GRADUATE SCHOOL OF BUSINESS AND LEADERSHIP

The Utilisation of Change Management and Problem-Solving in the Automotive Component Manufacturing Industry.

Student Name: Jade Myra Strachan

Student Number: 971162762

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Graduate School of Business & Leadership

Supervisor: Dr. Emmanuel Mutambara

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ABSTRACT

In South Africa the automotive component manufacturing industry is embarking upon a growth strategy but the questions remain as to whether employees at all levels (Managers or Shop Floor) are adequately equipped to deal with the massive rate of change, are they able to solve problems and implement solutions in order to keep up with industry demands. The objective of this study is to examine problem-solving tools and relevant change management in order to ensure the success of initiatives or projects within the Automotive Component Manufacturing environment.

An explanatory sequential design allowed the qualitative exploration of 13 Companies and 25 Team Leaders which determined the frequency and type of problem-solving tools used by Kwa-Zulu Natal based Automotive Component Manufacturers. Focus groups were then conducted which included interviews that explored the use of change management to assist solution implementation.

From this initial exploration, the qualitative findings can be used to develop assessment measures that can be administered to a larger sample of participants within the Automotive Components Manufacturing industry.

The investigation of Iuga and Rosca's categories as discussed in the recommendation related to the qualitative, descriptive study where the questionnaire results would lend themselves to the starting point of a Problem-solving Model for all South African Automotive Component Manufacturers to address root cause analysis and solution determination.

Models for both problem-solving and change management in an Automotive Component Manufacturing environment must be developed by the Automotive Supply Chain Competitive Initiative (ASCCI) to have a conceptual and theoretical framework for Managers within the industry to assist root cause analysis as well as solution determination and implementation.

CONTENTS

CHAPTER ONE

INTRODUCTION

1.1) Introduction

South African Automotive Component Manufacturers founded the Automotive Supply Chain Competitiveness Initiative (ASCCI) in December 2013. Targets set by ASCCI in 2013 were to increase supplier Manufacturing Value Add (MVA) to produce 1.2 million vehicles by 2020. The target included outcomes such as increasing employment, enabling local supply chain capabilities, increasing local content, and advancing transformation.

ASCCI had three strategic priorities, the first being - Supplier capability, which included World Class Manufacturing best practice. A skills development framework was first put into practice by ASCCI in 2016 to establish standards and a delivery model with World Class Manufacturing being a major skills focus for Shop Floor workers and Team Leaders due to the varying levels of problem-solving competence within the industry. Problem-solving is a process of finding solutions to difficult or complex issues which is an essential skills set for a company wishing to embark upon World Class Manufacturing.

Tools were developed by Automotive Component Firms with the assistance of specialist consultants to improve both the problem-solving and change management competencies of project Managers or leaders, but a study is required to determine whether the tools are based on best practice and the levels effectiveness in terms of root cause analysis and solution implementation.

1.2) Focus of the Study

The study's focus was to research suitable tools to assist with problem causation in a manufacturing environment and subsequent solution determination and implementation which is more commonly referred to as change management.

1.3) Problem Statement

Repeat customer complaints are of primary concern in terms of a threat to South African Automotive Component Manufacturers who could face losing their export licence due to rejected parts from global customers. Other major concerns are wasted funds spent on non-sustainable actions as well as uncontrolled processes.

Problem-solving and change management form the basis of Lean manufacturing implementation and without these competencies in place, South African Automotive Component Manufactures will not progress to a more mature level of capability. What senior management at Automotive Component Manufacturers may have overlooked is Shop Floor loss of faith in the levels of problem escalation where improvement suggestions are acknowledged but not implemented.

The study proposes a problem-solving and change management as tools with a vital addition being the impact that solution implementation has on Shop Floor morale since this is the group responsible for the manufacturing of the product and resultant customer complaints.

1.4) Purpose of the Study

The objective of this study is to address problem-solving and relevant change management in order to ensure the success of initiatives or projects within the Automotive Component Manufacturing environment. The purpose of this explanatory sequential design will be to first qualitatively explore with a small sample. The first phase of this study will be a qualitative exploration of the frequency and type of problem-solving tools used by Kwa-Zulu Natal based Automotive Component Manufacturers.

Focus groups will then be conducted which will include interviews to further explore the use of change management to assist solution implementation. From this initial exploration, the qualitative findings will be used to develop assessment measures that

can be administered to a larger sample of participants within the Automotive Components Manufacturing industry.

1.4.1) Specific Objectives

The objectives of this research are as follows:

1.4.1.1) To identify effective problem-solving and change management tools.

1.4.1.2) To examine the applicability of the tools, evaluate the effectiveness of the problem-solving and change management tools within the Automotive Components Manufacturing industry and critique their relevance.

1.4.1.3) Models for both problem-solving and change management in an Automotive Component Manufacturing environment to be developed in order to have a conceptual and theoretical framework for Managers within the industry to assist root cause analysis as well as solution determination and implementation.

1.4.2) Research Questions /Hypothesis

During the first phase of the study, the following questions will be answered:

1a) What type of problem-solving tools are most frequently used?

1b) Do the types of problem-solving tools use result in solution determination (what is the close-out rate)?

1c) What is the escalation rate from simple problem-solving tools to more complex problem-solving tools?

1d) What is the solution implementation rate once problem determination has taken place?

1 e) Is change management taken into consideration during any of the problem-solving steps?

The second phase is a qualitative, descriptive study that in addition to focusing on the questionnaire results will via a Team Leader focus group process, sought answers to these questions:

2a) What practical suggestions do the Team Leaders have to improve solution implementation after hearing about other firm's practices?

2b) Do you have examples where change management has been applied to solution implementation (of problem-solving), what was the outcome?

2c) What behavioural traits should a change champion have?

2d) What job grade should change champions have?
2e) Do you consider a Suggestion Scheme's as a form of problem-solving, if so, please explain further?
2f) Explain whether change management has been applied to Suggestion close outs?

Finally, the third phase, culminated in a descriptive study of Shop Floor employees after giving them the same summary of the internal and industry questionnaire, to seek answers to these questions;
3a) What practical suggestions do the Shop Floor employees have to improve solution implementation after hearing about other firm's practices?
3b) What is the Shop Floor employee's perception of whether change management is applied to problem-solving?
3c) What behavioural traits should a change champion have?
3d) What job grade should a change champions have?
3e) Do you consider a Suggestion Scheme's as a form of problem-solving, if so, please explain further?
3f) Explain whether change management has been applied to Suggestion close outs?

1.5) Expected Outcome of the Study

The proposed study aims to present a summary of problem-solving tools used in an Automotive Component Manufacturing environment and determine the effectiveness of the problem-solving tools in relation to root cause analysis.

A further benefit of the study has been to determine the use of change management tools in relation to solution implementation to ensure that the employees affected are ready for the changes in work practices and both support and understand the implications of the change.

1.6) Delimitations of the Study

The major delimitation of the study will be the sample size of the quantitative sample relating to problem-solving tools because it will only represent a small focus group from “Company A” and not the entire Automotive Component Manufacturing industry due to confidentiality reasons with firms fearing that quality defects might be published and some firms do not track problem-solving incidents at all due to a lack of manufacturing systems maturity.

1.7) Limitations (Anticipated Shortcomings)

A limitation to this study is the responsiveness from the Automotive Component industry since completing questionnaires is usually not a high priority even if it is distributed by an employer organisation such as the Durban Automotive Cluster (DAC). The response rate to questionnaires is usually only 40%.

1.8) Assumptions

Being a mixed methods study where quantitative data will initially be collated about the types of problem-solving tools and their frequency of use in a manufacturing environment. An assumption must be made that manufacturing firms will all apply the same definitions to the problem-solving tools based on JIPM (Japan Institute of Production Management) which is where the tools originated from.

The qualitative assumption would be that all manufacturing firms who participate in the questionnaire would apply definitions from Kotter’s (1995)
change management theory which addresses according to Applebaum et al (2012) “fundamental changes in how the business is conducted in order to help cope with a new, more challenging market environment”.

1.9) Outline of the Study

The research study was structured according to the format below and explains the linkage between individual chapters and the resolve of each chapter.

Chapter 1: Introduction

An outline and the background to the study is presented in this chapter inclusive of the problem statement. The purpose of the study and a contribution towards a summary of problem-solving tools used in a manufacturing environment to determine the effectiveness of the problem-solving tools in relation to root cause analysis.The structure of the study was outlined in this chapter as well as the goal of each individual chapter and how each chapter related to other chapters is explained. Anticipated outcomes and limitations of the study are stated.

Chapter 2: Literature Review

The provision of a thorough literature review is the focus of this chapter in order to delve into the theory of problem-solving and change management tools. The literature review then deepens the exploration of the impact that culture and group interaction has on the problem-solving process with a discussion on the impact that these variables have on suggestion schemes. Change management is the next area of investigation with Kotter's 8 step model coming under scrutiny as well as the tools associated with implementing change management in the workplace and how to champion the change process.

The variables of culture, group dynamics and differences in the application of problem-solving tools and the availability of change management tools are discussed in more detail in chapter three's research and methodology.

Chapter 3: Research Methodology

The objective of this chapter was to develop a suitable research methodology that could measure and analyse the key research variables identified in chapter two of the study.

The aim of this study is to research suitable tools to assist with problem causation in a manufacturing environment and subsequent solution determination and implementation which is more commonly referred to as change management using questionnaires and focus groups. The mixed methods of research design involved first conducting qualitative research via a questionnaire which was sequential in nature since the questionnaire generated quantitative data followed by focus groups explanations. The mixed methods study researched suitable tools to assist with problem causation in an Automotive Component Manufacturing environment and subsequent solution determination and implementation used in the management of change.

The results of the questionnaire and the outcomes of the focus group discussions are recorded in Chapter four. The conclusions and recommendations have been presented in chapter five of this study.

Chapter 4: Results

The results of the research questionnaire and outcomes of the focus groups are presented in this chapter. The raw data from the research questionnaire is organized and analysed so that it can be presented in summary tables and graphs that are easy to read. Outcomes of the focus groups will be tabulated and clustered so that themes can be identified that relate to problem-solving and change management.

Chapter 5: Conclusion and Recommendations

Conclusions will be drawn in this chapter from the results tabled in chapter four and the conclusions will be incorporated into recommendations that can be escalated to ASCCI to possibly develop problem-solving and change management tools for the automotive component industry. Linkages are drawn from the literature review and empirical research to assist ASCCI's decision making process.

Opportunities for further research will be stated in this chapter that could be conducted by ASCCI since the limitation of this study was that participants were only based in KwaZulu-Natal and not a national study of automotive component manufacturers.

1.10) Conclusion

The chapter presented an overview of the study. A justification as to why the study has been conducted together with an outline of the problem statement, the focus areas of the study including objectives and various hypotheses have been captured. The limitations of the study have been discussed with explanations given. A literature review will be presented in the following chapter where theory and definitions will be explored further.

CHAPTER TWO

LITERATURE REVIEW

2.1) Introduction:

The focus of the chapter is to present literature related to the research. Sections covered in the chapter include to determine which problem-solving tools used by Automotive Component Manufacturers that apply World Class Manufacturing principles and reference Kotter's change management theory. Specific Managers from the Durban Automotive Cluster member companies as well as focus groups from Team Leaders within "Company A" who is an Automotive Component Manufacturer are faced with problem solving on a daily basis and deal with the resultant change and the associated challenges.

The focus points of this literature review support the attributes tested in the study. The attributes include problem-solving tools, a culture of problem-solving, a groups approach to problem-solving, change management and associated methods and the role of change champions. These attributes have been used to determine whether the problem-solving tools have resulted in real solution determination and implementation by Automotive Component Manufacturers.

