wang (1996) cautioned that process changes may not necessarily instil positive teamwork on their own, but require leadership to create the environment for positive teamwork along with the process changes. The results suggest the majority of employees, at both levels, felt teamwork had improved. The researcher notes this in accordance with the results of Leadership Behaviour. It appears there is a correlation between teamwork and leadership behaviour as suggested in the literature.

For the perception element 'Roles and Responsibilities', the top operational theme of 'Job Made Easier' with occurrence of 12 out of 32 was an indication that some operational employees felt their roles and responsibilities had been affected in a positive, personal way. However, the theme 'Increased Responsibilities' with occurrence of 8 out of 32 indicated a significant number of other operational employees felt they had taken on more work since the process changes. This is confirmed by the top two operational sub-themes of 'Have to Work Harder' and 'New Tasks Added'. The researcher notes that many operational employees acknowledged their existing roles and responsibilities had become easier with the changes, but not necessarily that their roles had become easier due to their role changing. For supervisory employees on the same perception element, the top themes were shared by 'Job Made Easier' and 'Increased Responsibilities' with 3 occurrences of each. Looking at the shared, top supervisory sub-themes, 'Improved Control of Process' and 'New tasks Added', it shows that supervisory employees generally acknowledge a useful change to their roles and responsibilities but that in some cases this was perceived to be at the expense of additional tasks. The researcher notes the supervisory sub-theme 'Improved Process Control' shows 3 of the 5 supervisors felt they could better manage the physical and information flow of the process since the process changes. The top themes for each sample group suggested that both groups generally experienced personal benefits as a result of the process changes made. This is in line with what Bicheno & Holweg (2009) indicate that the principle of giving employees more responsibilities is a good thing.

For the perception element, 'Performance Measurement', both groups had a strong perception that their performance improved. The first difference between the groups was that there were some operational employees who felt that their performance dropped, or was unchanged, as opposed to no supervisory employees having this perception. It is noted that supervisory employees elaborated how much the process changes had helped them improve their performance as seen in the sub-themes (in order of descending occurrence): 'Improved Control over Process', 'Get Support When Needed', 'My Morale Increased', 'Gained

Knowledge'. The findings suggested that employees' own personal performance improvement could have contributed to improvement and benefit for the organisation. The results did not clearly align to Majchrzak & Wang's (1996) finding of overlapping responsibilities in process-focused improvement fostering collective responsibility as responses were mostly individually focused. Rather, the perceptions of employees that their *personal* performance had improved came through stronger in this perception element. However, the earlier discussed findings of improved teamwork indicated that employees were working better together by better execution of their own individual responsibilities. The researcher observes that the results suggest the process changes aided most employees to take better individual responsibility to drive individual performance improvement, and that this perceived improvement was *not* a result of new overlapping responsibilities as Majchrzak & Wang's (1996) suggest.

6.3.3 Effectiveness of Change

There was a common perception among both groups that the process changes had made the employee's jobs easier, and that they believed flow of the process had improved. These two prevalent themes suggested that operational and supervisory employees did experience personal benefit from the changes as well as benefit for the organisation by improved flow of product through the process. The main difference between the top themes of operational and supervisory employees for the 'Quality of Process Change' perception element, was that supervisory employees' themes were mostly expressing personal and organisational benefits, as opposed to some minority negative themes expressed by operational employees. The researcher notes the prevalence of sub-themes to question 4 from both operational and supervisory employees regarding benefits of the changes extending beyond just personal, but to the process and organisation. The results of the perception element 'Quality of Process Change' appeared to mostly support Liker's (2004) finding that technology should be used to support the people and processes of the organisation. This was reflected by the dominant perception themes of employees' that their jobs had been made easier, and that flow of the process had improved. The prevalence of the perception by some operational employees that the IT system was sporadically a bottleneck, highlights the cautions made by Aljunaidi & Ankrah (2014) and Bicheno & Holweg (2009) that management should first deeply understand a process before implementing expensive IT systems into an operation. This raises the concern that the timing of the IT system implementation prior to the physical flow improvement might have been a factor to this perception.

For the perception element, 'Acceptance of Process Change', question 2 was found to be unreliable in providing credible results to verify whether employees perceived acceptance of the process changes. However, the results to question 2 did suggest that the communication upfront to the employees appears to avoid a majority perception of the change being a threat, as cautioned by Bicheno & Holweg (2009). The majority of the employees' responses around acceptance of the change also back up Kotter's (1995) finding that credible, regular communication is needed to influence employees to be willing to embrace changes. Question 12 however, provided more reliable results for the perception element 'Acceptance of Process Change'. The majority of operational employees found the change would last long where as a

subtle difference was observed in the supervisory employees where 3 of the 5 sampled suggested the change would last until the process is changed again. The researcher observes this difference between the two sample groups as an example of the deeper understanding by supervisory employees that the changes were part of a systemic process improvement that would be a continuous process and not a once-off event. The researcher notes that the majority themes of 'Change Will Last Long' and 'Until Process Improved' by operational and supervisory employees respectively could suggest acceptance of the process changes and also benefits for both groups personally and for the organisation. The researcher is of the view that the top themes of this perception element give an indication that a strategic advantage was achieved by management in the case study. This comment is made in relation to the discussion quoting Pfeffer (1995) in the literature review of this change factor.

6.3.4 Employee Involvement and Empowerment

The researcher found that the perception element, *Involvement in Solution*, was inconclusive and no findings could be highlighted on this. This was due to the answers to question 2 being unreliable in yielding sufficient common perception themes or sub-themes for any findings to be made.

The majority of operational and supervisory employees perceived themselves to be involved in resolving a problem. The main difference was that, for operational employees, there was a unanimous theme of 'Was Involved'; while a minority of operational employees did perceive themselves not to be involved in problem resolution. This majority perception of being involved as an individual was considered by the researcher to be beneficial to the employee as an individual and the organisation. There are two observations that can be made in comparing these findings to literature. Firstly, supervisors themselves felt mostly empowered by being involved in problem resolution, which appeared to cascade to many of the operational employees feeling similar (with a minority of exceptions). This appears to correlate to Fenton-O'Creevy's (2001) finding that middle managers' intentions to support employee involvement were positively related to their own experience of being empowered. The second observation is that with most employees perceiving themselves to have been involved, this is in contrast to Vidal's (2006) finding of cases where in technical and social change, employee empowerment is limited due to the demands of standardisation and resistance among workers. There isn't enough evidence to explain why this is different to Vidal's (2006) findings, but the researcher takes note that Vidal's (2006) findings are in the context of an organisational routine centred on an authority structure.

The top theme for the responses towards the 'Escalated Issues Resolution' perception element suggests many participants of both groups of employees felt their issues *were* resolved when escalated. The difference was that supervisory employees unanimously indicated that their issues were resolved when escalated, but there were some themes from operational employees indicating they didn't feel this way. The researcher observes (by logic) the organisation and employees would have benefitted when issues escalated were perceived to be resolved by both groups. With reference to the literature, the results of 'Escalated Issues Resolution' suggest to uphold the findings of both Shadur et al. (1999) and Kotter (1995) that

progressive change can only take place when leadership actually removes obstacles raised by employees.

The example of what impact a lack of issues resolution has is shown in the theme of 'Issue not Resolved', where a minority of operational employees perceived their escalated issues were not resolved. The researcher notes that this minority result is a potential caution for leaders, if they lose focus of removing obstacles raised by their employees. There were no common sub-themes among the 5 participants' responses classified as 'Issue not Resolved' but each response indicated that they had raised a unique issue that their supervisor never resolved or failed to give effective feedback on. Linking to the literature review of this perception element, the impact of the theme of 'Issue not Resolved' is that for front-line employees who gave these responses, they felt their unique obstacles were not removed. This means, as stated by Kotter (1995), that the new process (or change) could potentially not move forward. For supervisors and managers, this is a risk to the success of the change with the new process.

6.4 Results in Relation to Research Purpose and Motivation

The results discussed identify the significance of the perceptions of employees on the selected four change factors derived from the change iceberg in literature. The findings appear to confirm, that in the socio-technical system where humans and machines work, the physical changes to a process must work in harmony with consideration for the human beings that operate the machines. The significance of the flow efficiency approach taken by leadership was that it forced them to seek ways to improve the flow of the process, without placing blame on the human beings for the problems experienced. The flow efficiency approach, combined with leadership consideration for the employees, helped deliver solutions that involved and empowered employees. The combination also developed employees' understanding and appreciation for the benefits of improving flow by making tasks easier and quicker. The researcher believes the findings of the research have contributed to the South African Reconstruction and Development Programme's need for research in 'managing and developing human resources'. However, due to a specific case study being used, the researcher acknowledges the research does not contain enough scope and evidence to suggest that the flow efficiency approach has a broader contribution to directly impacting the other research needs of: providing jobs and building the economy in South Africa.

The findings of the research give an insight into the experiences of employees' during a flow efficiency approach in the labour-intensive, South African context (outside of the first world context of Modig & Ahlstrom's (2012) scope.) Significantly, the findings appear to highlight the importance of leadership to show support for employees and the process changes when driving and communicating matters using the flow efficiency approach. A further significance of the findings is that no pre-requisite, maturity levels in the organisation were identified as a baseline for the results found using the application of the flow efficiency methodology and the presence of evident leadership commitment.

7 CONCLUSIONS AND RECOMMENDATIONS

7.1 Conclusions

The following conclusions are made from the results and discussion of the research. The researcher has opted to split the conclusions into ‘High Level Conclusions’ and ‘Case Study Conclusions’. ‘High Level Conclusions’ give over-arching comments with reference to the Introduction chapter of the research, while ‘Case Study Conclusions’ give specific comments with reference to the research themes and sub-themes from the case study results.

High Level Conclusions:

- The research *did not* achieve a broad-based view on the impact of the flow efficiency management approach on employees’ perceptions in the greater industry context. However, the researcher would like to stress that this was not the intention from the beginning of the research. The research *did* however achieve an *insight* into perceptions of changes experienced by South African, front-line and supervisory employees when the flow efficiency management approach was used in the chosen case study. Although participant responses had specific context emanating from the details of the case study, the researcher is of the view that many of the identified themes and sub-themes are universal. An example of this is the general perception among operational employees that the process change actions made their job’s easier than before. This theme alludes to personal benefit being perceived by operational employees when a flow efficiency management approach is used – highlighted by literature as a positive aspect to the success of any change initiative.
- The researcher believes all 4 research objectives were met in the following ways: (1) the literature review yielded the 4 key change factors and related perception elements that affect employees directly involved in a process-focused improvement initiative. (2) the participants’ responses to the questionnaire and their allocated themes and sub-themes in the Results section showed the perceptions of the operational and supervisory employees of the changes they experienced during the process-focused improvement initiative. (3) certain themes and sub-themes of the operational and supervisory employees indicated employees experiencing benefits and drawbacks to themselves and the organisation. Benefits themes and sub-themes occurred more frequently than drawback themes and sub-themes. Lastly, (4) differences between operational employees and supervisory employees were discussed in the ‘Results’ and ‘Discussion of Results’ chapters despite the sample number being in favour of the operational employees.
- The researcher believes the research question ‘*What is the employees’ experience of a process-focused improvement initiative?*’ was answered through the identified themes and sub-themes from the responses to questions of the various perception elements tested. This directly meets the need of the first part of the research problem: ‘*...the*

*lack of information given by Modig & Ahlstrom (2012) on the **experience of workers** to a management approach using the flow efficiency methodology*'. The second part of the research problem was '*...that focus tends to be on success factors and culture requirements for implementations of process-focused approaches in the South African, manufacturing industry*' in the South African literature. This part of the research problem was not achieved by the research in the greater industry context. However, the case study did reveal an *insight* into the experiences of employees in the South African, labour-intensive context. This insight was different to the commonly researched pre-requisites for successful process-focused approaches in the South African context.