2.2) Theoretical Review

In 2013 Roger Pitot the Executive Director of the National Association of Automotive Component and Allied Manufacturers (NAACAM) was quoted by Engineering News South Africa, "Automotive component manufacturing is a global industry and, whenever costs increase, owing to increases in wages, electricity, transport and raw materials, its ability to retain and attract new manufacturing investments to South Africa is greatly threatened" . This quote indicates the pressure that automotive component manufacturers are under to solve problems using Lean aligned tools and implement sustainable change.

2.2.1) Definition of Problem-Solving

Puvanasvaran et al (2010:450), refers to (Liker, 2004) who states that in order to become fully Lean, a firm must contemplate that Lean is a “long-term philosophy” about the “right processes” that will ensure the “right results” and will add value to the firm, by continuously “developing people and partners through continuously solving problems”.

2.2.2) Definition of Change Management

To coin Al-Haddad and Kotnour’s (2015) opening statement, “We are living today in a constantly growing global business environment, where change has become the norm for organizations to sustain their success and existence. Industrial and governmental organizations are constantly striving to align their operations with a changing environment”.

The aim of the study is to indicate the need for both problem-solving and change management competencies to be applied simultaneously for the automotive component manufacturing industry to be able to complete globally and deal with all the local changes in legislation. As a result of the study, there should be indications of what behavioural traits are suitable for a successful change agent to ensure the acceptance of change and the successful implementation of problem-solving.

2.3) Empirical Review

2.3.1) Introduction to Problem-Solving and Change Management

According to Puvanasvaran et al (2010), Lean Manufacturing is an approach that is most widely accepted by firms as being a route to obtaining peak performance. Lean process management assists an organisation to initiate change as well as help employees adapt to the new requirements in order to keep up with customer and market needs.

Gangon and Michael (2003) are referenced as centering their argument around the success of Lean being in the hands of the Shop Floor employees most especially a “great level of employees involvement and change in attitude and behaviours” (Puvanasvaran et al, 2016, p.450).

2.3.2) A Culture of Problem-Solving

Most of the studies around problem-solving are situated in the West which may not totally suit our South Africa situation where there are cultural and political differences. It can be argued Apartheid regime can be compared to China's Communist regime where there is a "high power difference" between Shop Floor workers and supervisors who give instructions (Li et al, 2015, p.2).

Chinese culture has a concern for "saving face" and it can also be argued that Nguni culture has a similar grounding from "hlonipha" practices where politeness is very important and so is "saving face (Luthuli 2007).

Wanting to "save face" is seen by Li et al (2015) as a major hindrance because Shop Floor workers would out of politeness not want either themselves or their supervisor to lose face by making suggestions or worse, the rejection of an idea.

2.3.3) Suggestion Schemes Bolstering Problem-Solving

The business not being able to change behaviour was also cited by Emiliani (1998) where he calls "repeated mistakes" a type of waste which has also been seen as a major concern of South African automotive component manufacturers who are focusing on the elimination of repeat consumer complaints.

Gangon and Michael (2003) view the maximum involvement of Shop Floor around the reduction of waste that will strengthen a firm's problem-solving capacity and effectiveness.

Company A has a Suggestion Scheme that has been well utilised until recently when management has noted an all-round reduction in suggestions submitted. de Jong and Hartog (2007) are referenced as putting emphasis on Shop Floor contributing to the continued success of a firm through problem-solving via the "generation of ideas" which at Company A is the Suggestion Scheme.

In order to generate suggestions, an element of trust is required which Li et al (2015) point out as being foundational to Chinese society and admittedly in South Africa, there is a great feeling of mistrust by the Shop Floor towards supervisors due to our previous political dispensation. McAllister (1995) is cited as purporting “cognition-based trust that guides the Shop Floor towards having a sense of security through the evaluation of their supervisors “professionalism and competence” by supporting the use of standardised problem-solving tools.

Gangon and Michael (2003) proposed that the frequency of use of problem-solving tools supports the elimination of waste which is the case of this proposal is reoccurring customer complaints.

2.3.4) Group Problem-Solving

Problem-solving competence of the Shop Floor will also result in cost savings due to waste reduction which according to Gangon and Michael (2003) also aids continuous improvement (Kaizan) which are ongoing efforts to achieve "incremental" improvement over time or "breakthrough" improvement after a focused effort.

For the Shop Floor to be able to solve problems, there needs to be a common understanding of which tool can best be applied to the type of problem that has been encountered. Iuga and Rosca (2017) in their research state that problem-solving tools used in Lean Manufacturing are used by small groups depending on “problem complexity” and the impact of the tools “by themselves or combined”. A further proposal in their research is criteria for the different methods of problem-solving to assist Shop Floor members to select a tool which will be best utilized to solve a problem which are as follows;

1. CO - Creativity orientated
2. RC- Root cause analyze orientated
3. CM - Complexity of method
4. IS - Immediate solution oriented
5. AS - Solutions analyze orientated
6. CPX- Appropriate for complex problems

Group problem-solving competence is also vital to the reduction in time to determine solutions through cross-functional focus that has been sighted by Cooper (1999).

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Shop Floor empowerment is enabled through employees being given autonomy to make suggestions and come-up with ideas in order to solve problems. Krause (2004) states that the “ability of the workers to come up with ideas, and importantly to exhibit problem-solving capabilities” will support “the innovation process” (Gangon and Michael (2003).

2.3.5) Change Management

Applebaum et al (2012) discuss how necessary it is for a firm to be able to keep up with industry changes, and technological advancements as well as maintain their share of the market. Firms are required to be agile and have an ongoing culture of learning.

A scary notion is that “research suggests that failed organizational change initiatives range from one-third to as high as 80% of attempted change efforts” (Applebaum et al, 2012, p.765) which is due to Managers having a knowledge gap relating to change management.

The point of the study by Applebaum et al (2012) was to try and prove Kotter’s change management model as having a theoretical basis, even though the author never referenced empirical sources. Despite the lack of academic rigour, Kotter’s change management model has been used widely in business and even referenced in academic textbooks.

Limitations are present in Koter’s 8 step change model with the most prominent being that it is too rigid. An argument around the failure of change management initiatives is that a firm’s culture can be different to what is required from Kotter’s model (Applebaum et al, 2012, p.775). Culture plays an important part in one’s approach to problem-solving with “hlonipha” practices that must be taken into account in South Africa and so too does the firm’s culture.

I do not necessarily agree with Applebaum et al (2012) when they state that steps 7 and 8 will not be relevant to a firm that is installing new manufacturing machines because they can't "consolidate gains and produce more change" or "anchor new approaches in the corporate culture". With new machinery, customisation is always required to suit the product being manufactured which results in more change.

Something that Applebaum et al (2012) may not have considered is that manufacturers such as Company A and World Class Manufacturing consultancies develop their own tools based on Kotter's 8 step model so there would not be many case studies on the use of this model and major change projects due to company intellectual property and confidentiality. This is a question that I will ask in the questionnaire of other automotive component manufacturers in order to confirm my assumption.

What I am in agreement with is Kotter's quote that the most difficult part of implementing the 8 steps is "changing the behaviour of people" (Applebaum et al, 2012, p. 777).

Keyser et al (2016) states that there is "scant research on the collaborative use of Lean and change management" because firms use the two concepts separately. It is however difficult to implement problem-solving without having the desired behaviour attributes necessary for a successful change process.

Schaffer (2010) offers four reoccurring mistakes that Managers make which negatively impact on the implementation of change management: "(1) Managers fail to set proper expectations; (2) they excuse subordinates from the pursuit of overall goals in lieu of personal, or departmental, goals; (3) executives go along with staff experts and consultants by allowing the experts to introduce and implement change without any measurable deliverables; and (4) management waits while associates over prepare for any change initiative" (Keyser et al, 2016, p. 32).

Lean principles were originally established by Toyota to eliminate waste and inefficiency in its manufacturing processes. The goal of lean is to eliminate scrap or waste—components that add no value to a process. There are however instances

where Lean implementations are not successful, a review of current literature by Keyser et al (2016) resulted in a summary list as to why the implementation of Lean principles fails - with problem-solving being one of the tools;

Why Lean fails:

1. Lack of visible leadership at the senior management level
2. Lack of understanding of the fundamental change process
3. Too focused on eliminating *muda* or technology development that sluggish response time to 'sea-changes' in product development swiftly renders their products obsolete
4. Failure to align management practices with Lean philosophy
5. Unqualified 'expert' leading the Lean philosophy
6. Undisciplined problem-solving efforts (i.e., no strategic game plan)
7. Neglecting to establish metric baselines for comparison
8. Documentation overload
9. No plan for sustainability
10. Insufficient resources
11. Lack of coordination
12. Lack of commitment
13. Inadequate core competencies
14. Lack of follow-through and feedback
15. Mentality that Lean is just another fad rather than an overall business philosophy

The conclusion of Keyser et al (2016:42) study does offer some advice in terms of managing change and overcoming the list of 15 most common failures. Communication and explanation are the most common thread where management must "articulate" the vision and mission and allow discussion in order for people to understand why change is needed. People must grasp the "motives" as to why the decision to implement the change came about so that they "embrace the change mandate".

Understanding the personal losses that might come about if the change is not implemented is equally important, for example a loss of market share will result in job losses which could "sway the pessimists" and bring about acceptance of the change.

Change impacts on all aspects of an organisation; strategy, structure, processes, people's jobs and behavior and organisational culture. Firms must come to the realization that change is" neither quick nor straightforward" and because of this, change initiatives need to be both "flexible" and "very well planned" (Al-Haddad & Kotnour 2016: 251). What Al-Haddad and Kotnour are speaking about is people's alignment to organizational change whether it be external or internal.

Relating change to Lean tools such as problem-solving should not punish people with paperwork. One of the behavioral limitations that people feel as a result of change is that they might not have the requisite "knowledge" and "skills to succeed "so the self-doubt brings about behaviour that is not supportive of change (Keyser et al, 2016: 33 & 39). Having the "authority to impact on metrics" is a major concern that people have. The most common fear is whether management have ulterior motives which affects behaviour. Most of these fears are due to negative past experiences so open communication is very important and will require addressing previous management failures.

Motivational theory in psychology can be applied to organisations with Maslow's hierarchy of needs is a comprising a five-tier model of human needs being considered during periods of change. Maslow's hierarchy is often depicted as levels within a pyramid to determine possible changes of affiliations because there is a social affinity in a manufacturing environment amongst teams. People do like to be rewarded which is why the suggestion scheme is so important and through the application of Maslow's hierarchy, mitigate the usual fear that Shop Floor employees have of being given additional work without pay (Keyser et al, 2016: 35).

2.3.6) Types of Change and Methods Used

Company A has developed two change management tools with the assistance of a consulting company. There is a 4-point change plan for small scale change and a 10-point change plan for a large-scale change initiative. Recognising that there are different types of change is in line with Al-Haddad and Kotnour (2015:242) sentiment, especially with regard to large scale change where "strong collaboration" and "visionary leadership" is required due to large numbers of people that will be impacted by the change.

The change methods adopted by Company A are based on Kotter's 6 step process but the tools that are in place have expanded some areas in order to assist Managers, especially in the 10-pointer where more detail is required when taking a multi-disciplinary team through a change process.

From the outset, there is a decision process whereby it is decided the extent of the change, is it a large or small scale?

The 4-point change plan is very basic;

1. Understand Need for Change
2. Stakeholder Meeting
3. Develop and agree actions for the change
4. Implementation Plan for Project
   *With the addition of an action plan.

The 10-point change plan is more detailed;

1. Establish need for change
2. Build a shared vision for change
3. Establish measurements of success for the change
4. Establish change leadership structures
5. Develop a broad plan for change
6. Analyse key stakeholders
7. Understand the impact for change on the Individual
8. Assess and Manage Risk
9. Assess Support Requirements
10. Formulate a Communication Plan
    *With the addition of an action plan.

After reviewing Keyser et al (2016:41) summary list of Lean implementation failures, it is suggested that applying the 10 or 4-point change tool to major problem-solving could possibly avert some of those failures and make sure people's anxieties are addressed. It is important to note that Womack and Jones (2003) purport that the "Lean change

method revolves around three fundamental areas: purpose, process and people" (Al-Haddad & Kotnour 2016: 247).

2.3.7) Change Champions

From as early as the 1940's Lewin stressed the importance of discussion when solving problems. He stated that "problem-solving requires active participation of change agents in understanding the problem, finding a solution and implementing it (Al-Haddad & Kotnour 2016: 247).

Company A has developed change management tools, there is training on both the tools and the concept of change management, but no analysis has been done on change champions.

Change champions would be the next step in developing a culture of change at Company A and turning to Chrusciel (2007) research to source or develop an assessment to determine whether employees have the correct traits to become a change champion.

Chrusciel (2007) focuses on significant or strategic approaches which in Company A's terms would be the use of a 10-point change management tool and having the correct change champion to facilitate its use as well as support the implementation of the change.

There is no mention of change agents being used for small change projects that would require a 4-pointer and Chrusciel (2007) does not discuss the need for a change champion when conducting problem-solving or to use change management to assist with root cause analysis as well as solution determination and implementation because it is not part of his research scope. It would be beneficial for firms to consider change champion traits for those who facilitate problem-solving.

The following traits purported by Chrusciel (2007:158) can be included in the interviews and industry questionnaires to select Change Champions;

- "Derive reward from the team success and believe that the change transformation is beneficial for the organization"

- Motivational and influencing skills
- Appreciation of organizational culture, strategic networking and leadership
- Ability to take calculated risks for personal gain (by assisting with the team's success)
- "Bridge the gap between leadership and the rank and file by either having or gaining the respect of those affected by the change initiative"
- Be able to work with other whilst still be willing to drive the change
- Team oriented and value group contributions
- Early adopters of change

What is interesting to note from Chrusciel's (2007:158) research is that a change champion is "neither a rising nor a superstar performer" they see more value in the team's accomplishments.

According to Chrusciel (2007:158) "intangible benefits clearly outweighed any tangible reward" if applied practically, management when wanting to recruit change agents must search for people who display "intrinsic values" and cherish "team involvement and organizational benefit over individual extrinsic rewards".

2.4) Conclusion

It is very important for Automotive Component Manufacturers to have a clear understanding of why problem-solving tools a do not result in solution implementation with the desired change taking place. Problem-solving has the greatest impact on productivity and profitability and the literature review highlighted other aspects that result in a successful change being leadership, culture and group dynamics. Additional research on suitable tools to assist with problem causation in a manufacturing environment and the change management tools as well as behaviour traits of change champions to assist solution determination and implementation. There is very little research on how change management impacts on problem-solving sustainability. The next chapter presents the research and methodology to determine suitable tools for problem-solving and change management.

CHAPTER THREE

RESEARCH AND METHODOLOGY

3.1) Introduction

The purpose of this chapter is to describe the research methodology that was applied to the study. The study is to research suitable tools to assist with problem causation in a manufacturing environment and subsequent solution determination and implementation which is more commonly referred to as change management. A framework has been included in this chapter to describe the methodology used whilst conducting the research.

From the outset, the researcher was cognisant of where the questionnaire participants related to this study are located geographically. The research design, research approaches, questionnaire mechanism and data collection strategy as well as the study site was elaborated upon. The researcher discussed the population, sample and questionnaire methods. Subsequently, the data collection instruments involving focus groups will be expanded upon. A commentary on data quality control will also be considered. An overview was provided by the researcher of the reliability and validity of the research followed by a deliberation on the data analysis process involving data reduction and data display. The researcher commented on the ethical scrutiny of the study as well as the limitations. A conclusion was drawn by the researcher to summarise the main threads of the research and methodology.

3.2) Participants and Location of the Study

Both the questionnaire and the study were conducted in Kwa-Zulu Natal amongst members of the Durban Automotive Cluster (DAC) which also has industry members located in Pietermaritzburg. The targeted questionnaire participants were from two distinct groups; Managers from member companies of the DAC as well as Team Leaders (foreman or supervisor level) from Company A who is an automotive

component manufacturer located in Durban. Participants in both questionnaires applied problem-solving techniques in the manufacturing environment.

The location of the focus groups was at Company A and there were two sessions for each focus groups due to participants working across a three-shift system. A clear separation between Team Leaders and the Shop Floor was made, with the Shop Floor participants falling within the bargaining unit.

3.3) Research Design

The aim of the study was to research suitable tools to assist with problem causation in a manufacturing environment and subsequent solution determination and implementation which is more commonly referred to as change management through the use of questionnaires and focus groups. The explanatory sequential mixed methods of research design will be employed where according to Creswell (2014), this form of research design involves first conducting qualitative research, in this case a questionnaire and then analyses the results to “explain in more detail with qualitative research”.

The research design was also sequential because the questionnaire generates the quantitative and qualitative responses followed by focus groups which allows for further analysis of the questionnaire responses. It is important to note that the questionnaire focused more on usage and not preference so there is no behavioural element contained in the questionnaire. In manufacturing, the problem-solving tools are outlined by the company and the persons grade and level of authority determines which problem-solving tools they can use. The point of the questionnaire was to see which problem tools were utilized and the close-out rate but there are no questions about preference because the participants are not permitted this freedom.

Research objectives ensured the alignment of the interview questions contained in the questionnaires. A descriptive method of research according to Rahi (2017) refers to the type of research that aimed at obtaining information on current state of phenomena”. Rahi (2017) elaborates further by explaining that descriptive research

“sets out to provide an accurate profile of situations, people or events” and rather observe and record an occurring phenomenon” that is difficult to “ascribe an objective value to” hence the need for focus groups to explain the results of the DAC questionnaire.

3.4) Research Method

The research method selected was mixed methods. According to Creswell (2014) mixed methods allows the researcher to have a “pragmatic world view” that includes a combination of both quantitative and qualitative data “sequentially in the design”. A researcher can assume that that their inquiry which involves the collection of both types of data “provides a more complete understanding of the research problem” than if only one type of data was selected.

In accordance with Creswell (2014), this research contained a first phase of broad industry and Team Leader questionnaires in order to “generalize results to a population” and then a second phase of focus groups that is able to “collect detailed views from participants to help explain the initial qualitative questionnaire”.

The qualitative aspect offered during the second phase focus groups according to Rahi (2017) allowed the researcher “to collect in-depth details on a particular topic” and ensure that “precise and honest responses are obtained” in order to further the understanding of problem causation in a manufacturing environment and subsequent solution determination and implementation which is more commonly referred to as change management.

3.5) Research Data Collection

3.5.1) Research Instrument

A questionnaire was utilized in order to conduct the first phase of this study. Questionnaires are an efficient way of obtaining data in an efficient and structured manner. Rahi (2017) explains that “collected data” that is gleaned from a “structured questionnaire” make it possible for the “enumeration of a selected population or

subgroup" in an efficient and cost-effective manner and respondents only need to spend less than 15 minutes to be able to contribute to the study.

Qualitrics was used by the researcher, it is an online questionnaire and data analysis software which allowed for the distribution of the questionnaire to 30 DAC member companies and or merSETA members and a separate questionnaire to Company A. The Team Leader respondents from Company A are shift workers and had the opportunity to respond at any time of the day.

A major positive of Qualitrics is that the software generates statistics instantaneously and the researcher was able to monitor response rates with ease.

3.5.2) Administration of Research Instrument

All respondents had access to email addresses since they were either Managers from DAC member companies or Team Leaders from Company A with internet and email privileges. Qualtrics captured the online data responses automatically into the online questionnaire.

The online questionnaire offered by Qualitics are customisable and researchers can design Likert scale type questions. The researchers work plan allowed for a three-week period from the 15 October 2018 – 03 November 2018 for data collection to take place which involved allowing the respondents time to access the online questionnaire according to their workload.

The links to the electronic questionnaires were sent by the researcher to DAC member companies and by a representative selected by Company A who emailed a link to their Team Leaders. A reminder email was sent after the second week to the respondents using the same communication channels.

3.5.3) Measurement Scale

Questionnaires were the primary instruments used to collect quantitative data. There were three different Likert scales selected when the researcher designed the questionnaire in order to solicit responses that would aid in the analysis of the problem-solving tools used by automotive component manufacturers in KwaZulu-Natal.

Three-and four-point Likert scales were utilised in order to focus the responses with most of the questions being asked around how regularly a problem-solving tool is being utilised or the escalation rate. Only one of the questions in the questionnaire had a remote possibility of being emotive or emotional, this was not a behavioural questionnaire and the focus of the research was not as Rahi (2017:3) would put it "on individuals behaviour" so a five or seven-point Likert can was not necessary to select as a measure of the items in the questionnaire.

The questionnaire opened with demographic questions pertaining to company and job details as well as years of experience. Participation in the questionnaire was restricted to either Managers in automotive component manufacturers or Team Leaders from Company A with the focus being on the use of problem-solving tools, not a sociological inquiry.

The second part of the questionnaire was divided into subthemes relating to problem-solving and change management. The DAC questionnaire had a total of 5 questions in the second part of the questionnaire which were separate research constructs;

Table 3.1: Research Constructs

Research construct 1:	what type of problem-solving tools most frequently used?
Research construct 2:	do the types of problem-solving tools used result in solution determination?
Research construct 3:	what is the escalation rate of from simple problem-solving tools to more complex problem-solving tools?
Research construct 4:	what solution implementation challenges are faced?
Research construct 5:	Is change management taken into consideration during any of the problem-solving steps?

An explanation is requested from the DAC and or the merSETA respondents as to whether change management is taken into consideration during the problem-solving steps

The Company A Team Leader questionnaire only contained the first three research constructs due to the focus groups which would further elaborate on a qualitative basis as to what the usage of problem-solving tools is and whether change management has an impact on solution determination.

The example below is an illustration of the usage and not behavioural orientation related to the codification of the Likert scales;

Table 3.2: Likert Scales

0	**1**	**2**	**3**
Not applicable	Seldom used	Regular use	Daily use

The focus groups that the researcher conducted following the questionnaire's completion were to delve further into the behaviour and attitudes that Team Leaders and the Shop Floor have towards problem-solving and change management.

3.5.4) Pilot Testing

Saunders et al. (2012:196), explain that a pilot study is a "smaller version of a full study" that assists a researcher to prepare for the full exercise. The pilot study is essential to the research design because it "tests the readiness of research instrument to avoid unforeseen circumstances" that a researcher would not want to have to deal with halfway through their inquiry which could render the entire research process invalid. Benefits of conducting a pilot study are listed below;

- the detection of possible flaws in measurement procedures in advance
- identification of "unclear or ambiguous items" in the questionnaire
- pilot participants can give feedback on wording that might cause confusion

Company A required that a copy of the questionnaire be submitted in advance for review for ethical and intellectual property purposes. In order to test the online Qualtrics system, a link to the questionnaire was submitted to three Company A representatives who gave feedback on its ease of use and time restriction of 15 minutes.

Feedback from the participants mostly related to wording, especially the high level of English used and sentence structure. Three of the questions were condensed thanks to the feedback and two of the questions were given an additional explanation in brackets.

There were no concerns about intellectual property being violated.

3.6) Study Site

Phase-one of the study had a wider audience, the Automotive Component Manufacturing industry in Durban and Pietermaritzburg and their approach to problem-solving and change management. The questionnaire was sent to specified Managers at 30 companies who are in a position of seniority and able to evaluate their company's problem-solving and change management capability.

The study site for conducting the second-phase of the study is the results of a questionnaire directed at Company A's Team Leaders.