- The research purpose highlighted the comment by Bicheno & Holweg (2009) that in a socio-technical system, the relationship between labour and processes is inseparable. The research purpose '*to understand the experiences of employees who are directly affected by changes related to a process-focused management approach*' was chosen to specifically focus on the *labour* aspect of the socio-technical system in the South African context. This was achieved through the results of the questionnaire in the case study and as already mentioned in previous conclusions, was merely one example, or insight, into the greater South African context. The researcher believes that the unstructured questionnaire approach further contributed to eliciting detailed perceptions from the participants on their experiences. This research method was used to intentionally avoid a structured approach that would limit or influence participant answers. The researcher therefore believes the chosen research method extracted a greater variety of themes and sub-themes than a structured method would have achieved and could therefore offset the risk of low data validity through a single case study.

Case Study Conclusions:

- Operational employees acknowledged their existing roles and responsibilities had become easier with the process changes, but not necessarily due to their roles changing.
- Employees generally perceived teamwork to have changed for the better with the process changes they experienced.
- Supervisory employees indicated their roles and responsibilities had changed, and they perceived this to be a good thing.
- Most employees, at both levels, took better individual responsibility to drive individual performance improvement.

- Most employees', at both levels, perceived their jobs had been made easier and that flow of the process had improved.
- Employees felt empowered when leadership actually removed obstacles and issues raised by employees.

7.2 Recommendations

The researcher recommends the following for future research related to this topic:

- Assessing the response of employees in applying the flow efficiency methodology as a primary management approach in a broader variety of South African industries.
- Understanding the operational performance and sustainability of the flow efficiency methodology in labour-intensive, South African operations.
- Comparing the impact of a general lean implementation programme versus a process-focused management approach, on employees and operational performance in South Africa.
- Assessing whether the flow efficiency approach can help boost job creation in the labour-intensive, South African manufacturing sector.

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Appendix A: Draft Questionnaire

Process Improvement change factor	Perception Element	Operational Employee Question	First Line Manager Question
Leadership Behaviour	Leadership Commitment	How did first line managers treat the process changes?	How did cell managers treat the process changes?
	Coaching by Leaders	How did you learn the new process?	How did you learn the new process?
		Explain the purpose of the process changes.	Explain the purpose of the process changes.
Social System Change	Work Organisation	What impact do the process changes have on teamwork in the 'spine'?	What impact do the process changes have on teamwork in the 'spine'?
	Roles & Responsibilities	How have your roles and responsibilities been affected since the process changes?	How have your roles and responsibilities been affected since the process changes?

	Performance Measurement	How has your individual performance measurement been affected by the process changes?	How has your individual performance measurement been affected by the process changes?
Effectiveness of Change	Quality of Process Change	What impact has the process changes made on the flow of pallets from palletising to IDL?	What impact has the process changes made on the flow of pallets from palletising to IDL?
		What impact have the process changes had on the Tekdan scanner system?	What impact have the process changes had on the Tekdan scanner system?
		Have the process changes made your job easier?	Have the process changes made your job easier?
	Acceptance of Process Change	How long do you think the process changes will last?	How long do you think the process changes will last?
Employee Involvement & Empowerment	Involvement in Solution	How was the up-front communication to you before the process changes were made?	How was the up-front communication to you before the process changes were made?

	Involvement in Problem Resolution	How was your involvement when a problem occurred?	How was your involvement when a problem occurred?
	Escalated Issues Resolution	If you raised a problem with the new process, how well was it dealt with?	If you raised a problem with the new process, how well was it dealt with?

Appendix B: Draft Questionnaire with Expert's Feedback

Process Improvement change factor	Perception Element	Operational Employee Question	First Line Manager Question	Nicole's feedback
Leadership Behaviour	Leadership Commitment	How did first line managers treat the process changes? <i>How was your first line manager's attitude towards the process changes?</i>	How did cell managers treat the process changes? <i>How was your cell manager's attitude towards the process changes?</i>	This question is quite vague and may result in employees providing answers that don't correlate to your model answer. I would try to be more specific in terms of what kind of information you're looking for here. Based on the model answer, I would suggest something along the lines of "What was xxx's attitude towards the process changes?"
	Coaching by Leaders	How did you learn the new process?	How did you learn the new process?	
		Explain the purpose of the process changes. <i>What was the purpose of the process changes?</i>	Explain the purpose of the process changes. <i>What was the purpose of the process changes?</i>	Perhaps to keep in line with the questions, "What was the purpose of the process changes?"
Social System Change	Work Organisation	What impact do the process changes have on teamwork in the 'spine'?	What impact do the process changes have on teamwork in the 'spine'?	
	Roles & Responsibilities	How have your roles and responsibilities been affected since the process changes?	How have your roles and responsibilities been affected since the process changes?	

	Performance Measurement	How has your individual performance measurement been affected by the process changes?	How has your individual performance measurement been affected by the process changes?	
Effectiveness of Change	Quality of Process Change	What impact have the process changes made on the flow of pallets from palletising to IDL?	What impact have the process changes made on the flow of pallets from palletising to IDL?	
		What impact have the process changes had on the Tekdan scanner system?	What impact have the process changes had on the Tekdan scanner system?	
		Have the process changes made your job easier? <i>Have the process changes made your job easier? In what way is your job easier or more difficult?</i>	Have the process changes made your job easier? <i>Have the process changes made your job easier? In what way is your job easier or more difficult?</i>	The question alone may elicit just a yes or no response; consider "Have the process changes made your job easier? In what way is your job easier or more difficult?"
	Acceptance of Process Change	How long do you think the process changes will last?	How long do you think the process changes will last?	
Employee Involvement & Empowerment	Involvement in Solution	How was the up-front communication to you before the process changes were made?	How was the up-front communication to you before the process changes were made?	
	Involvement in Problem Resolution	How was your involvement when a problem occurred? <i>Were you involved in resolving problems within your area? Please give an example of when you had a problem and</i>	How was your involvement when a problem occurred? <i>Were you involved in resolving problems within your area? Please give an example of when you had a</i>	A simpler way to ask this would be "Were you involved in resolving problems within your area?"

		<i>how you were involved or not.</i>	<i>problem and how you were involved or not.</i>	
	Escalated Issues Resolution	<p>If you raised a problem with the new process, how well was it dealt with?</p> <p><i>If you raised a problem with the new process, how well was the problem dealt with? Please give an example.</i></p>	<p>If you raised a problem with the new process, how well was it dealt with?</p> <p><i>If you raised a problem with the new process, how well was the problem dealt with? Please give an example.</i></p>	<p>This question appears as though you're looking at how the person who the problem was reported as opposed to how well the problem was dealt with. I would consider "If you raised a problem with the new process, how well was the problem dealt with?"</p>

Appendix C: Email response from external expert on Questionnaire

Nov 5

Dear Chris,

I hope you're doing well!

I'm so sorry for taking so long to read through your survey and get some feedback to you; it's been a crazy week.

I think overall, the survey looks great, it's clear and understandable. I have made some edits in terms of simplifying the questions to ensure you get the responses you're looking for. They're just suggestions, so please don't feel like you're obligated to make those changes :)

I know it's also your first draft, but consider adding more detail to your model answers which will really help you later on. I tried looking at the responses, but I was out of my depth in terms of what type of responses you may receive.

Also think about how you will introduce the questionnaire, you mentioned group administered questionnaires -will you be administering and talk them through the questionnaire or provide written instructions? Especially emphasise confidentiality as some of those questions are fairly personal (perhaps even randomly number the questionnaires with no identifying details).

Let me know if you have any questions or if you'd like me to go through anything again-it was fun!

Thanks,

[REDACTED]

[REDACTED]

Industrial Psychologist

083 [REDACTED]

**Appendix D: Draft Operational Employees Questionnaire with Internal Experts
Feedback.**

Research Questionnaire

Date: _____

Job Position: _____

Permanent or Temporary Employee: _____

1) How was your first line manager's attitude towards the process changes? –
Make last question

2) How did you learn to use and work in the new process? – Make Third
Question

3) What was the purpose of the process changes? – Make first question

4) What impact do the process changes have on teamwork in the 'spine'? –
Make 6th Question

5) How have your roles and responsibilities been affected since the process changes? **Make 5th Question**

6) How has your individual performance measurement been affected by the process changes? – **Make 7th Question**

7) What impact have the process changes made on the flow of pallets from palletising to IDL? – **Make 4th question**

8) What impact have the process changes had on the Tekdan scanner system? – **Pair with process Flow question**

9) Have the process changes made your job easier? In what way is your job easier or more difficult?

10) How long do you think the process changes will last?

11) How was the up-front communication to you before the process changes were made? – Make 2nd Question

12) Were you involved in resolving problems within your area? Please give an example of when you had a problem and how you were involved or not. – Move before Process last question

13) If you raised a problem with the new process, how well was the problem dealt with? Please give an example. – Move to after “how were you involved” question

Thank you for your participation!

Appendix E: Final Version of Operational Employee's Questionnaire
Research Questionnaire

Date: _____

Job Position: _____

Permanent or Temporary Employee: _____

1) What was the purpose of the process changes?

2) How was the up-front communication to you before the process changes were made?

3) How did you learn to use and work in the new process?

4) What impact have the process changes made on the flow of pallets from palletising to IDL?

5) What impact have the process changes had on the Tekdan scanner system?

6) Were you involved in resolving problems within your area? Please give an example of when you had a problem and how you were involved or not.

7) If you raised a problem with the new process, how well was the problem dealt with? Please give an example.

8) How have your roles and responsibilities been affected since the process changes?

9) What impact do the process changes have on teamwork in the 'spine'?

10) How has your individual performance measurement been affected by the process changes?

11) Have the process changes made your job easier? In what way is your job easier or more difficult?

12) How long do you think the process changes will last?

13) How was your first line manager's attitude towards the process changes?

Thank you for your participation!

Appendix F: Final Version of Supervisory Employee's Questionnaire
Research Questionnaire

Date: _____

1) What was the purpose of the process changes?

2) How was the up-front communication to you before the process changes were made?

3) How did you learn to use and work in the new process?

4) What impact have the process changes made on the flow of pallets from palletising to IDL?

5) What impact have the process changes had on the Tekdan scanner system?

6) Were you involved in resolving problems within your area? Please give an example of when you had a problem and how you were involved or not.

7) If you raised a problem with the new process, how well was the problem dealt with? Please give an example.

8) How have your roles and responsibilities been affected since the process changes?

9) What impact do the process changes have on teamwork in the 'spine'?

10) How has your individual performance measurement been affected by the process changes?

11) Have the process changes made your job easier? In what way is your job easier or more difficult?

12) How long do you think the process changes will last?

13) How was your cell manager's attitude towards the process changes?

Thank you for your participation!

Appendix G: Participant Letter of Consent

November 2015

Dear Participant,

Re: Participation in research on “The Results of Flow efficiency Methodology in a Labour-intensive, South Africa Operation”

My name is Chris Bodill and I am a part-time MSc Industrial Engineering student at the University of the Witwatersrand, Johannesburg.

I am currently undertaking a research project titled “*The Results of Flow efficiency Methodology in a Labour-intensive, South Africa Operation*”. You have been requested to participate in a group-administered questionnaire. The purpose of the questionnaire is to understand your perceptions on various aspects of the flow efficiency changes that took place within the ‘spine’ area improvement project in the Danone Boksburg plant during 2015.

Your participation in this questionnaire is anonymous and voluntary during which you have the right to ask any questions or withdraw at any time. You have been selected to participate in this questionnaire based on your specific roles in the spine area of the factory where the case study for this research project took place. Please note that your answers to the questionnaire will be kept confidential and used for research purposes only.

The questionnaire contains 13 open-ended questions. Please be open and honest in your answers and include as much detail in your answers as you can. Please avoid “yes” or “no” answers to the questions as these will limit the content of your perceptions for the research. If you need clarity on a question please feel free to ask. Please don’t right your name anywhere on the questionnaire.

Thank you for your time and effort to assist with this research project. By signing this form, you give permission to use the information captured in the questionnaire for my MSc research project report. The results of the research might be reported in academic papers and at conferences. Please feel free to contact me if you would like more information on the research project or questionnaire.