Finally, the third-phase of the questionnaire will be directed at a focus group consisting of Shop Floor members where a descriptive study had taken place to better understand characteristics, events and situations relating to problem-solving, change management and the Suggestion Scheme.

3.7) Target Population

A target population is a description of where the samples for the questionnaires and interviews are selected. The population selected was Durban and Pietermaritzburg based Automotive Component Manufacturers who are members of the Durban Automotive Cluster (DAC) and or the merSETA.

A total of 30 DAC companies were contacted to participate in the questionnaire, these companies were selected because they are respondents to other DAC questionnaires that have been conducted in the past that relate to the automotive component industry.

Please note that this is not a large questionnaire group since there are only 72 automotive component manufacturers in total located in Kwa-Zulu Natal but more than half do not respond to questionnaires. All the participants were at a management level within an automotive component manufacturer and utilized problem-solving tools.

Company A distributed the questionnaire to 55 Team Leaders that used problem-solving tools on a regular basis.

3.8) Sampling Strategies

The systematic sampling methods have the following criteria; firms are either Durban Automotive Cluster (DAC) and or merSETA members / firms must indicate whether they are small, medium or large enterprises / firms may only participate if they manufacture automotive components.

With regard to the sampling design of this population, the researcher did not have access to the names of all the DAC members so a cluster of participants thanks to the Durban Automotive Cluster was selected on the researchers behalf based on the systematic sample criteria and past response rates of these organizations to DAC questionnaires.

The cluster is thus a nonprobability sample because the respondents were chosen on their previous response rates to questionnaires due to the unfortunate fact that DAC member companies are notoriously nonresponsive and there was a concern that the validity of this research would be affected. Purposive sampling was used since it is just not possible because the overall population of automotive component manufacturers are small and the cluster rationale was deemed as being essential.

3.9) Sample Size

Phase-one of the studies had a wider audience, the Automotive Component Manufacturing industry and their approach to problem-solving and change

management but the number of respondents will be small with 30 companies being contacted.

The sample size for conducting the second-phase of the study which was the questionnaire directed at Company A's Team Leaders were sent to 55 specified Team Leaders.

Finally, the third-phase of the questionnaire will be directed at Company A with two separate focus groups being the Team Leaders and Shop Floor members where the descriptive studies will be compared. The qualitative focus group interviews were used to develop a correlational study to see if there are any similarity or differences between the responses of the Team Leaders and Shop Floor Members since they occupy jobs at different levels of the organisation. The focus groups consisted of a minimum of 8 and a maximum of 12 respondents.

3.10) Sampling Techniques

3.10.1) Probability Sampling

According to Surbhi (2016) probability sampling is a method where all the populations members have an equal chance to be a participant. The randomization technique is part of the procedure to guarantee that all individuals in the population have an equal opportunity to be selected so the possibility of bias is reduced.

"Statistical inferences can be made by the researchers using this technique", which means the results of the questionnaire can be generalised to say that it is reflective of the target population. There are different methods of probability sampling;

- Simple Random Sampling
- Stratified Sampling
- Cluster Sampling
- Systematic Sampling

3.10.2) Non-Probability sampling

Non-probability sampling occurs according to Surbhi (2016) when all "individuals in the universe" are not given an equal opportunity to be selected. This technique is dependent on the "subjective judgment of the researcher". A researcher cannot draw

the conclusion that the result reflects the general population of the sample. There are different methods of non-probability sampling;

- Convenience Sampling
- Quota Sampling
- Judgment or Purposive Sampling
- Snowball Sampling

3.10.3) Controlled quota sampling

Quota sampling according to Saunders et al. (2012), is a sampling method to collect "representative data from a group". Applying quota sampling to a group allows the researcher to apply specific "characteristics" to that specific group.

The sampling technique was controlled but there were restrictions that limited the researcher's choice of samples. The DAC only allowed limited access to certain members to respond to the questionnaire but for good reason and Company A submitted the questionnaire to 55 Team Leaders due to corporate governance reasons.

The sample was further restricted with criteria to ensure that only those people directly involved in problem causation and subsequent solution determination and implementation. The criteria that the researcher attached to the controlled sampling technique is as follows;

1) Managers from KZN based automotive component manufacturers (questionnaire, only)
2) Company A Team Leaders (questionnaire and focus group participation)
3) Company A Shop Floor (focus group participation, only due to limited internet access and literacy concerns)

3.11) Data Collection Methods

According to Surbhi (2016), data collection is crucial to statistical analysis with two categories of data being presented, primary data, and secondary data. Primary data is collected first-off by the researcher and secondary data is produced by others. The

most important difference is that “primary data is factual and original whereas secondary data is just the analysis and interpretation” of the primary data.

First-phase structured questionnaire of Automotive Component Manufacturers in KZN where their responses were recorded via online software.

Second-phase structured questionnaire of Company A where their responses were recoded via online software.

Third-phase structured focus group interviews culminating in a descriptive study which indicates themes and theoretical analyses depicting both correlations and discrepancies between that of the Team Leaders and Shop Floor feedback.

3.12) Data Quality Control

Interviews and questionnaires were conducted in a confidential and ethical manner. There is constancy due to a specialist facilitator who is an expert in World Class Manufacturing dealing with the Shop Floor and Team Leader feedback since the participants were expected to answer to some of their questions. The focus group respondents involved are used to their roles as they have been required to offer opinions on other initiatives in the past which gives credibility to the process hence the need for a specialist facilitator. The study was conducted by the author who has 18 years’ experience utilizing problem-solving tools with a green belt in Lean six sigma as well as 12 years’ experience facilitating change management related to the manufacturing environment.

3.13) Data Analysis

Walliman (2011) states that data is further divided into two other categories that focuses on characteristics of being numeric or descriptive in words which affects data collection, recording and analysis. Walliman (2011) defines numeric data records information about science and society, such as “pressures, bending forces, population

densities, cost indices etc" and is referred to as quantitative data. Numeric data is usually analysed using statistical processes.
"People's judgements, feelings of comfort, emotions, ideas, beliefs etc." can only be described in words. Qualities and not quantities are recorded with qualitative data. "Words cannot be manipulated mathematically, so require quite different analytical techniques".

The data analysis in this research has been conducted in two parts, first with questionnaires which is a first phase quantitative feedback with a qualitative analysis and the second phase via focus groups which is a qualitative analysis and thematic in nature.

3.13.1) Data Analysis Methods

Qualtrics software is of great assistance to researchers since it enables them to automatically analyse the raw data by cleaning and verifying any missing values. Qualtrics is has a very useful building rating system called Expert Review powered by IQ by where the software analyses the structure of the questionnaire and rates the structure from matrix tables to time and metadata.

Conducting an online questionnaire through Qualitrics has benefits to the respondents, they are prompted by the software and this prevents questions being overlooked by respondents and ensures high quality data with no duplications or missed responses allowing for built-in data integrity thanks to the Qualtrics software.

3.13.2) Usage Analysis and Interpretation of Data

Qualtrics software offers a quantitative analysis, in this instance, a questionnaire that results in a usage analysis to indicate which problem-solving tools are utilized in industry and what their escalation and close-out rate is as well as the usage of change management.

Brochenin, et al (2017:5) in their research on Resource Usage Analysis for an online learning company called FutureLearn is to provide their course designers with a deeper understanding of the usage of the resources by course participants. There are some differences between the FutureLearn application and the usage of tools.

FutureLearn designers are interested in drop-out rates while this research focuses on escalation and close-out rates.

FutureLearn commissioned this research on Resource Usage Analysis in order to improve progress feedback systems associated with their Massive Open Online Course (MOOC) platforms. Brochenin, et al (2017) states that “developing ways to automatically analyse resource usage and generate visualizations can be a valuable tool” which has also been the case with the close-out and escalation of problem-solving tools. Company A and industry participants will be able to have a visual summary that will “direct their time and effort to the parts that need more attention” as well as automatically recognize the resource usage properties and provide feedback and recommendations”.

The usage analysis provided by Qualitrics for this research was utilised to draw inferences based on the quantity of responses related to a question. There are instances where an equal ranking can be found which for example was the case with time and management support when it came to difficulties experienced during problem solving implementation. The focus group interviews provide an opportunity to delve deeper into the usage analysis and inferences can be drawn once more detail is gleaned from the focus groups.

3.14) Reliability and Validity

An explanation of reliability and validity is offered by Sekaran and Bougie (2013) where validity to “measure the concept we set out to measure and not something else” and reliability is an indication of the stability and consistency with which the instrument measures the concept” as well as assess “the goodness of the measure” Sekaran and Bougie (2013). Participants have to trust that their questionnaire responses will be put to good use and that the researchers are credible, in the case of this research that the respondents will not suffer any repercussions that will affect their jobs or the company’s reputation within the automotive component manufacturing industry.

3.15) Elimination of Bias

Quantitative studies involving questionnaires can be impacted upon due to researcher bias but in the case of the questionnaire, the questions were based on problem-solving tools that are commonly used in the automotive component manufacturing industry, specialist Managers from Company A were also consulted when designing the questionnaire questions.

Change management is however a very new concept to the automotive component industry and in many instances, the questions contained in the focus groups could be the first that the respondents would have ever encountered which necessitated a facilitator from Company A as well as a Shop Steward during the Shop Floor sessions.

3.16) Ethics and Corporate Governance

In addition to ethics, corporate governance is a major consideration relating to this research since the questionnaire involved responses from 12 other companies as well as focus groups to be conducted at Company A. Besides the collection of data via a questionnaire and keeping the responses of the company representatives confidential there is the issue that some of the companies are in fact competitors and no damage to a company's reputation will be permitted.

Access to the Qualtrics online database will be restricted to the researcher so that no individual companies' responses are published, and that the analysis of this research will be of the KwaZulu-Natal automotive component sector alone. An approval process to conduct the questionnaire was conducted via the DAC who has pre-existing forums and members were assured of UKZN's ethical approval process.

Company A who was central to the focus groups also had input into the questionnaire content via a pilot and were instrumental in shaping the theoretical framework of this research. An ethical clearance process was facilitated by Company A's project leader with both the Team Leaders and Shop Floor focus group participation which also included consultations with a Shop Steward. Company A plans to utilise this research

in order to improve problem-solving and change management competence within their organisation.

3.17) Conclusion

The mixed research methods utilised described in this chapter. Aspects such as the research design and theoretical framework, sampling and data collection and the statistical tools employed for analytical purposes have been noted. The mixed methods study attempted to research suitable tools to assist with problem causation in a manufacturing environment and subsequent solution determination and implementation which is more commonly referred to as change management. The next chapter will investigate the research analysis and findings of the questionnaires and focus groups that were conducted.

CHAPTER FOUR

RESEARCH ANALYSIS AND FINDINGS

4.1) Introduction

It has been necessary to conduct the research in two parts, since an explanatory the mixed methods research approach was selected for the questionnaires which is a first phase of the analysis and the second phase of the analysis via focus groups.

4.1.) Questionnaire Method

The purpose of this chapter is to analyse and present data collected via two questionnaire instruments which is the quantitative aspect of this study and summarise the main outcomes of two focus groups being the qualitative aspect of this study that seeks to determine suitable tools to assist with problem causation in a manufacturing environment and subsequent solution determination and implementation which is more commonly referred to as change management.

The first objective of the study is to convert questionnaire data into outcomes that can be used by Company A to improve problem-solving and change management practices and make recommendations to key stakeholders which will be discussed in chapter five which is the second objective that will also factor in the summary of the outcomes from the focus group interviews.

4.2) Focus Group Method

According to Jones et al (2018), it is generally agreed that the function of a focus groups is to examine “perceptions, feelings, and suggestions about topics, products, or issues”. The difference between the focus groups held at Company A and traditional focus groups is that the participants in most cases are known by each other and aligns to the “friendship group model” which is a methodology researched by Jones et al (2018).