Kind regards

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Signed: _____

Date: _____

Appendix H: Spine Change Management Presentation

Spine Flow

The new world ahead...



SpineToday?



Waiting..



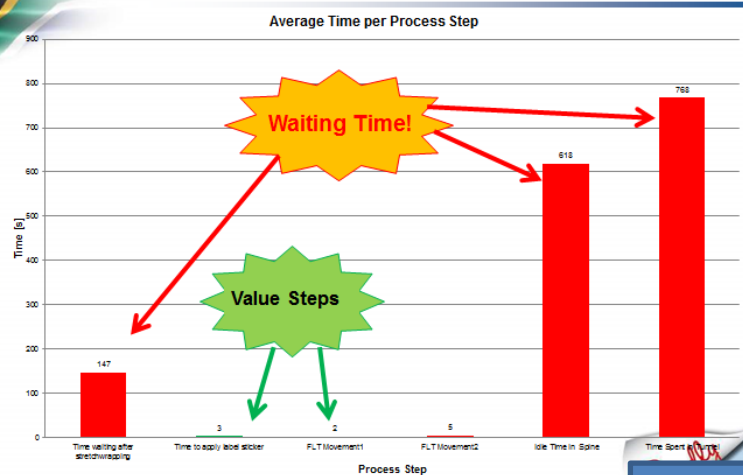
Spine March 2015?



Where are we now?

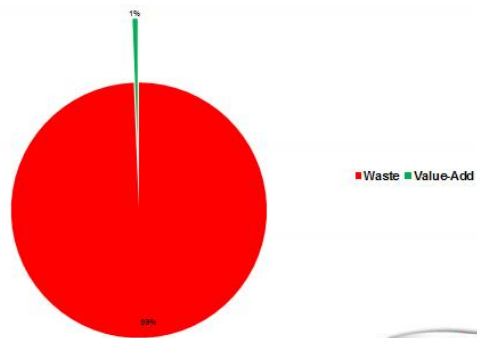


Spine Current Situation



Spine Current Situation

Value/Waste Pie Chart of Average Pallet Movement in Spine



Spine Current Situation

Incorrect and over declared labels amounted to **R4 million in 2014!!!**



What must we achieve?



What must we achieve?

1) Flow: A pallet should **continue moving** or **processed** between end of line and IDL. **No full pallet waiting in spine!**



What must we achieve?

2) **100% accurate** application of pallet labels with **zero overprinted** labels!



What will be changing?

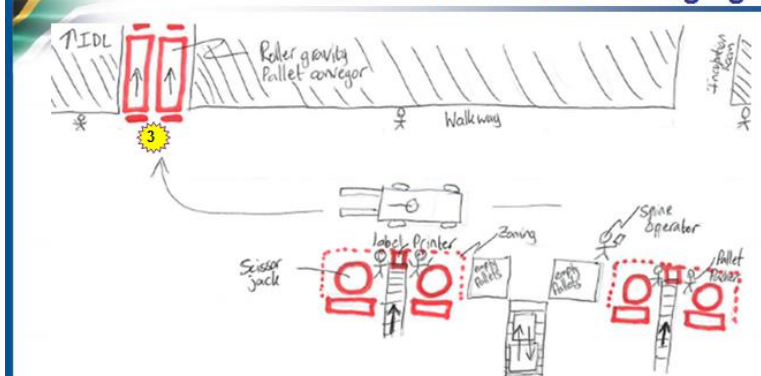


What will be changing?



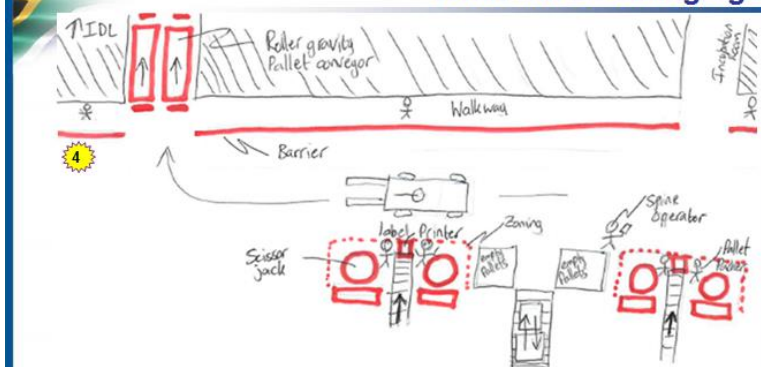
- 1) Each line to have its own printer. Printers will move to above conveyor for easy access. Palletiser packer will apply label himself to pallet
- 2) Each line will get its own "Palletpal" for quicker, easier pallet packing

What will be changing?



- 3) Gravity-feed rollers in spine tunnel to reduce pallet waiting, reduce forklift time wasted at tunnel area, better flow of pallets.

What will be changing?

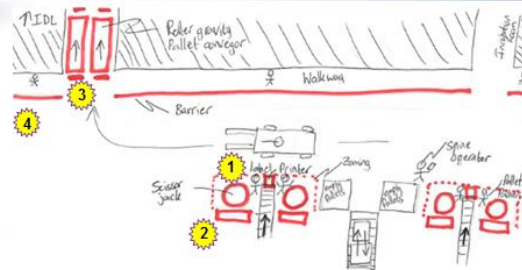


- 4) Barrier within spine to:
 - Prevent a pallet being stored against the wall. Want no buffer between line and tunnel (no pallet waiting in spine!)
 - Create a safe walkway in spine

When will changes occur?



When will changes occur?

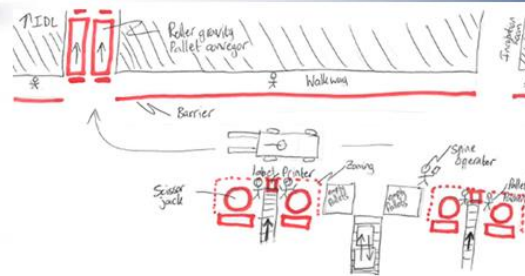


- 1) **Printers:** - stands, cabling, network and printers installation early Feb starting with Arcil 3 pilot and roll out to other lines afterwards.
- 2) **Palletpals:** End March/ early April. Ship delayed from USA due to storm
- 3) **1 x Tunnel Roller Conveyors:** Late Feb/ Early March
- 4) **Spine Barrier:** March

How will people be affected?



How Will People Be Affected?



- 1) **Forklift drivers:** No changes.
- 2) **Spine Controllers:** Only change is that he won't stick label onto pallet
- 3) **General workers (pallet packers):** Only change is he will stick label to pallet from online printer.

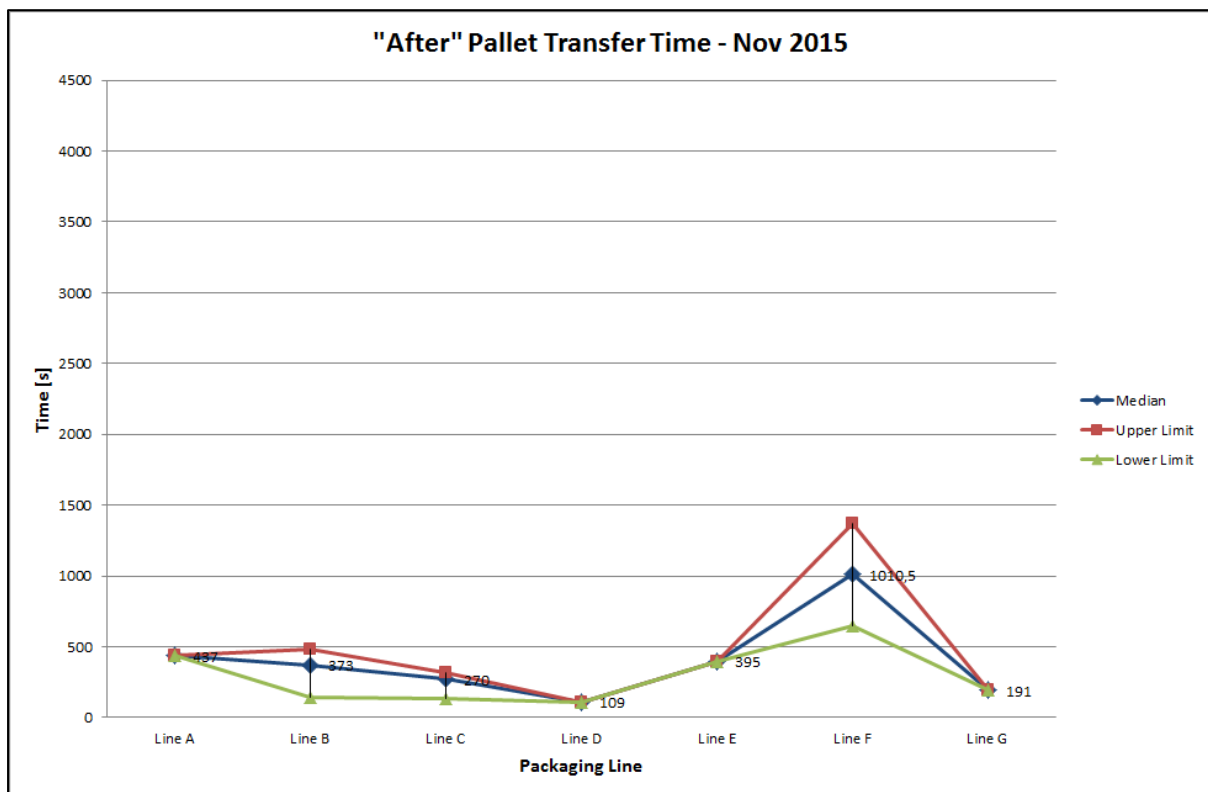
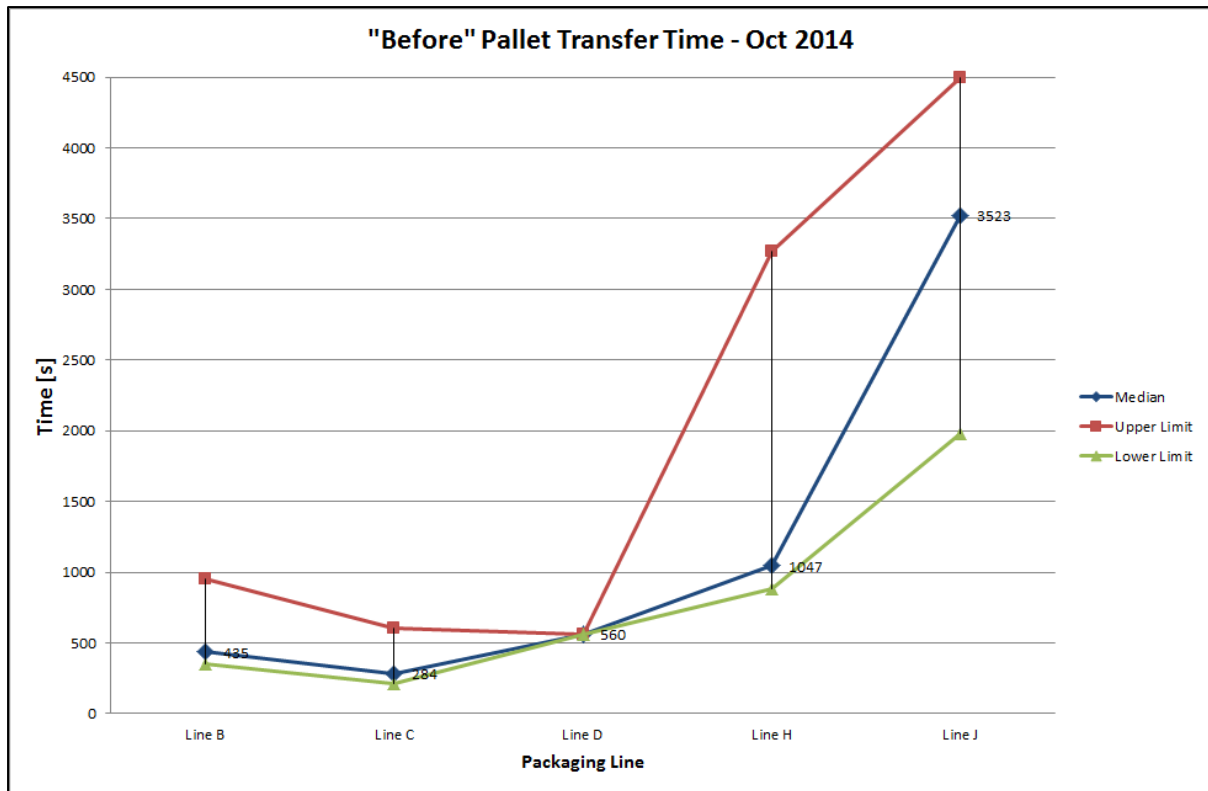
Note: Above changes are effective only when that line has its printer set up so it's a line by line change as printers are installed.