Participants from Company A have varying levels of acquaintance since they all work in the same large factory, in similar jobs but within different departments.

The facilitator from Company A recruited the focus group members based on the diversity of opinions that had been observed during other Company A forums that required high levels of openness (Jones et al 2018: 102).

All the participants in the focus groups had to have been trained on problem-solving tools and Company A's World Class Manufacturing Processes which were criteria that Company A's facilitator applied when recruiting Company A's participants.

Two separate sets of focus groups were required due to the level of work, one set for Team Leaders and another for Shop Floor in order to record similarities and differences between the two distinct groups.

Thematic analysis is a method of identifying and reporting themes from the topic that is being researched using an inductive approach. The focus group participants put forward views or offer more detailed explanations relating to their own experiences.

4.3) Response Rate

Both Qualitrics online questionnaire questionnaires were distributed for responses to be logged between the 15 October 2018 – 03 November 2018. The both questionnaire's participation rates are summarised below;

Table 4.1: Average DAC Companies Participation Rate

Detail	**Count**
Number of individuals from companies invited to participate	30
Participation Rate	13 = 43.33%
Completion Rate	100%
Dropouts (after starting)	0%
Validation Errors	0%

Table 4.2: Average Team Leader Participation Rate

Detail	**Count**
Number of individuals from companies invited to participate	55
Participation Rate	25 = 45.45%
Completion Rate	100%

Dropouts (after starting)	0%
Validation Errors	0%

4.4) Questionnaire Analysis - Descriptive Statistics

4.4.1) Demographics

The demographic analysis presented below as explained earlier is not sociological but to ensure that the respondents were from the correct work level in the organisation for example, the DAC and or merSETA respondents had to be at a management level whilst the Company A respondents had to be at a Team Leader level; either a supervisor or a foreman.

4.4.1.1) Years of Service

Both sets of respondents from the DAC and Company A questionnaires can be described as having a great deal of industry related experience due to the average years of service in their respective companies;

Table 4.4.1: Average Years of Service

DAC and or merSETA member	10.69
Company a Team Leader	14.84

The average years of service is a positive result since the respondents will be able to offer insightful responses to the questionnaire.

4.4.1.2) Number of Employees

Durban Automotive Cluster Questionnaire Responses

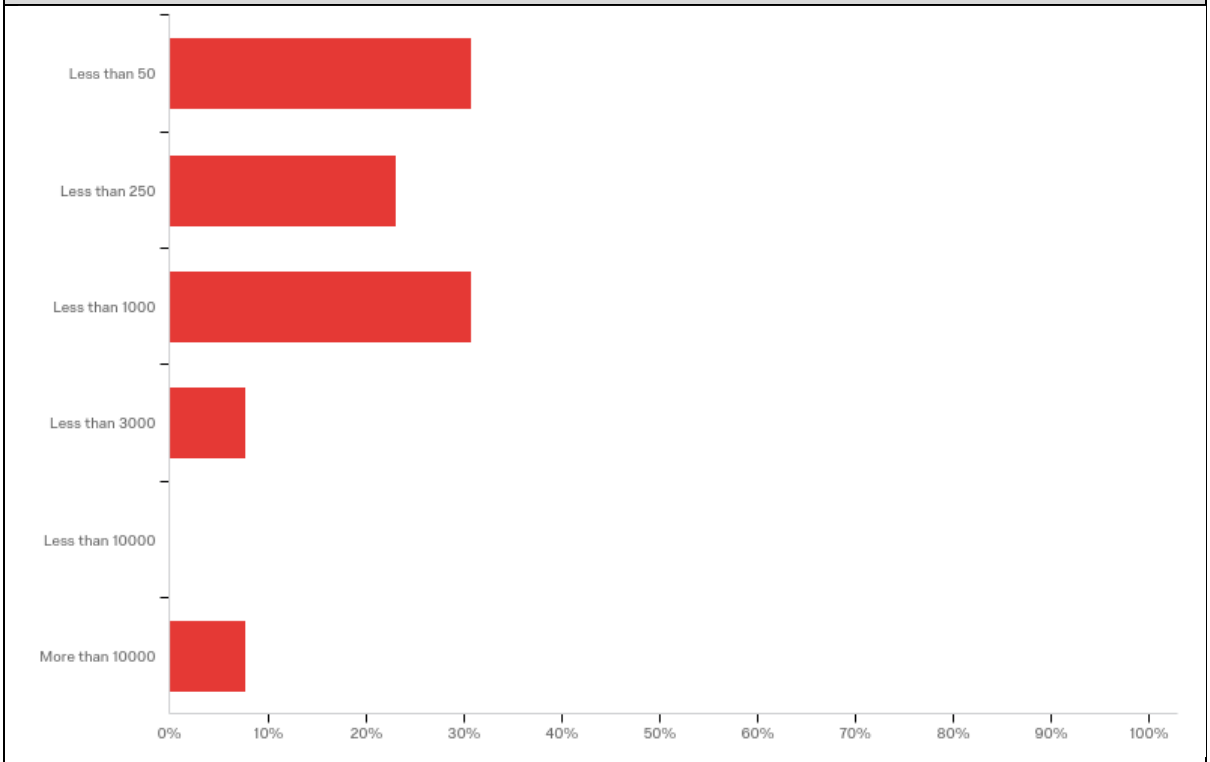

Figure 4.1: Q1 Number of employees in your organization?

DAC and or merSETA companies that responded to the questionnaire are from predominantly small employers who have less than 50 employees or small-medium employers that have less than 1000 employees.

Company A is slightly larger than the norm since they fall into the less than 3000 category which is that of a medium sized employer.

The respondents to the DAC and or merSETA companies were carefully selected due to being participants in other DAC questionnaires for feedback on industry issues. All the respondents were at a management level in their organisation and had access to information on problem-solving due to being part of their Manufacturing Excellence programme that meets on a quarterly basis.

Having consulted the DAC in advance, the researcher was informed that a response rate of 40% is the norm.

4.4.2) Research Construct 1: Types of Problem-Solving Tools

Durban Automotive Cluster Questionnaire Responses

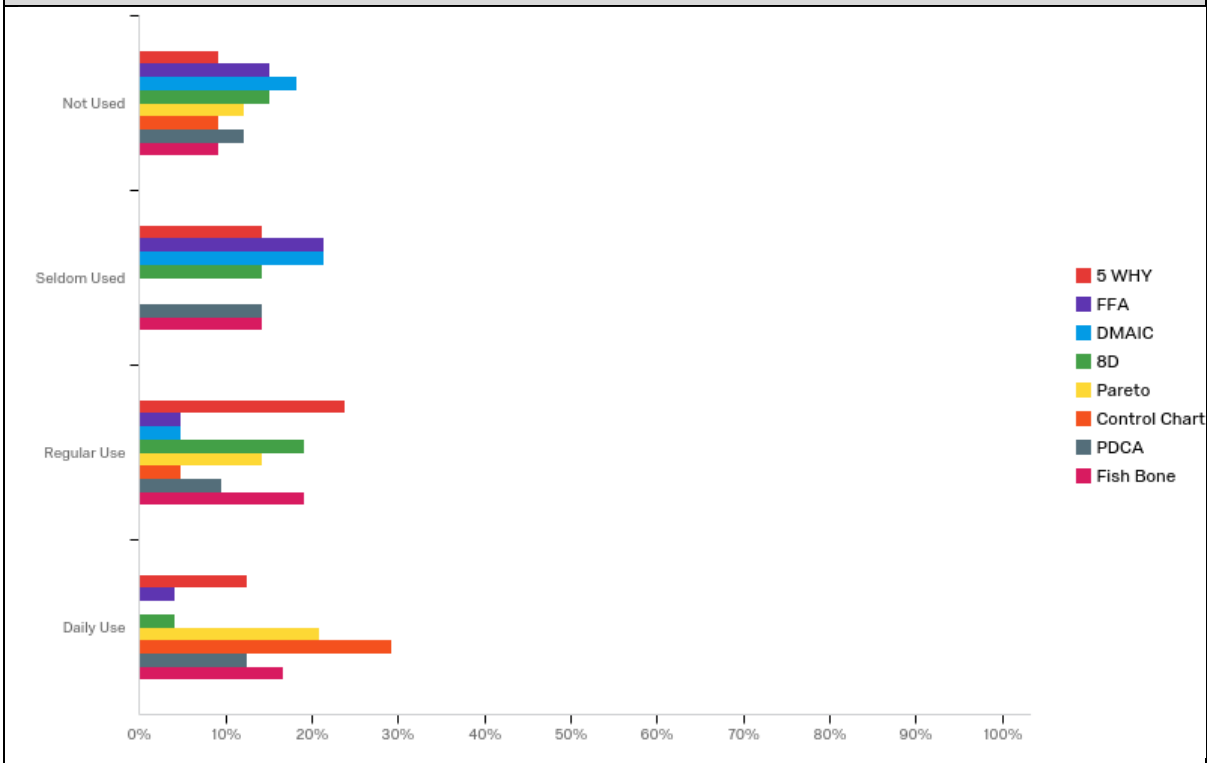

Figure 4.2: Q1 What type of problem-solving tools are most frequently used?

Company A Team Leader Responses

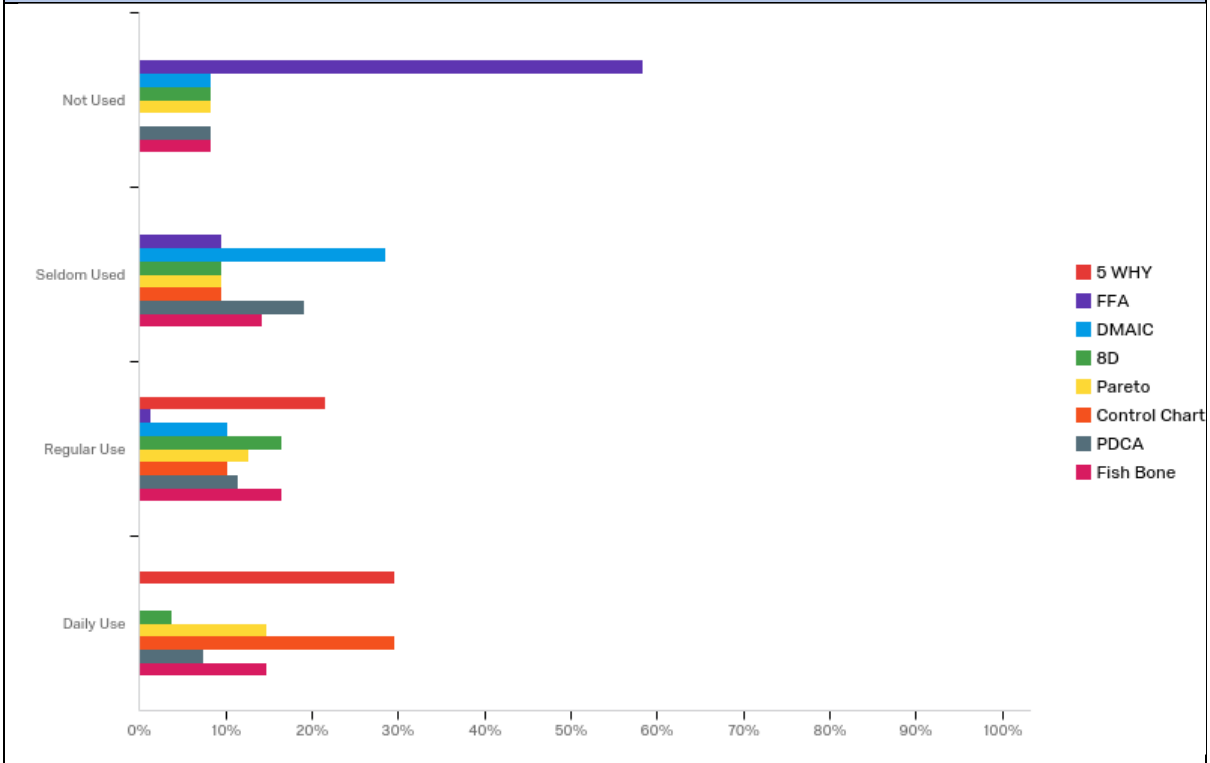

Figure 4.3: Q1 What type of problem-solving tools are most frequently used?

Refer to Table 4.3.2 for further explanation of Research Construct 1.

Regarding problem-solving tools that are most frequently used, there are differences to be noted between the DAC and Company A's practices -

Table 4.4.2: Problem-Solving Tools Utilised

#	Question	Not Used	Seldom Used	Regular Use	Daily Use
Durban Automotive Cluster Questionnaire Responses					
Top 1	Control Chart	27%	0%	9%	64%
Top 2	Pareto	33%	0%	25%	42%
Top 3	Fish Bone	23%	15%	31%	31%
Least 1	DMAIC	60%	30%	10%	0%
Least 2	FFA	50%	30%	10%	10%
Company A Team Leader Responses					
Top 1	Control Chart	0%	11%	44%	44%
Top 2	5 WHY	0%	0%	68%	32%
Top 3	Pareto	6%	12%	59%	24%
Least 1	FFA	70%	20%	10%	0%
Least 2	DMAIC	7%	53%	40%	0%

From the table 4.4.2 utilisation rates show that there are clear differences in the application of tools between DAC member companies and Company A.

Control Charts are the most common form of problem-solving amongst the two groups but with Company A having a greater reliance of 20%. There is also a high use of Pareto analysis but again the utilisation rate differs by 18%. In terms of the third most commonly used tool, Company A prefers 5 Why's whereas DAC companies utilise the Fish Bone analysis daily. Fishbone analysis is utilised at Company A but at a daily rate of 19% (Figure 4.2 Graph) which is a notable difference.

The only tool that does not seem to be popular is the FFA – Formal Failure Analysis with 70% of Company A's respondents indicating that the tool is not used.

4.4.3) Research Construct 2: Questionnaire Data Analysis

Durban Automotive Cluster Questionnaire Responses:

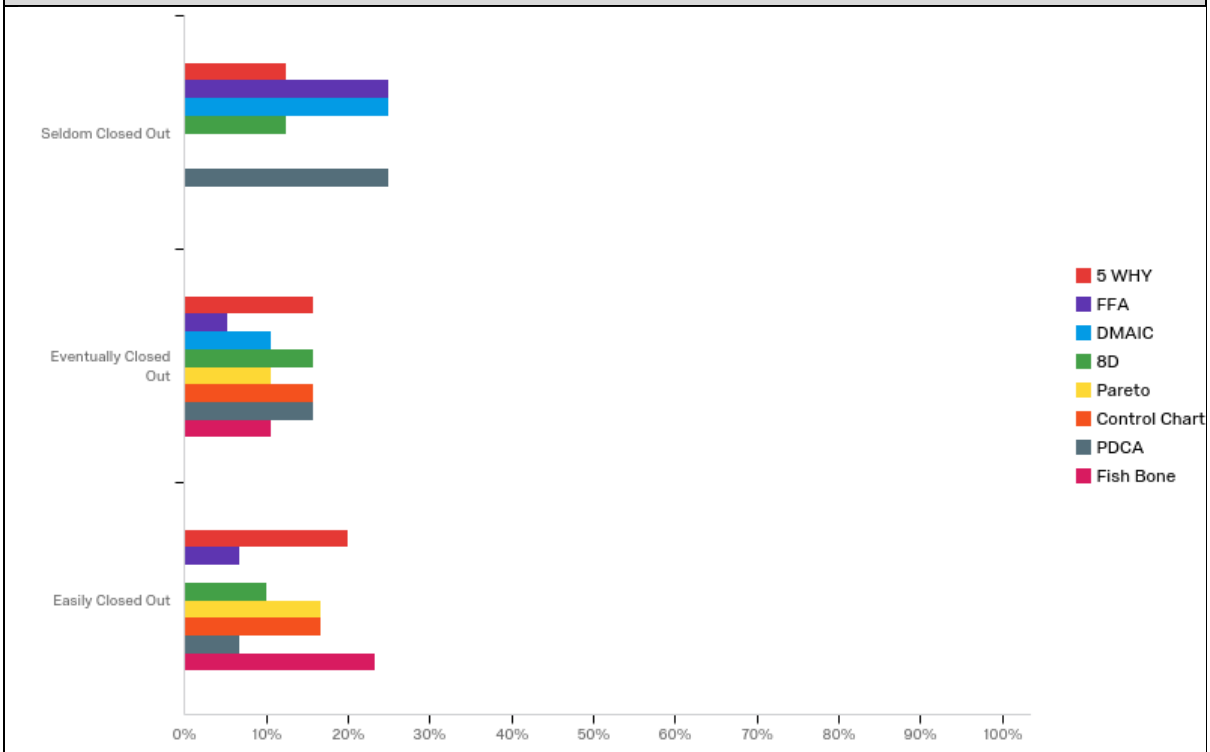

Figure 4.4: Q2 Do the types of problem-solving tools used result in solution determination (what is the close-out rate)?

Company A Team Leader Responses

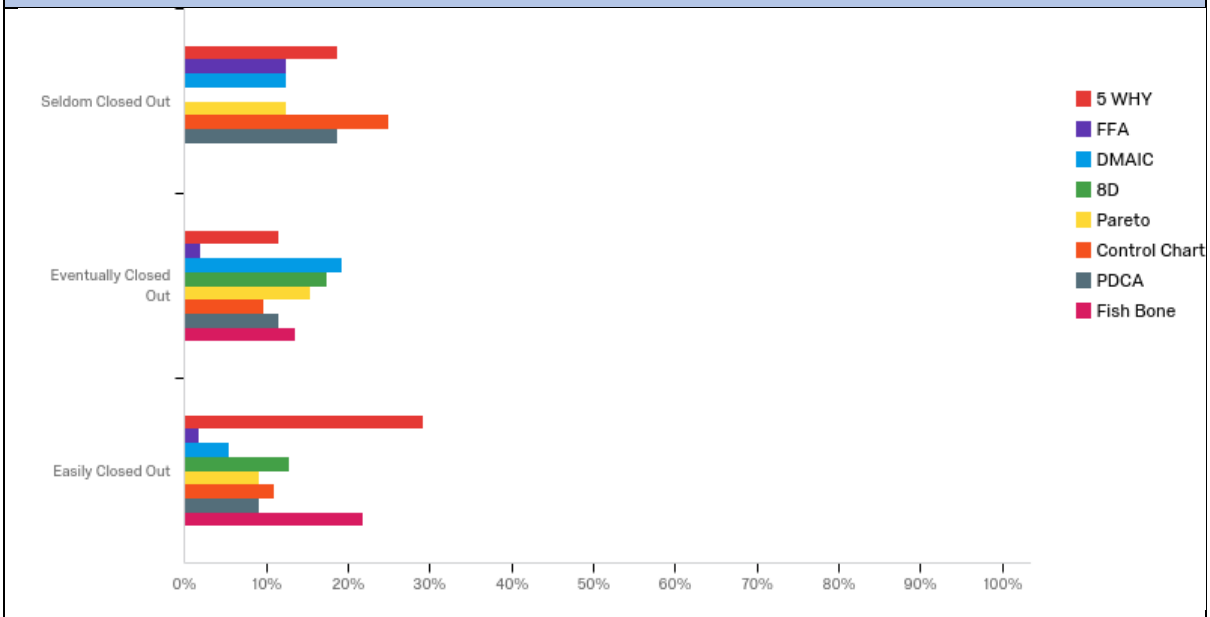

Figure 4.5: Q2 Do the types of problem-solving tools used result in solution determination (what is the close-out rate)?

Refer to Table 4.3.3 for further explanation of Research Construct 2.

Problems need to be solved and closed-out, the results comparison between the DAC respondents and Company A are discussed below –

Table 4.4.3: Problem-solving Close-Out

#	Question	Seldom Closed Out	Eventually Closed Out	Easily Closed Out
Durban Automotive Cluster Questionnaire Responses				
Top 1	Fish Bone	0%	22%	78%
Top 2	Pareto	0%	29%	71%
Top 3	Control Chart	0%	38%	63%
Least 1	DMAIC	50%	50%	0%
Least 2	FFA	40%	20%	40%
Company A Team Leader Responses				
Top 1	5 WHY	12%	24%	64%
Top 2	Fish Bone	0%	35%	60%
Top 3	8D	0%	53%	41%
Least 1	Control Chart	27%	33%	40%
Least 2	PDCA	20%	40%	33%

An analysis of the close-out rates between Company A and the DAC questionnaire responses indicates that the Fish Bone analysis is common in terms of the top 3 tools that result is solutions being provided to problems or even problems that remain without a solution.

DMAIC (Design, Measure, Analyze, Improve and Control) as well as FFA are both high-level tools that the DAC companies indicate are seldom closed with a high rate of 40-50% which is problematic. Control Charts and PDCA (Plan, Do, Check, Act) which according to Iuga and Rosca (2017:7) are root cause problem-solving tools. PDCA has a response of 20-27% seldom closed-out which is concerning because it means that problems are continuing without any idea what caused them.

DMAIC at Company A is seldom-closed out at a rate of 13% and eventually at 63% (Figure 4.5) which indicates that Company A does have the ability to close-out highly complex problems but the respondents feel that it takes a long time.

4.4.4) Research Construct 3: Questionnaire Data Analysis

Durban Automotive Cluster Questionnaire Responses

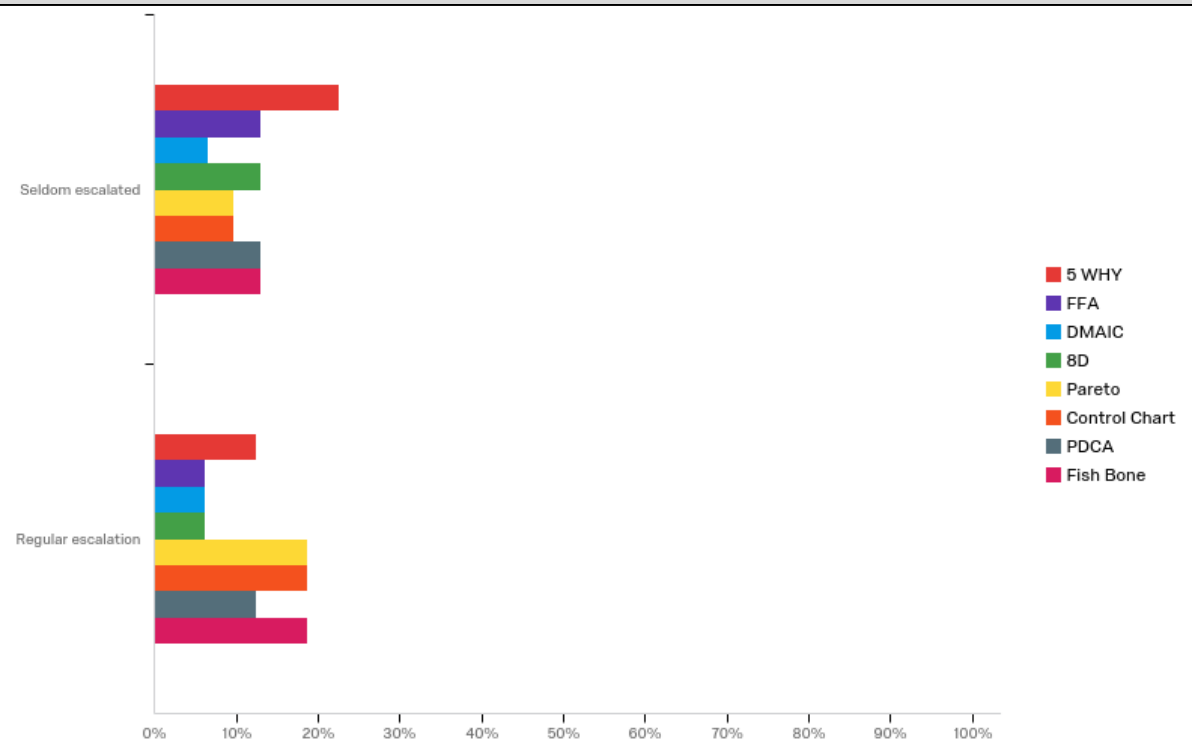

Figure 4.5: Q3 What is the escalation rate from simple problem-solving tools to more complex problem-solving tools?