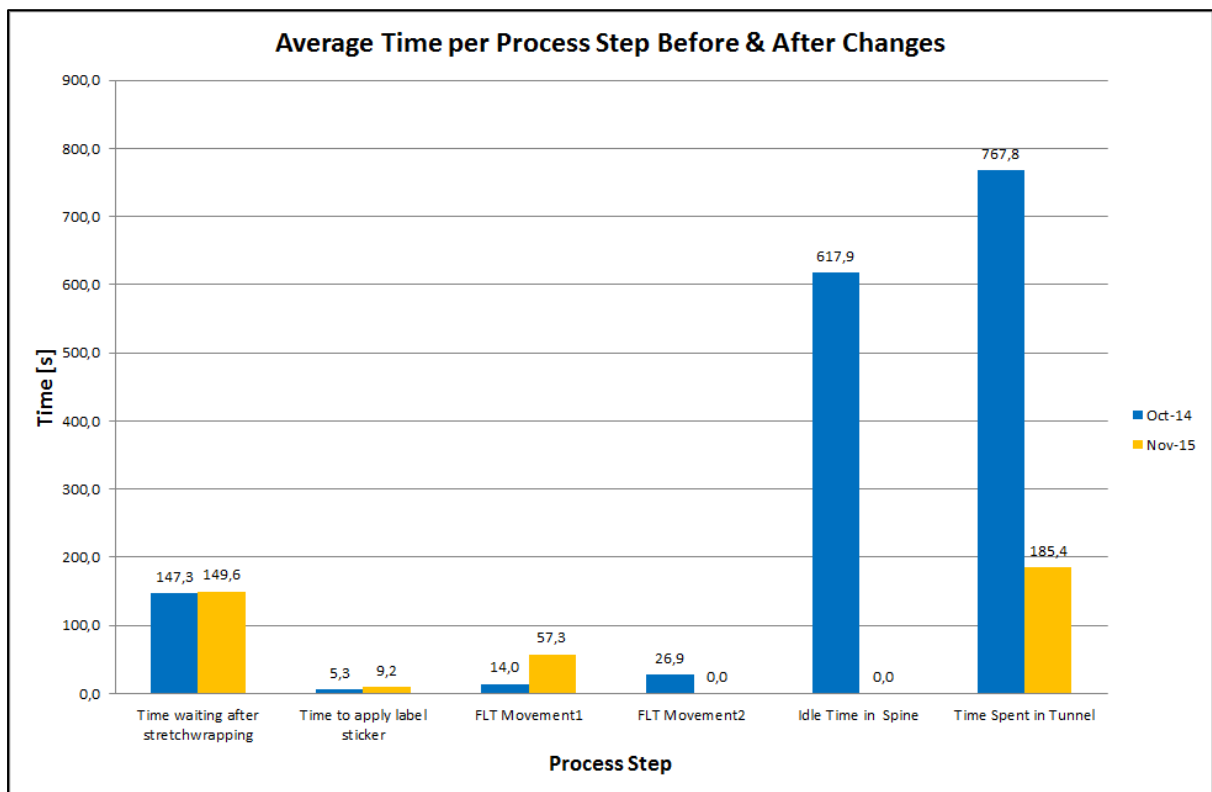
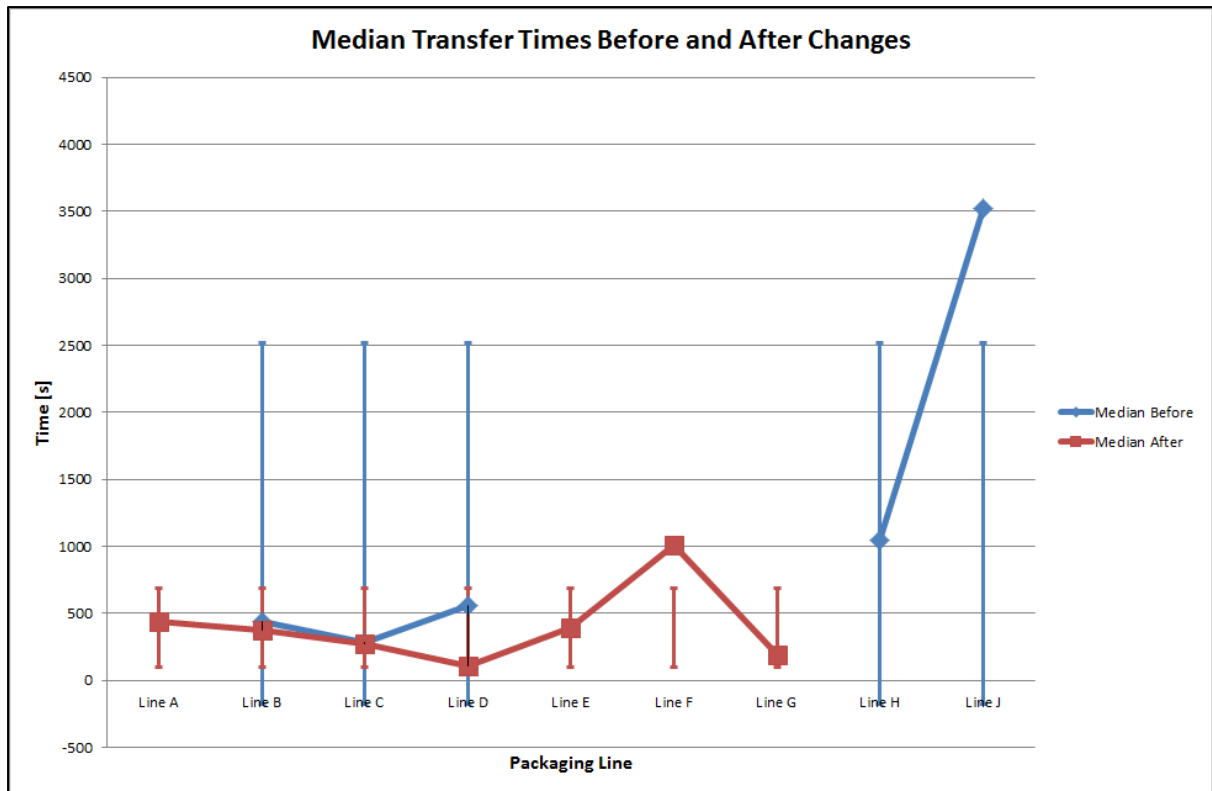
Questions?

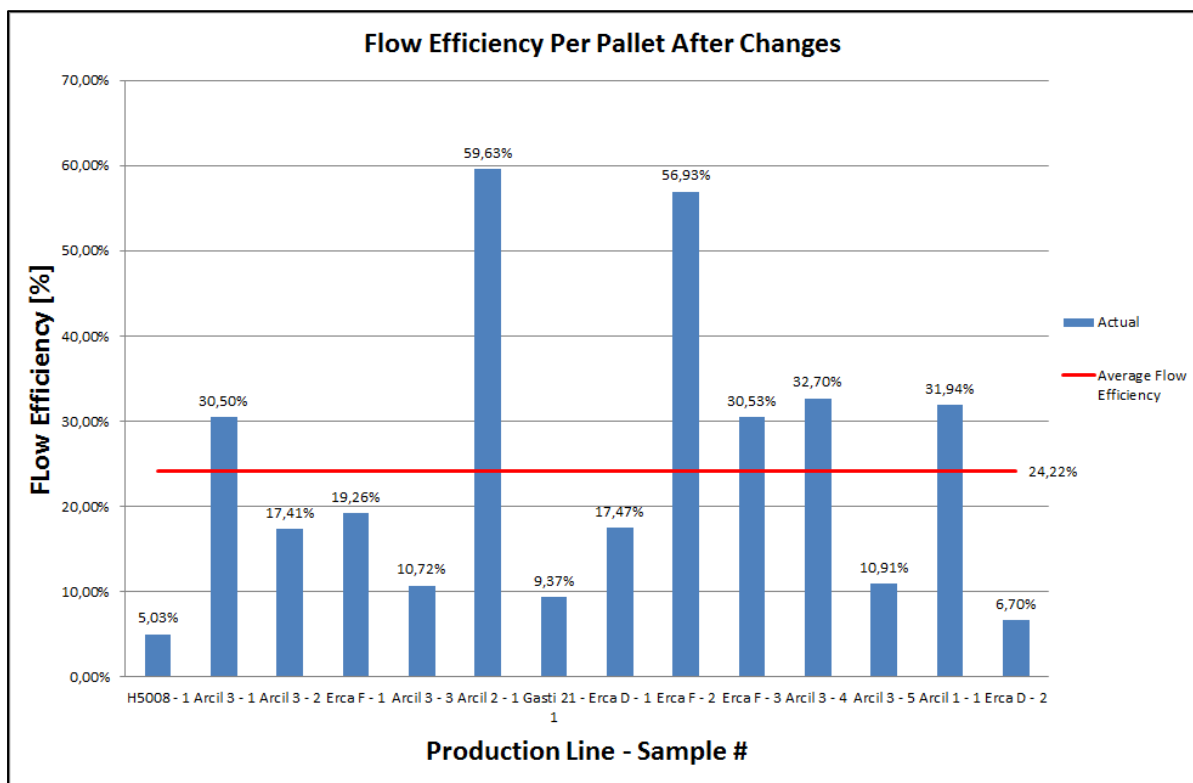
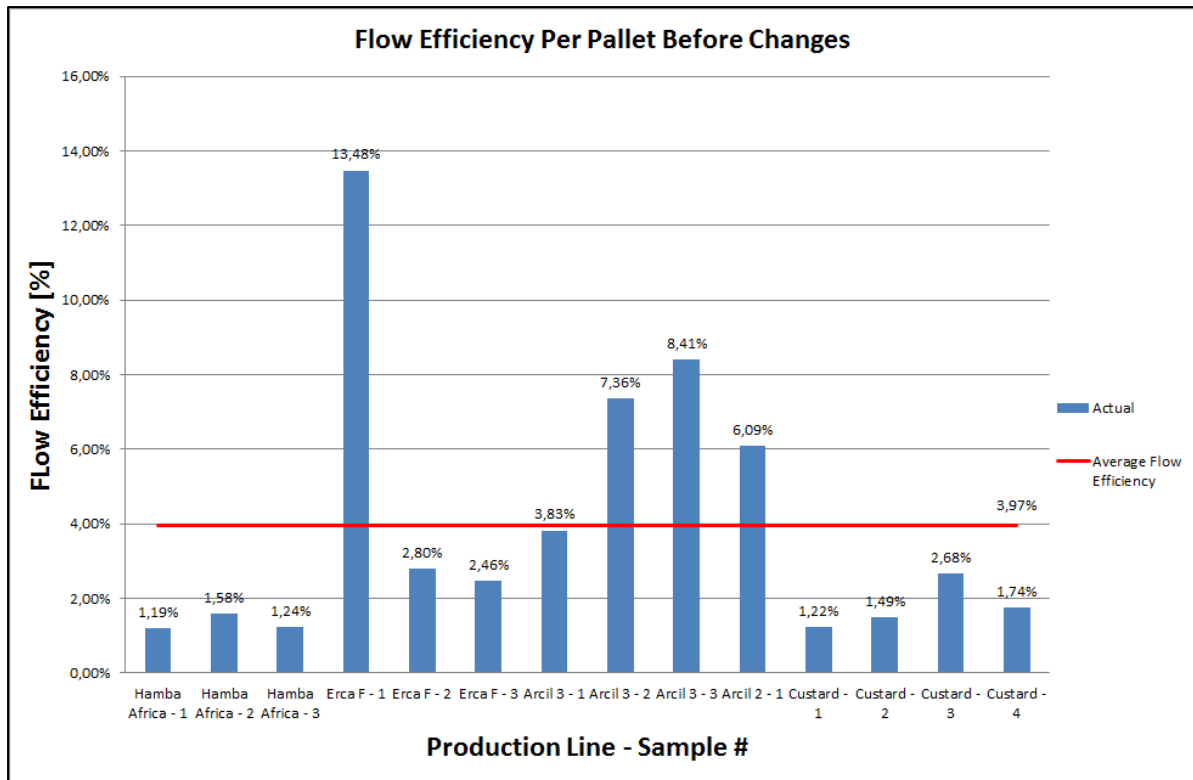