Company A Team Leader Responses

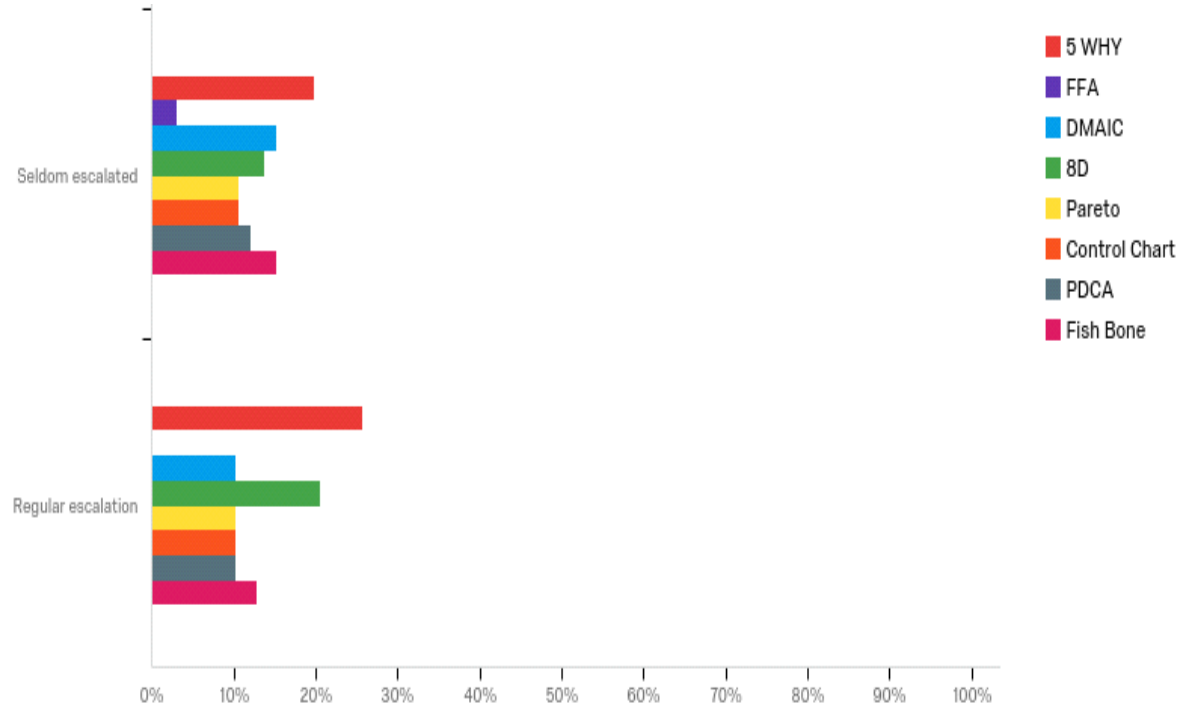

Figure 4.6: Q3 What is the escalation rate from simple problem-solving tools to more complex problem-solving tools?

Refer to Table 4.4.4 for further explanation of Research Construct 1.

Problem-solving tools that do not reach a solution require escalation to a higher level of authority. The differences in escalation rates between the DAC and Company A's are summarised below –

Table 4.4.4: Problem-solving Escalation

#	Question	Seldom escalated	Regular escalation
Durban Automotive Cluster Questionnaire Responses			
Top 1	FFA	80%	20%
Top 2	8D	80%	20%
Top 3	5 WHY	78%	22%
Company A Team Leader Responses			
Top 1	DMAIC	67%	27%
Top 2	Control Chart	54%	31%
Top 3	Fish Bone	53%	26%

The top 3 responses to the frequency that escalation takes place, have no commonality amongst tools between the DAC respondents and those from Company A.

In terms of categories of problem-solving tools, they both contain problem-solving method criteria for creativity, complexity and root cause analysis which supports Iuga and Rosca (2017:7) assertion that problem-solving is all about efficiency and not complexity.

4.4.5) Research Construct 4: Thematic Analysis

Durban Automotive Cluster Questionnaire Responses:

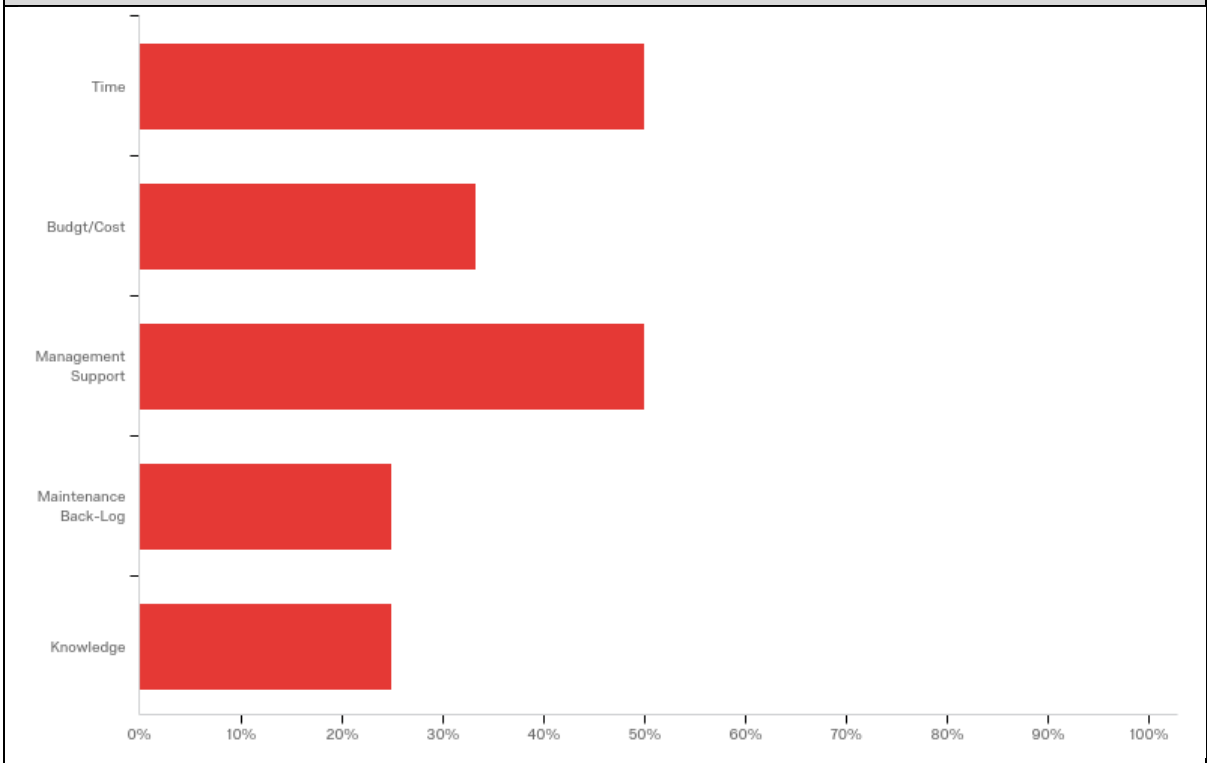

Figure 4.7: Q4A What solution implementation challenges do you face with problem-solving?

Table 4.4: Additional Solution Implementation Challenges

(Extract from Qualtrics)

What solution implementation challenges that were not listed above do you face with problem-solving
Complex manufacturing environment
The skill of knowing what to do and then implementing the required changes. This often requires teamwork across departments.
Participants knowledge and understanding of the Problem-Solving tools (models) before working with them.
All problem-solving is computerised and highly automated. There is tracing software that performs the function of a FFA and Control Chart. All staff have access and with the laser cutting machines being linked to AutoCAD and Inventer the cutting is automatic so there are no human errors.
Process changes not properly communicated

Themes from the focus groups were identified by the researcher and have been summarized into outcomes for Company A to further investigate.

4.4.5.1) Team Leader Solution Implementation Challenges

Team Leaders during their focus group were asked whether they shared the same solution implementation challenges as the DAC Company respondents. The main themes are summarized below;

A) Management Support:

- There are instances on the Shop Floor when problems are escalated but no support is received. The escalation just seems to sit and there is no feedback on the problem from the Production Managers.
- Management support is a problem, it is easy to meet the target for problem-solving tools, especially relating to 5 Why's but approval is difficult to obtain when you want to close a 5 Why out. Engineering takes a long time to close-out problems but if it is within productions responsibility (core building) it is easy to solve a problem.
- Management has a vision, if your solution to a problem does not fit in then your problem is not solved.
- Senior management is in conflict with lower management. Lower management will not push the Shop Floor agenda even if it is a solution to a problem, they lie (lower management).
- If a Production Manager has to stand by you as a foreman or a supervisor, this doesn't happen, they lie to you.
- Managers change their mind when it comes to problem-solving and they don't give foreman or supervisors feedback.
- With regard to Continuous Improvement in the MoT, the Team Leader should just initiate the problem-solving, there is a department that should be following-up and closing out problems not just managing a tracker. Everything should not just be the Team Leaders responsibility. There needs to be role clarification amongst the departments.

B) Time:

- Time is the biggest factor; you do your job but there doesn't seem to be time or opportunity to solve problems.
- There is lots of time wastage and poor planning which affects incoming material and tool changes. Tool Setters are forced to deviate from the original plan and attend to unplanned tool changes which wastes time. The result is that Tool Setters don't have the time to do problem-solving online and Team Leaders don't get the opportunity to discuss problems with them.
- Time is more of a problem relating to management making a decision and not the actual close-out of the problem. The response is not effective, there is at times no feedback at all.

C) Budget or Costs:

- Small departments have more time but less of a budget when it comes to making improvements to manufacturing processes and solving problems.
- Big departments have larger budgets to make improvements to manufacturing processes based on problem-solving but then don't seem to have time. Big departments do make a plan to scrape together money for solutions relating to problems.

D) Knowledge:

- With specialist departments like Injection Moulding, problem-solving is a challenge due to a lack of knowledge of processes.
- Knowledge base is small for specialist departments when problems need to be solved, there is a small knowledge base, even at a high level.
- Material problems in Cooling of Engines (CoE) is a time factor. Shouldn't the process owner or Manager be responsible? The escalation process is not clear, there is a knowledge problem.

4.3.5.2) Shop Floor Solution Implementation Challenges

Shop Floor members during their focus group were asked whether they shared the same solution implementation challenges as the DAC Company respondents.