Appendix I: Data and Results of Process Time Studies

Date:	17-Oct-14	Flow Unit: Pallets with finished goods					
Time started study:	08:46	Time Units: seconds					
Time ended study:	11:42						
Production line supply - sample #	Time waiting after stretchwrapping	Time to apply label sticker	FLT Movement1	FLT Movement2	Idle Time in Spine	Time Spent in Tunnel	TOTAL [s]
	Seconds						
Hamba Africa - 1	140	4	10	25	2219	867	3265
Hamba Africa - 2	269	6	12	19	2	739	1047
Hamba Africa - 3	720	3	14	24	68	56	885
Erca F - 1	120	5	16	17	46	80	284
Erca F - 2	258	7	8	19	130	180	602
Erca F - 3	38	5	12	20	69	66	210
Arcil 3 - 1	128	8	15	29	132	639	951
Arcil 3 - 2	96	4	17	25	61	145	348
Arcil 3 - 3	43	6	19	27	11	329	435
Arcil 2 - 1	108	4	16	31	300	101	560
Date:	20-Oct-14						
Time started study:	14:25						
Time ended study:	16:15						
Custard - 1	53	5	15	35	2067	2322	4497
Custard - 2	65	7	13	42	2004	2045	4176
Custard - 3	15	4	12	37	831	1080	1979
Custard - 4	9	6	17	27	711	2100	2870
Date:	10-Nov-15	Flow Unit: Pallets with finished goods					
Time started study:	13:50	Time Units: seconds					
Time ended study:	16:10						
Production line supply - sample #	Time waiting after stretchwrapping	Time to apply label sticker	FLT Movement1	FLT Movement2	Idle Time in Spine	Time Spent in Tunnel	TOTAL [s]
	Seconds						
H5008 - 1	10	3	19	0	0	405	437,00
Arcil 3 - 1	38	3	40	0	0	60	141,00
Arcil 3 - 2	32	12	62	0	0	319	425,00
Erca F - 1	206	8	44	0	0	12	270,00
Arcil 3 - 3	146	7	33	0	0	187	373,00
Arcil 2 - 1	1	21	44	0	0	43	109,00
Gasti 21 - 1	60	9	28	0	0	298	395,00
Erca D - 1	203	8	105	0	0	331	647,00
Erca F - 2	46	8	70	0	0	13	137,00
Erca F - 3	152	13	85	0	0	71	321,00
Arcil 3 - 4	147	10	93	0	0	65	315,00
Arcil 3 - 5	83	10	43	0	0	350	486,00
Arcil 1 - 1	42	9	52	0	0	88	191,00
Erca D - 2	928	8	84	0	0	354	1374,00







Appendix J: Questionnaire Answers Spreadsheets (Operational, Supervisory)

Date	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
Date	2015-12-01	2015-12-01	2015-12-01	2015-12-03	2015-12-03	2015-11-30	2015-12-01	2015-12-02	2015-12-03	31-11-2015	2015-11-30	2015-11-30	2015-11-30	2015-12-02	2015-12-01	2015-12-03	2015-11-30	-	2015-12-04	2015-12-04	2015-12-04	2015-12-09	2015-12-09	2015-12-10	2015-12-10	2015-12-10	11/12/2015	11/12/2015	8/12/2015	30/11/2015	08/12/2015	
Job Position	General Worker	General Worker	General Worker	General Worker	General Worker	General Worker	General Worker	General Worker	General Worker	General Worker	General Worker	General Worker	General Worker	Spine Controller	General Worker	General Worker	Learner	-	Pack operator	General worker	pack operator	Forklift driver	General worker	General worker	General worker	General worker	Spine Controller	Spine Controller	Spine Controller	Forklift	Spine Controller	
Perm/Temp	Temp	Temp	Temp	Temp	Temp	Temp	Temp	Temp	Temp	Temp	Temp	Temp	Perm	Perm	Perm	Temp	Temp	-	-	Temp	Perm	Temp	Temp	Temp	Temp	Temp	Permanent	Temporary	Permanent	Temporary	Permanent	
Question	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
1) What was the purpose of the process changes?	It is to make job easy or to save.	The purpose of the job was to avoid crates.	Employees have a walkway to make sure they are safe from forklifts. The employees feel comfortable when using the rounding stand.	The purpose of the changes is to improve zoning and safety in the plant and to keep the area clear always. Pallets must not stay at the spine. The pallets from the machine must go straight to the fridge.	To make easy work for everyone who is work on the spine and see that it is the safe place.	It is one new pallet and elevator printer per line and system of the scanner working are team.	It is to make our job easier than before.	It is to avoid losses and make sure that pallet not stay long at spine before received by IDL. The Tunnel conveyor is helping a lot because it takes a journey before you packed it, its giving a time to wrap and sort material.	To make easy work for everyone on spine and that is the safe place.	To give employees less work and to make work go fast because people were getting tired easily because the pallets were were down and when you done to pack a pallet you will have pain in back.	The changes they had now are better than before. We help each other and the speed of a machine we can handle.	The purpose of the change was to make work easier.	To make our job more simple. Before we had crates to pack our products. The change helps us pull our crates.	The purpose is to make the job easy and faster.	The process change is good to make things faster.	The purpose is very advanced because it brings more safety to people who work at the spine.	The process is to make the job easy and to change from crates to boxes.	The Process improvement change tool place to the spine.	To make a budget for the company no matter the people are changing to make the spine.	The purpose of the new process is to reduce cost of the pallets from the new barrier.	To understand our perception as spine workers on various aspects of process improvement changes.	To make job easy and fast and the product must go on clean.	I think to make faster than the other system.	Easier work and no delay.	To make the working system simple because past it was hard to work.	The purpose of the change is to make job easier and fast.	The purpose of the new change was to make the spine a safer place and to be more organised.	The purpose of the change is that the job we had it was simple only 2 find out it was difficult 4 us we could not control it but now we can control the job just because there's a change	It was to make our job easier and manageable	To me the things order the controls like printer working ching the plast rep plast is not rep was the take the prom impact in time to the 3rd review and play and forklift on forklifts. because if the forklift is not coming in time.	The process changes is to make job easy for us to change way cast working in the spine e.g. traffic of pallet in the spine they put were pallet in the flow of spine. Flow it easy because you take pallet straight to the thankfull on to the conveyors.	
2) How was the up-front communication to you before the process changes were made?	Much better.	It was right because we're using the hooks to pack the product.	There was a mix up. Pallets were all over the place. Safety was not provided because we didn't have a walkway. Product was not taken to fridge on time.	Not every line had a printer for pallet labels. Some of the lines had their pallet labels printed on other lines, which could lead to pallets having wrong labels.	Communication was not good because we had to wait for forklift and line was already full.	FIM and operator communication is better before and after. So now is the very light communication the spine of the factory too.	It was more official communication to the each other, especially at spine.	Before the forklift drivers print the stickers and place it for now they just print then palletising placed it on the pallet but sometimes they delay to print and it causes stoppages of lines and traffic on spines.	Communication was not good because line was always full.	Supervisor says when you done to palletise, take the sticker and place on the pallet. Printers were made that early on the machine was one, so now it's easy to get on time.	Yes I sometimes see the forklift drivers using it sometimes, I ask them to show me how to use it but when the printer is stuck not bringing the barcode I know where to touch.	Communication was clear. After the change was introduced the team was present at the spine throughout.	Because I realise we don't have many losses of products. The computer is packing the pallets automatically.	Our communication was good before the changes were made. I think if management communicate with general workers the company will see more changes.	There was a lack of communication.	The communication was not good before the process. Now its good.	you Specific roles in the Spine.	There was no up front communication. Why? In saying so because there is no finish up.	The up-front communication was not presented to me.	Now everything is clear to me because now I see a problem I communicate with packing operators. Before it was difficult because I have small knowledge.	I think I should process was good because it make more job for temp employees.	I was not present.	It was hard to work because sometimes the stackers crush the products, but now no waste.	The up-front communication is good because he communicate what happens when machine has problems.	The communication was good. All the changes that took place were necessary.	I learnt practically because that's where I work and before we had connection on the spine but now the work is easier for us.	We were told about the process before and we were allowed 2 ask questions and we were answered before the process can change	We just told what we supposed to do even though we had suggestions they were not helping until there was a new change	Life the product is not rait with on the operat if the pallet is not rait with took the pees not imobse the IDL the printers is weaking rait and the time is stack the control gear is not rait if I go them fixt the time.	It is not easy for us because they have not communicate simply the conveyor is not there for so there for us there's a one machine platen	The process changes is to make job easy for us to change way cast working in the spine e.g. traffic of pallet in the spine they put were pallet in the flow of spine. Flow it easy because you take pallet straight to the thankfull on to the conveyors.	
3) How did you learn to use and work in the new process?	The new process is difficult for people because the box that come from the elevator is cracked. If they come there on the spine make a disaster.	We learned hard because the boxes were heavy.	Although no training was provided, signs were available to help with process. I think training needs to be provided to make sure we work in a safe environment	I was trained on how to use and work in the new process.	It was not easy to learn it but when time goes on we find that it is a easy way to work and no longer overwork.	It is very easy to work now and before the change it was hard to work. Change to last so now is right working.	It was easy because we were taken for training and it make the job more easy.	I learnt that safety is important and working as a team we can achieve more and get training on how to use printers and where I should work and walk to avoid forklifts.	We are no longer waiting for forklifts. Overflow and pallets are no longer waiting.	It was hard the first time, but in the mean time its better. Now learning is more important to be able to work and the new process is good. The machines are running fast.	People I am working with show me	Spine controllers coached me how to.	We have pallet pals turned around to make our job safe and enjoyable.	They ask the training and they now work better than before.	From other workers.	I have learned that there is a area for people only and there is a area for forklifts. We are not bending like before to pack product.	At first it was not easy but now we know how to use pallet pals.	The questionnaire is Open.	I was learning but working is very bad now. Why? There is no communication at all.	The line maager train me to make a job clear and ask if something is not right.	I learned that you must work hard always to improve yourself.	I learn simple because we not work hard.	To work on the machines in the spine.	The line manager at the meeting teach me how to work.	The was a training meeting where everyone who works in that area was briefed.	To clear the spine connection and to make the work of spine controllers and fork lift drivers easier and to ensure safety of workers.	It didn't take time. I just needed 2 understand it but now it's working and this new process is not difficult 2 understand	To learn to use work in the new process was easy because we communicate well	Am wai rait then the old one new angoust the skemer and printers other live better out agust until thing	It is easy because the first they put more pallets on the flow but now they take pallet straight to IDL. Logistic not to put the pallet on the flow of the spine and to make job to be faster than the last process		
4) What impact have the process changes had on the flow of pallets from palletising to IDL?	Sometime there is no forklift to pick up pallets that cause the spine to be full. If we can't take fast the pallets from the spine is easy.	Much better than we used to do it.	It made the product to be quick because there is a tunnel conveyor that makes it take for IDL. It also saves time.	The process changes have made a major impact because now pallets don't delay to get to IDL. Correct pallets with correct labels gets to IDL.	We no longer waiting for forklift. No overflow and pallets are no longer waiting.	You have palletising pallet from the down and top and using blue paper and plastic tape and put the layboard.	To make the job go fast and so there won't be problems with the lost pallets.	New method helped a lot by not placing a wrong sticker on a wrong pallet so we have one printer per line.	To put pallets in the fridge fast and so there won't be problems with the lost pallets.	It is better than older day because now we have material conveyors.	Flow of pallets to IDL is quicker because we have a tunnel conveyor. The pallets are covered with plastic and no scrap.	Yes. Before we were not using conveyors to take pallets to IDL and it was not safe, but now we use conveyors.	The Whole pallets are covered with plastic and no scrap.	The process brings tunnel conveyor that is very fast.	Yes, but for the company not for us.	It made a good impact for products to stand a long time. The forklift drivers are the one's who give us problems. They take too much time to remove pallet from stand.	It made no change towards the average line because the pallet pals are not installed.	for the research project took place.	Yes, but for the company not for us.	It made a good impact for products to stand a long time. The forklift drivers are the one's who give us problems. They take too much time to remove pallet from stand.	To decrease the customer complaints and everyday increase the good target of the company.	I think from old system was not good new system good but you must make more change to pallet pals.	Changes help IDL because forklift don't come to spine to put product.	They have fitted the tunnel conveyor to simplify the movement of the pallets from the spine to the cold room.	After changes drivers of forklift have done the work of pallet is finished packing.	A good impact because the place was messy.	It made a good team work of spine working right, fast and easier than before.	At first we had pallets fall all over the spine, since we have a barrier walkway the no longer put the pallets on the spine the only thing we needed 2 do is 2 drive it 2 the tunnel conveyor and that makes us not 2 work over the pallets we found at spine	The impact has made it easier for the worker at the spine and as well as the workers at IDL.	Pallet pals weiking in the wbcuse is bring the conveyor before am work was hard now form	Is to make job easy for us to take pallet straight to IDL. Logistic not to put the pallet on the flow of the spine and to make job to be faster than the last process	
5) What impact have the process changes had on the Teldan scanner system	The scanner sometime there is no network that the pallets don't fill up the spine.	It is right at the pallets don't fill up the spine.	It helps because it is fast. You can print from a distance and there is a printer in every machine, which makes it quicker and saves time to scan.	The scanner communicates with the printers in all the lines and in the end it puts the right label on the right line.	It makes work so easy and flow of pallets is easy.	Yes. Systems of the scanner is right, but sometimes it's wrong because system was delayed.	The spine control showed me how to use scanner and how to do the job. If the system is slow they come and help so that we can work together.	Teldan Scanner system use two scanners - one for printing label and one to transfer so that we can see the combination to avoid the loss of pallets.	It made work easy and flow of pallets easy.	It keeps the sticker when you're done palletising and it's right here so you don't have to walk like the first.	There is an improvement in the sense that flow of pallets is quicker.	Changes are very Professional.	Although the system was giving problems, they fixed it when we reported it.	papers or stickers on the pallets.	They make the new method that every line have a printer.	The scanner is right, I don't know much about it, but I think its working good.	Area improvement in the Danone Boksburg.	N, because the packers are involved now but nothing else them happy.	It make job easy and careful because all the pallets are in the computer and no lost stock.	The Teldan scanners are too slow.	Improved printers per line and scanner work easier.	The have changed the old printers and the system of the new scanners.	A good change because before there was a lot of confusion regarding the scanning and printing.	I used to travel a lot for eight hours when declaring labels for the whole factory and sometimes we overprinting because the job was strenuous and difficult for ours.	At first we had two printers at spine and now we have printers per line and that is making our job 2 be easy 4 cause we no longer have 2 walk all over the spine asking labels 2 each other and every pallet.	Well before we used to have 4 printers and it was hard for us to catch with the speed of the machines	The tells scanner am wiking is small because am not working the scanner	Teldan scanner system now there's a lot of printer you print label on the more machine soon the same time.				
6) Were you involved in resolving problems within your area? Please give an example of when you had a problem and how you were involved or not.	Yes. The conveyor was jammed because the sensor was dirty. Was supposed to clean it and get it right.	Yes. We have a problem of Palletizing before they put on the pallet pals.	Yes. We had to come up with a quick way to pack inkman on filmatic because that machine is fast and the boxes are heavy.	Yes. Before the changes were made I was involved in a problem where I put a wrong label in my pallet. The label was not for my line, but I put it on my pallet because it was printed on the printer that is where I work.	There was one forklift and I had to help him to flow pallets by helping him to take out stickers on my system.	Sometimes forklifts delayed at take out of the pallet, so you have communication at FIM and operator.	The problem we had after the scanner the label we didn't see the scanner taken out and they had to scan other labels without knowing that they drew scanner labels	Yes. It was on August this year I was packing a pallet at the back and the forklift driver damage it the way to IDL and he came back to force me to repeat it while machine was still running and caused the stoppage of the machine.	no solving problem.	No, but I am pushing myself to learn more so I may something is wrong on the spine I can report it.	First of all we must clean our area because we are very professional.	Yes I was. My problem was over-printing of labels. I report it to my supervisor.	When we increased the height of the boxes and the problem was not solved we tried to call safety management but nothing happened.	I didn't have any problems within my area.	sometimes we have problems with people scan the pallet system.	Spine area improvement.	Not yet because our line manager is funny to the people working on the spine.	I was not involved as I was absent due to the service of the machine.	My problem is the machinery in the production is quick and the forklift was decreasing the speed of the job.	I think I can solve my problems by speaking to floor manager.	I was not involved in solving problems in my area after process changes.	There was no pallet pal in the area I am involved there is.	There was a big problem in my pallets that should be inside fridge but was not. My suggestion is to move full pallets straight to IDL.	My performance went up because the job is easier and faster than before.	They had a problem in putting labels in the new printers only 2 our out that I know how 2 and I had 2 teach and help some of them but they know.	Yes we had printers messing up the labels and we did try to solve the matter by using a cloth and benine	Examine the box peks is not flow the box we coth the seprations	I'm involved because I'm working on spine I'm concerning in my order or my job all of us are concerning.				
7) If you raised a problem with the new process, how well was the problem dealt with? Please give an example.	Motor or elevator. They change that motor and put a new motor for machine to run.	It was better after putting the pallet pals.	Very well. We had to add people on the machine. Two packers and two rappers in a rotating manner to make it easy to do the job.	Never had a problem with the new process.	Because now we can take out the sticker ourselves- now there's no longer overflow of pallets.	For example if you working at FIM, FIM was take action on your communication me and somebody.	To avoid stop and go of the machines we have to take plastic wrap from other machine to wrap pallet.	When all machines are running the forklift drivers get some problem because sometimes they have to go and change the forklift batteries.	Printer is sometimes rolling the sticker in side you can say is no sticker.	I am not taking time when we go to deal with it.	If one runs out of cardboard fast sheet, one would borrow from the next machine as not to stop the line.	I went well as my FIM called me to my manager and project team to let us know that we must have own printer to avoid printing wrong labels.	They don't want to teach general workers. Only operators working good in the factory.	I have a problem to report on the spine because our line manager never take something written on Q form.	The problem was pallet pals and the problem was not dealt with because the pallet pals are not installed.	We raised issues about the forklift speed is too low.	As a forklift driver I want packers wrapping the pallets quickly because the forklift speed is too low.	The printer can sometimes get jammed.	Tunnel conveyor was blocked at pallet.	Packing crates in stacks can cause injuries and waste of product.	I have never raised a problem with the new process because it is very effective.	It had positive impact because of the smooth flow of spine and accuracy of our job	If I'm having a problem with the printer at spine I simply report it meanwhile I'll be using the next line printer 2 make labels, in order 4 them it can take them a day or half a day.	The problem was when we lose labels and how we try to reprint them and use them if the product is still running but if not we cancel the label.	Live naming lariat	It is simple for us because the process now for us it changes. It makes our job easier						
8) How have your roles and responsibilities been affected since the process changes?	My role was to make sure that always I take all pallets from the conveyor because the weight of the conveyor is too light.	It was much better.	They were affected because the machines are fast and we are always tired. Speed needs to be reduced.	The responsibility to take the label for the printer and place it on the pallet. Before the changes this was done by the spine controller.	Now it can be easy to work or to do your job.	Palletising pallet is new system elevator may job is the change from the rate go to plastic tape, so your job is not very easy now.	I had to put label by myself after the spine controller scanner.	It is to make sure when the forklift drivers print out the sticker then put it on is full	I can't go to the toilet because the machine is running fast and forklift is slow to keep the stickers.	Nothing.	All the problems have been resolved because we use new technology	To make my job easier than before. So now I have more time to check pallets before I send to IDL.	To be the hard worker in the factory and focus what you are doing.	The new process never affect my responsibility. It brings more energy to working	Sometimes we don't see the red tape on the product because its hidden in the box.	It affected my roles and responsibilities for the sake of my safety.	The customer complains are less.	It has changed, but it is not right like pallet spine.	I work safer in a barrier working spine.	Not affected because since process changes I learn more.	My roles and responsibilities have been affected for the better.	It was good because the system made our work easier and we can also be accurate when declaring and transferring pallets.	Before the process can change we had many difficulties like we had 2 walk all over the spine pasting labels over pallets and now we no longer do that.	Since we are having this new printers we the spine operators have 2 print the labels and the start operators have 2 put on the label in the pallets they work on and that makes it easy for us 2 work.	We now communicate very well as we were struggling before.	Am wiking the term	As a spine controller communication is good now because we are working as a team now thine process is changing my condition.					
9) What impact do the process changes have on teamwork in the 'spine'?	The problem is that the box is heavy. They need more people to work there.	Much better.	A lot of team-work is required to avoid the conveyor from getting stuck. So if we work as a team there are less problems.	It Strengthens communication between myself and the forklift drivers, the spine controller and IDL.	Now there is more team-work than before.	That guy was working for scanner if one has to go for lunch it is not working. Nice so team-work is very important.	We are working together instead of going to toilet and we are working together if other machines are not running.	We tell our forklift drivers to print when the pallet is full and they tell us when we have to wrap the pallets.	Im working now. Change.	We going high because we take the work on team-work.	It is more understandable now since we have seven people on the machine. We rotate so everyone will know how the machine works.	Team-work is still existant. General workers are able to relieve each other during short breaks.	We were confused because we didn't know how we are going to work and our job, but after few weeks we don't let us be happy.	The impact of the process change in the spine is a good all the time.	Team-work is good but not happy because the job is too hard we need more power.	There is no team-work yet on the spine. Why? We don't get Danone benefit for all of us.	It made a impact of decreasing motion and more safer with the machinery.	There is no team-work because the spine controllers have gone for recharge of batteries of the forklift they don't let us know.	The people packing the product must have communication with stock controllers.	The team-work with the spine is not good because communication is bad.	Safe and easy work because we have a spine bottle and tunnel conveyor.	Simplify way of working. There was few printers in the spine, now every machine has printers.	The communication is right. You have to tell the guy to pick up the scrap.	There is good team-work now because there is a good communication.	As a packer at the spine I feel very comfortable with the new process. Everything I need to do my work is close to me.	Yes, because I cannot travel long distance when declaring and transferring pallets.	Since we are having this new printers we the spine operators have 2 print the labels and the start operators have 2 put on the label in the pallets they work on and that makes it easy for us 2 work.	We now communicate very well as we were struggling before.	Am wiking the term	As a spine controller communication is good now because we are working as a team now thine process is changing my condition.		
10) How has your individual performance measurement been affected by the process changes?	The performance is going slow by the new process because if you are working alone the machine they stop everytime because the conveyor is too short.	Not effected as such.	It has changed because the machines are fast and the spine people are always under pressure. That includes the slow forklifts.	The quality controller may delay to print the label while both pallets are full, and that causes the line to stop.	Now you can work easy and happy.	Performance is the right form and process, but the guy working on the spine is not safe.	The performance hasn't changed much because if the machine is not running I have to make sure that the sometime that at my gear.	Its very good because it gives me time to make some movements and get my material next to my work place.	Process is very good. My job is very good now.	Performance has improved since all resources I need to perform my job are here.	Our performance are very good	We must not lose focus on what we are doing because once you lose focus you make mistakes.	My individual performance is good on the process because I am no longer bending when packing products.	The performance becomes enjoyable because am no longer bending when packing products.	It will take time to get used to the job.	The process has improved the spine.	It affected bad because I don't know my job in the company.	Everything is not good for me at all because I use a lot of energy and it always tired.	I lost because not job for temp anymore.	Machine is very fast.	I'm improved on the position I worked before	Forever/ permanent	At first we had a bad movement at spine only 2 found out that the pallets are stacked at spine the spine is full but now we are no longer experiencing that.	Now the number of undeclared labels has come down.	Is not so hard	Let I printing more label because of one printer now my performance measure meant is a lot of printers as a spine controller						
11) Have the process changes made your job easier? In what way? Is your job easier or more difficult?	No. They need more people on the spine cause it is difficult.	It is much easier than before.	It made the job difficult because the forklifts are too slow. The speed is reduced, so conveyors are always full so we are under pressure.	No. Because now I have the responsibility to put the label on the full pallet, which was done by the spine controller.	Yes. I am no longer waiting for forklift or waiting for sticker.	It is more difficult because new system is very fast so its not easy.	More difficult because I had too fast to make a wrap a pallet and to avoid the stop and go of the machine.	It makes it much easier because forklift is going far from where I am working.	Job is easier - not waiting for forklift	It is easy to pack - plastic wrappers are of good quality so my work is safe.	We no longer have to wrap the pallet ourselves.	The change made my job easier because I was able to print labels and paste them myself.	Yes, because I don't have to round with the pallet now am just spinning the pallet into the holder.	It is not more difficult, but we need more people at spine. The units of product and now its 3040 and we pack by hand.	Made my job more difficult because of the decreased number of employees. Has been more pressure.	My job is more complicated than before. We used to pull one line of 6 crates to the pallet with 500 employees and now its 3040 and we pack by hand.	The job is easy because I'm not counting for the label and pallet. The machine is full.	Yes, he made my job easier. The way you change is good, but no job anymore for temp.	First in my line we use hands to pack product, now we have box packer.	The job is easier after the changes. The new system is good to add production.	The new process has made my work easier.	It was confusing and at the same time understandable because we know the purpose of the change.	At first I had 2 purch pallets inside the tunnel conveyor we put the pallets on top of it then they roll inside I think it's easy 4 me now than before	It is easier because now we can catch up with the speed of the machines while printing.	The process changes is make my job easier for me. I have a conveyor in spine lots of printers take the pallet straight to the tunnel.							
12) How long do you think the process changes will last?	Not so long.	It will last long.	Until someone comes up with a better process.	Until someone comes up with a better process.	I think this is a good way to work with and must stay longer.	It is too very long time.	Maybe.	I think it can take long because it make our job look easier and simple and avoid injuries and losses.	Long-term	Three to five years depending on us.	I thinks its going to take two to three years.	This change will last because of the flow of products at the spine.	The process change will last forever because its satisfied our customers.	It will last if the equipment we use gets a service.	I think the process will last for years.	Will work forever.	I think the process change is killing us more than two years.	I think it will be a long time.	For a long period of time.	It is going good because they cant communicate with pallet pal, even first line manager.	Im not sure how long it will last.	I think it should last forever, but there is always a room to improve.	Yes, when the changes were made we had some complaints about pallets missing but it was discovered that the system had some errors	I think it will last 4 as much as we get another change cause it is easy 4 each and everyone, there are no difficulties and it doesn't affect or harm anyone. I like this process changes. Our is making my job easy.	For ever I think (IDL)	Httbck from with last home time	The process is going to take long time because it is easier for us it is making my job going faster than before.					
13) How was your first line manager's attitude towards the process changes?	It is too bad they do not take us at people.	Doing well.	Line managers always complain about stuck conveyors. They pretend as if they don't see the forklifts are slow and that machines were added so spine people always have to deal with pressure and stress.	she did very well because she went training for the wote thing.	We are no longer reporting or complaining about the flow of work in spine.	You first line manager is not attitude but you have to do your job, but sometimes it's attitude but not every time.	she was helpful and make sure that the job is easier by making sure.	It was not good because she just think that one person can make it.	You was doing.	Annoying because I was not knowing what exactly I was supposed to do for labels now.	First day I was scared but when day go I understand it easy and simple.	The attitude was positive since the FIM made turns to the spine and was coached us if we needed.	The attitude was good.	It was good because he give himself time to come to me if I have a problem.	The attitude was good towards the process change.	He change because he don't shout at me anymore.	The truth is our first line manager is killing us because he don't want to more people at spine.	Chris.	Bad attitude from line manager because there is no communication.	More difficult and unfair.	The attitude was as usual.	Good because we are working with machine stops he know what reason it stops.	My line manager was very happy about the new change because we don't have a spine fail.	He cares and has good attitude because when machine stops he know what reason it stops.	The line manager has the right responsibilities to do the work.	His attitude was good because he did not fight the change.	Good we had a problem with scanner not working well but we contact Chris then he just needed 2 get use 2 1 and now is working and I see no complaint about it.	It was positive because we all was looking for a change in our work environment	First day it is not improve for him but after three days it is easier for us it is making my job going faster than before.			

Survey #	1	2	3	4	5
Date	2015-12-01	08/12/2015	01/12/2015	01/12/2015	8/12/2015
Question					
1) What was the purpose of the process changes?	To improve the flow of material at the spine. Ie: Raw materials as well as finished product. To reduce losses.	Was to improve the pallets into the coldroom from the end of the lines and this improve efficiency in all upstream processes. The change also would create safe and sufficient supply of packaging materials to the line and improve forklift movement. The change also sort to reduce over declaration of labels on the spine.	To improve the process at spine and limite movement improve safety. To be more in control of losses / our declan labels. Manage the system process on the go.'	To improve the flow on the spine. We eliminated the use of crates that was used before for packacing. Cost reduction we use to have washing machine for crates reduced cost for labour and chemicals for clean up the line.	The purpose of the process changes is to simplify the flow of materials and finished goods in and out of the production lines
2) How was the up-front communication to you before the process changes were made?	It was communicated in advance before the actual changes took place.	The communication was cascaded down to our level via section(cell) managers and the progress of the project was once or twice mentioned through asikhukune forum.	Not very efficient, we catch up as we go.	It was very well communicated cause we know before the first introduction on the machines what was the expectation.	The communication of the changes were made upfront including the phases of the changes
3) How did you learn to use and work in the new process?	Coaching/training was provided to us by project leaders.	The process and my role were explained to me including all necessary tools, for example access to tehdan	I learnt to use Tekdon, I also got a better understanding of spine tech. How to manage overdeclared losses.	The was train up conducted about the new process and how the process going to affect our daily operations.	I got training on Tekdan specifically and I use it to trck stock produced as well as undeclared labels.
4) What impact have the process changes made on the flow of pallets from palletising to IDL?	There is a smooth flow of pallets as there are no pallets being stacked against the wall.	The flow has improved especially reduced the overdeclared labels. The role of applying the labels to the pallets has since being moved to the packers which allows spine controllers focus on moving pallets to more efficiency.	The spine is cleaner, more control and its safe :-), the walking for me its aoboner. Before walking at opic was. The pallets no longer stay for a long time. We are able to track losses over declare losses.	It made a huge difference there was use to be a number of incident where crtes was breaking and full up and dirty the floor with product. The place look clean now and we don't have to worry about crates machines.	There is much improvement in terms of pallets flow from palletising to IDL. Especially with the roller conveyors that makes the flow faster by being able to replenish pallets that has been moved without waiting.
5) What impact have the process changes had on the Tekdan scanner system	There is reduced losses as each label is printed on each line.	It has improved accuracy. Each line now has its own sssc label printer which eliminates put sssc labels on wrong pallets	The process didn't initially allow automatic movement to dl which caused lots of overdeclared we have now in process the system that you need to scan twice to allow movement. Because of lack of commitment guys are not work, turn not its better, because of more involvement from the people involved.	It is a good change these is loss problems only the issue of over delivered stickers but we are improving a lot to solving the problem.	The Tekdan scanner system has brought about improvement by reducing overprinting of labels. Each line has got its printer that makes it easy to identify and apply to the pallet there and there. Spine controllers don't have to move around a lot to print and apply labels.
6) Were you involved in resolving problems within your area? Please give an example of when you had a problem and how you were involved or not.	Yes. I have seven spine controllers who did not have Tekdan passwords. I arranged passwords for them via our IT department.	It has involved, and still are resolving issues around transferring of pallets IDL on the system and also investigating overdeclared labels.	Over declared label-cancel. Balancing shop orders, checkgin discrepancies and involving IDL intern turn is enced. Once hade shop order which should label was in STO (Introduction) but it was received, IDL discard with IDL and manage to get the pallet processed.	We had a problem where the packers were not using the cows board on the pallets this incident cause some of the production produced packed on pallets to collapse or damaged on the bottom layer, I was involve in trainign the employee by use of one point lesson.	I was involved in resolving some of the problem experienced with the printers not printing on correct lines. Pallets not getting transferred to location ST02, getting error on scanners of 'deficit BA unrestricted use". Most of the problems get escalated to IT to resolve on our behalf.
7) If you raised a problem with the new process, how well was the problem dealt with? Please give an example.	It was well received. Issues of pallet pals that were needed was speeded up to ensure that we received most of them asap.	It was dealt with efficiently. For example we had several workshops with IT crew set up to discuss true challenges we are facing	We had a problem with a guy reporting to having a lot of overdeclard labeler. We sat around with him also included IT and manage to sort it out.	It was attended very well we had a problem with true our declaration of stickers where by the physical apilet was in the warehouse but it still show our declared we did get help in getting the training to understand how it was happening and we managing up well now.	The rised problem got resolved eg. Late printing of labels when shop orders are long finished and also the problem of pallets not getting transferred to ST02.
8) How have your roles and responsibilities been affected since the process changes?	I'm required to take more responsibility in what happens in spine area.	Positively - There is a improved systematic approach to dealing with challenges on the spine	Now more focus on the spine area. Checking tuckdown system and sorting orders.	No mayoers. I just have to ensure that the employees use the correct boxes. For different machine and flavours and to check tekdan system covering overdeclared labels.	There is now less problems and less management of the whole spine area and more controlled labels printing no more many undeclared labels.
9) What impact do the process changes have on teamwork in the 'spine'?	Employees need to work as a team in order for the process to work. There is more Collaboration between the spine controllers and the packers.	Positive - they are able to track their work more accurately and to minimise true errors on the spine	The packers at the back now are responsible for putting labels on the pallet and spine controller creates label at forklift take the life.	It was huge cause before they had stackers to pack crates but now they have to physically pick up boxes to pack on the pallets it that way they are complaining about being tired but it is better now as they are getting use to the system.	The team is more relaxed. There is more co-ordination and controllers are also being able to check and see if any shop order is over packing and they notify us/operators.
10) How has your individual performance measurement been affected by the process changes?	My performance has improved as there is less delays in getting product through to IDL. Reduced losses as well.	Positive - the overdeclaration of labels has reduced and tracking of declared labels has improved.Errors are resolved within shift. There is less damages of the product on the spine due to falling pallets because some of the work load is shared with the packers at the end of the lines.	Morale gone up and I can problem solve	The was a major effect we getting all the help we need when ever we fall with problem function focus to have (b) overdeclared labels and we are getting there.	My performance measurement have been affected in a positive way of gaining knowledge and also that what do I have to do when faced with challenges. I can easily track losses as far as shop orders are concerned and also that I can compare what was produced to what was received with ease.
11) Have the process changes made your job easier? In what way is your job easier or more difficult?	Yes, I don't have to always be at the spine to ensure the spine is not full. The new process allows for a smooth flow of pallets. I am also able to monitor everything that happens via the Tekdan system.	It has made it easier - we are able to do things right first time. Safety has improved; witing for forklifts has reduced; applying wrong sssc labels on the pallets is almost eliminated.	Just move work load , but it has made me crarve for spine controller it has become easier.	Yes, it have we use or I use to stand at the back of the factory to ask for crates when ever we have a short supply of crates but now I only focus on the floor.	My job is easier and more difficult at same time. It is easier when I am closing shop orders and I find that when there is more inexplainable losses that I have to investigate and I have to compromise line tours and do investigation.
12) How long do you think the process changes will last?	They are here to stay. The new process is working well and should be kept as it is.	We are deep into it and I think two more months all stakeholders will be fully onboard.	It shold go on for a long time as it has improved the process	As toys we still getting the supply of boxes and affordable the process can last forever is a good process.	I cant tell for sure but if it is yielding good results for the company then it should stick around for a while as I believe it does yield some good results.
13) How was your cell manager's attitude towards the process changes?	He was supportive and guided me through the whole change.	Positive	Very supportive and sharing info.	It was great he was giving us a great support and still do.	My cell managers attitude was that we should make the process work as it is beneficial for all of us.

Appendix K: Example of a Completed Operational Employee Questionnaire

Participant Letter of Consent

November 2015

Dear Participant,

Re: Participation in research on "The Results of Flow Efficiency Methodology in a Labour-Intensive South African Operation"

My name is Chris Bodill and I am a part-time MSc Industrial Engineering student at the University of the Witwatersrand, Johannesburg.

I am currently undertaking a research project titled "*The Results of Flow Efficiency Methodology in a Labour-Intensive South African Operation*". You have been requested to participate in a group-administered questionnaire. The purpose of the questionnaire is to understand your perceptions on various aspects of the process improvement changes that took place within the 'spine' area improvement project in the Danone Boksburg plant during 2015.

Your participation in this questionnaire is anonymous and voluntary during which you have the right to ask any questions or withdraw at any time. You have been selected to participate in this questionnaire based on your specific roles in the spine area of the factory where the case study for this research project took place. Please note that your answers to the questionnaire will be kept confidential and used for research purposes only.

The questionnaire contains 13 open-ended questions. Please be open and honest in your answers and include as much detail in your answers as you can. Please avoid "yes" or "no" answers to the questions as these will limit the content of your perceptions for the research. If you need clarity on a question please feel free to ask. Please don't write your name anywhere on the questionnaire.

Thank you for your time and effort to assist with this research project. By signing this form, you give permission to use the information captured in the questionnaire for my MSc research project report. The results of the research might be reported in academic papers and at conferences. Please feel free to contact me if you would like more information on the research project or questionnaire.

Kind regards

Researcher (Chris Bodill) Contact Details: 084 72 82 776 or cbodill@gmail.com

Supervisor (Teresa Hattingh) Contact Details: 011 717 7374 or teresa.hattingh@wits.ac.za

Signed: 

Date: 04 December 2015

Research Questionnaire

Date: 04 December 2015

Job Position: SPine Forklift driver

Permanent or Temporary Employee: Temporary

1) What was the purpose of the process changes?

To make job easier and fast and the product
must be go very clean to the Market and attract
the eyes of consumers.

2) How was the up-front communication to you before the process changes were made?

Now everything are clear to me because if I see the
problem in the product I communicate by packers
operators and line manager and we solve problem
quickly. But before it was difficult because
I was have the small knowledge.

3) How did you learn to use and work in the new process?

The line managers are train me to make my job clean and ask if something is not so right. and I'm quickly correct.

4) What impact have the process changes made on the flow of pallets from palletising to IDL?

To decrease the customer complaint and every day increase the good target to the company. and we are make sure that all production are not have the mistake if we transfer to IDL

5) What impact have the process changes had on the Tekdan scanner system?

The Tekdan scan make job easy and careful because all pallet are read to the computer and no lost of stock.

6) Were you involved in resolving problems within your area? Please give an example of when you had a problem and how you were involved or not.

In the spine my problem is the machinery of production are quickly and the forklift was decrease the speed the job to make difficult and another problem the people working behind to packing the product to pallet then packing to pallets and so on. They rapping pallet late if two are full

7) If you raised a problem with the new process, how well was the problem dealt with? Please give an example.

Me as the forklift driver, I wish packers must rapping the pallet quickly because the forklift speed is too low.

8) How have your roles and responsibilities been affected since the process changes?

The customer cost complains are less and production have many buyers to the markets.

9) What impact do the process changes have on teamwork in the 'spine'?

The people working to packing the product must have the communication by stock controller if one pallet is must call the forklift driver or the print have the problem the packer must tell the spine controller.

10) How has your individual performance measurement been affected by the process changes?

Everything are good the problem is the low speed of forklift because the speed of machines are high it make the job difficult.

11) Have the process changes made your job easier? In what way is your job easier or more difficult?

The job is easy because you not writing the label and the pallet I'm taking to the machine to put straight the IDL. But it is difficult if the machine are far and the cubation inkomazi release because if you move out inkomazi to the cubation to put in the IDL it take long time to go the area.

12) How long do you think the process changes will last?

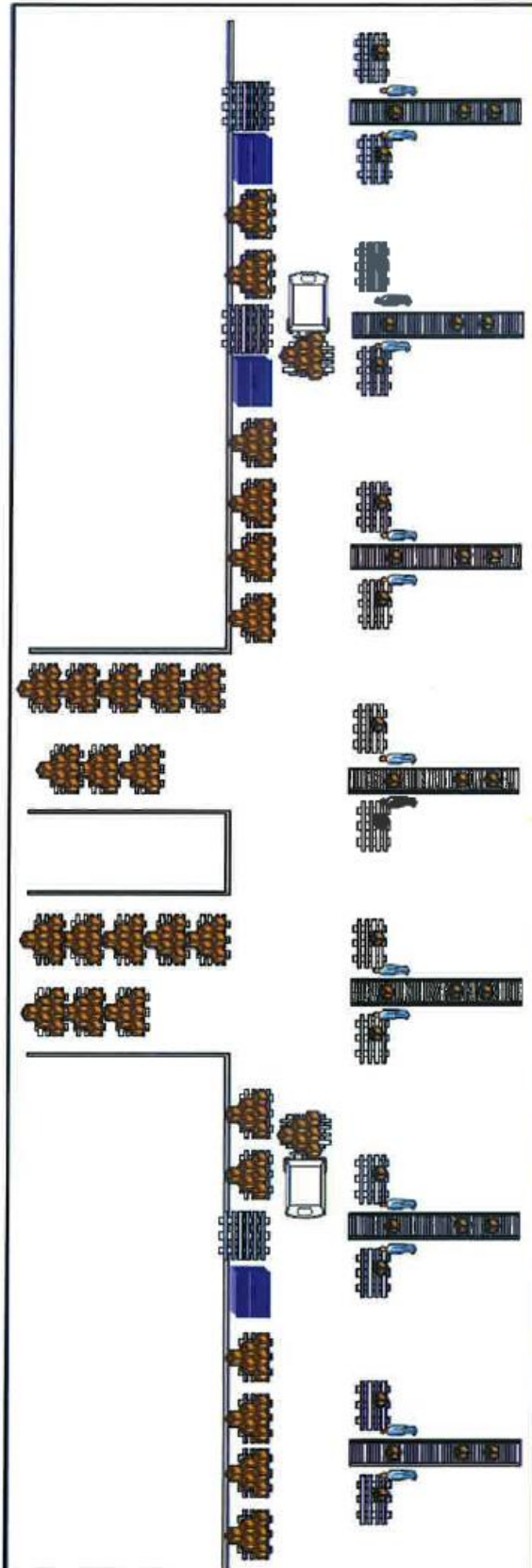
Since was started because everything are
going good because packers are putting labor
themselves it will be last.

13) How was your first line manager's attitude towards the process changes?

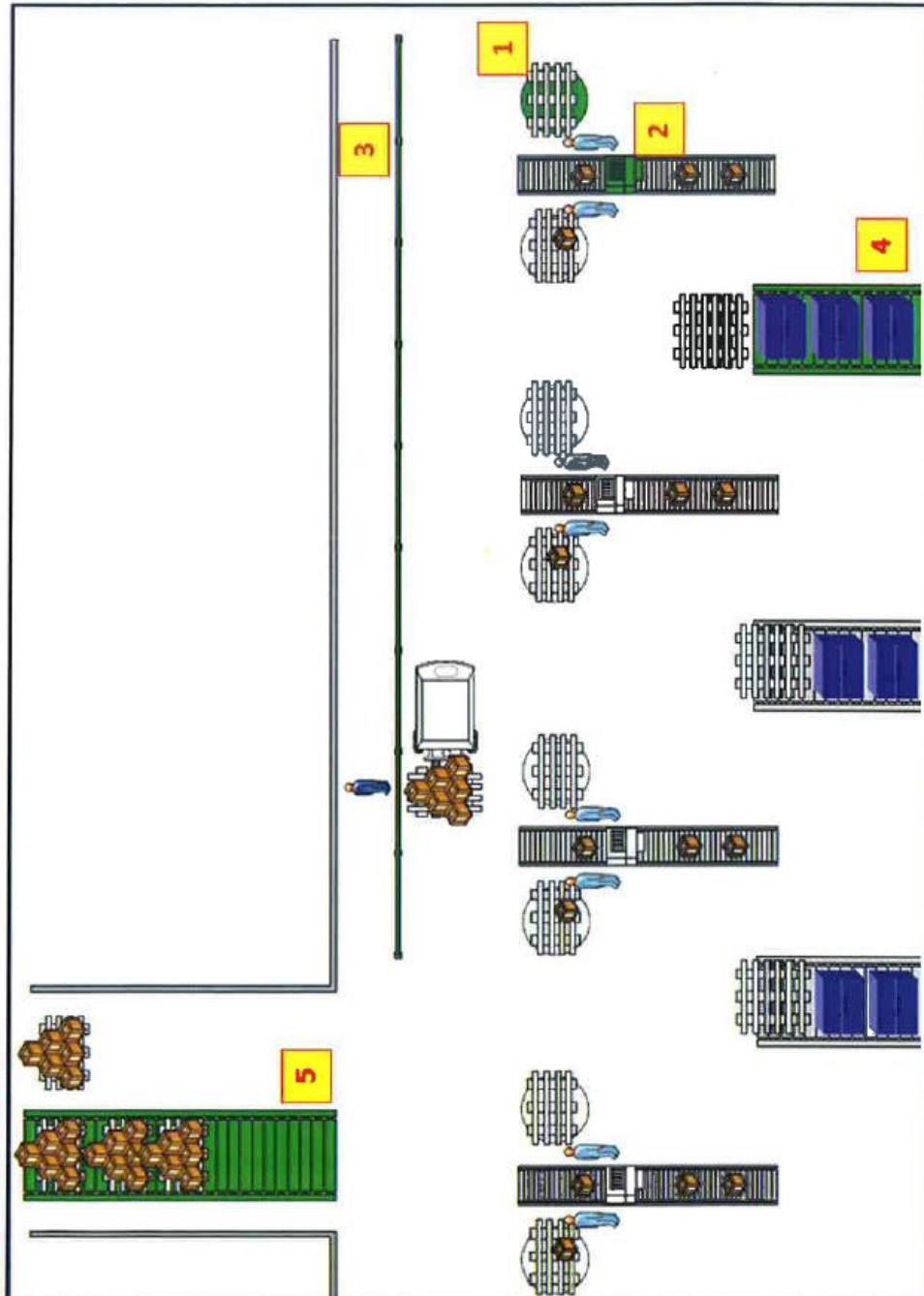
The first line manager is good because we are
working as a team if I have the problem I report
to her and solve the production problem. and she
see the problem she let me that this work is
slow what wrong and the after we solve the problem

Thank you for your participation!

Before Changes:



After Changes:



Changes Made:

- 1) Palletpals
- 2) Printers per line
- 3) Spine barrier/walkway
- 4) Materials Conveyors
- 5) Tunnel Conveyor