A) Management Support:

- T1 part had tight tact times and this problem was reported. Team meetings do take place, but management does not speak to the Shop Floor, no feedback was given on the tact time problem. The T1 part still runs at a high speed – causes injury, workers have severe shoulder pain and end up being absent from work.
- Don't get support in Assembly, problems are mentioned in the Team meeting but there are no resolutions;
  - Packed cores, they were packed too high. The cores didn't go through product checking / line checking – Supervisors want numbers, supervisors won't stop the line, they don't care about quality problems.
  - Cores are still being run even though they will fail and cause customer complaints. This is a big problem.
  - People from re-work complain, if the problem was resolved they wouldn't have so much re-work to do, surly this is an expensive waste?
- When there is a problem and it is beyond control of that specific department, there is no solution provided for the problem.
- If it is things that people can't do themselves, there is never a solution to the problem.

a) Budget:

- Budget is a problem, Supervisor says "do you know how much this thing costs?" But it is a useful request and affects production. If a blade is not sharp to cut Airways, surely the re-work cost is more than a blade?
- Supervisors blame other things for not providing solutions to problems.

4.4.5.3) Team Leader Solution Implementation – Additional Challenges

Team Leaders were then asked during their focus group what additional implementation challenges they faced to the ones listed in the DAC question.

Themes relating to additional solution implementation challenges are summarized below;

A) Knowledge:

- New projects are the biggest problem. People are not trained and do not have the required skills to solve problems.
- There is no step-by-step training on what the new process involves so how are people supposed to solve problems in future when they don't have the knowledge?
- An IT issue exists because there is a reliance on one IT Technician. You always have to wait for this one person. A suggestion is to write a Work Instruction to assist other more junior members of the IT department to trouble-shoot or for Team Leaders to trouble-shoot themselves.
- There is a lack of specialist knowledge of processes in order to effectively solve problems.

B) Management Support:

- When problems get to a certain level, there seems to only be upward and not down-ward feedback.
- The Shop Floor want to know about problems, they are just as affected as a management, but they don't get any information.
- The Shop Floor generally has a good attitude, unfortunately, they don't get an honest response from Managers who are two-faced and lack integrity.
- Shop Floor is not keen to buy into problem-solving due to lies from management and a lack of trust. Production Managers give one story to senior management and a different story to Shop Floor.
- Production management do not own-up to legitimate problems, they don't make Shop Floor feel part of the team.

C) Attitude:

- The attitude to problem-solving is not positive, people must be chased. Others do not understand the benefit of problem-solving.

D) Ownership:

- Ownership and over delegation are the biggest problem-solving obstacles. The responsibility gets lumped with the Foreman even if it is external to their work area. What is the CIP departments role in the MoT? There seems to be a large discrepancy between the CIP department function between the MoT and CoE.

4.4.5.4) Shop Floor Solution Implementation – Additional Challenges

The Shop Floor respondents were then asked during their focus group what additional implementation challenges they faced to the ones listed in the DAC question.

Management Support:

- Management is the main cause. They don't implement solutions.
- Time, budget and maintenance is controlled by Management.
- Roller doors example, where weather affects people's health and affects absenteeism. People aren't treated well.
- The Shop Floor receives no feedback.

4.4.6) Research Construct 5: Thematic Analysis

Durban Automotive Cluster Questionnaire Responses:

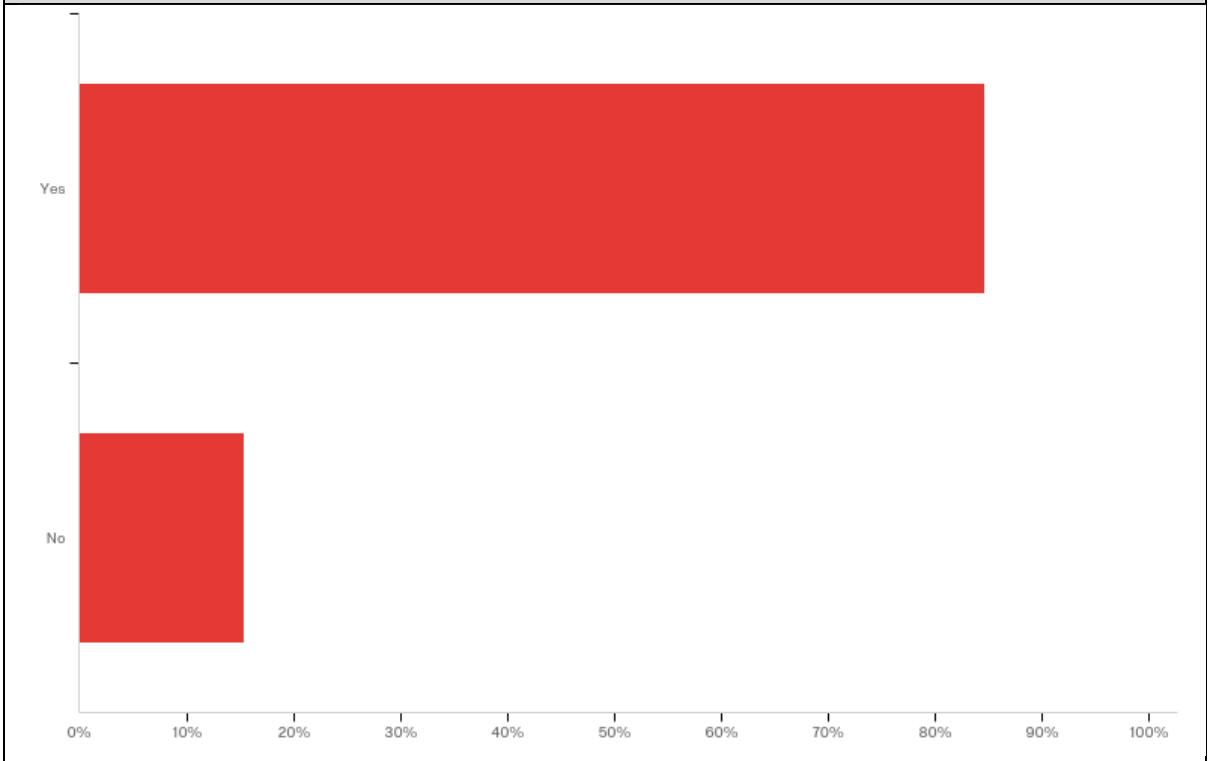

Figure 4.8: Q5A Is change management taken into consideration during any of the problem-solving steps?

Table 4.5: Explanation of Question 5.A

(Extract from Qualitrics)

Addressing the systemic corrective action

It is split between various production areas, so a person specific will be used.

Talk to and communicate with staff.

I believe that at a supervisor and foreman level, little consideration of change management is given, operators are expected to change/react as required. However, at more senior levels, change management and the affect on individuals or groups is considered.

The Strategic plans of the organisation is taken into account while solving current problems

It is a small plant so only production meetings are required. There is a German software called TOP that leaves no room for human error in the operation of the lasers. Only possible error is wrong material between the forklift driver and laser operator but they all have access to the system to double check what is required.

All relevant paperwork i.e. work instructions, procedures etc. are updated depending on the outcome of the investigation.

change is a process and needs clear communication and buy in as well as implementation transition plan

4.4.6.1) Team Leader Change Management Explanations

Team Leaders were questioned around change management practices at Company A as compared to the DAC Company respondents. The main themes are summarized below;

A) Change management only at Management Level

- Change management only occurs at a senior management level.
- Change management is at one level, not directed at line Managers/Team Leaders who should also be trained on change management tools. It is extra work but will make the lives of team members easier.

B) Change management Tools not Utilised or Trained

- There are change management tools, but they are not used affectively. People have to be reminded to use the change tools that are in place.
- Change tools do help even though it is more paperwork to do. There are benefits to the 4-step and 10-step change plan tool, but they are not widely used.
- The change management process is not applied because not everyone has been trained.
- Change is reactive, a change plan is only drawn-up when there are serious problems with the project or team. In some cases, there is procedural compliance but not full compliance in terms of solving real problems and implementing change.
- This is a great company, we have change tools, but they are not being used.
- There is a change plan to help projects, but it is not used properly.

C) Change at a Team Level

- Teams don't always adjust to change.
- There are lots of processes, maybe change management is confusing?
- Communicating change to teams should involve giving a time frame and reminders. Managers must go back and re-evaluate change. Give feedback and ask for opinions – this is not taking place.
- There is some resistance to change from teams but not too much.

- Everybody is capable of change but must be willing and not stuck in your ways. With change communication, go beyond the 7-times rule.
- With change, you should not just try and prove a point for personal reasons. For change, a Manager must communicate the reasons and the effect of the change up-front.

D) Work Instructions linked to Problem-solving and Change management (Solution Implementation)

- If problem-solving exercises take place, Work Instructions are only updated if there is an audit which is very wrong.
- Work instructions are only updated if there are major problems, it is not a habit.
- Work Instructions are not always updated even if there is a major problem that was solved. This must improve.
- VM board is also too much work, why isn't there an electronic notice board? Time is a problem and it would be easier to update an electronic notice board that communicates current information and can also indicate problems and those that have been closed out.
- A closed-out problem should automatically be included in a work instruction. Unfortunately, this is not a practice.

E) Honesty and Integrity

- Change requires honesty and integrity from Managers (similar comments were repeated often). Production Managers are told that there is a project, but the department is not aware, and no information is given, change is not free flowing.

4.4.6.2) Shop Floor Change Management Explanations

Shop Floor members with the assistance of their Shop Steward were questioned around change management practices at Company A as compared to the DAC Company respondents. The main themes are summarized below;

A) Poor time studies impact change management

- Management sends a time study person for 30 minutes who don't spend enough time observing. They don't even know how many people perform the same function or how physically demanding it is?
- Where is MTM-UAS on site? The Shop Floor knew about this practice but what happened to it?
- Time studies don't look at the change of human rhythm from start of shift to end of shift.
- Can't have same targets between products because of complexity and different models.
- Repetitive injury is a big concern for Assemblers. They don't trust the time study; think they are rushed, and no change management is used when wanting to introduce a time study for a new part.

B) Work Instructions impact change management

- CoE; No Work Instructions are issued, there is no communication of a process change. Operators are just expected to do things. A lot of the time, heavy work is required, the parts are difficult to lift. Sometimes there is no Setter and Operators are expected to do both setting and leak testing, they must just do it, figure out how.
- CoE; sometimes told about change and given Work Instructions.
- Most of the time Work Instruction just appears on the machine.
- MoT; just has verbal instructions not proper change management.

- No, the Shop Floor were not aware that there are 4 and 10 step change management plans.

C) Change management only at Management Level

- Change management is only for management.
- Operators are not recognized by the change management process; supervisors are only interested in production output and no information is given to the Shop Floor.

4.4.7) Findings

Company A utilised the focus groups to better understand the application of problem-solving as well as the impact of change management in the workplace. The Team Leader and Shop Floor focus group members were given the opportunity to air their views so that improvements can be made in future.

Please note that the numbering reflected below from 2.1) onwards relates to the questionnaire questions.

2.1) What practical suggestions do the Shop Floor have to improve solution implementation after hearing about other firm's practices?

Team Leader	Shop Floor
• Supervisors have not been trained on the 4 or 10 step change management process for solution implementation. Even if it is just a short awareness training, it would help Supervisors to understand how to better support change management. An information session on the change management tools would be appreciated. • As a company, all the change tools are in place, they just need to be used. • The culture is to just jump-in and do it. No, plan, no input and no communication. • There is no measure of how many change plans are used or implemented. A measure may encourage people to use the change tools. • Honesty and integrity of production management is the biggest problem for problem-solving.	• Come as a team to solve the problem - supervisor, tool setter and operator together solve the problem. • Don't just reject useful suggestions – listen. • The first Team Meetings were useful, 15 minutes every day – a problem was solved by the next day. • People have lost interest in Team Meetings, only having a meeting once a week and this doesn't work. • The Shop Floor has tried, they have talked, they gave suggestions but no change, no feedback. Even if the answer is no, that is fine, but supervisors must explain why. • Engine Cooling; only have meetings once a month, one minute before so no purpose in it.

• In addition to an electronic VM board, a suggestion is to have electronic Work Instructions as part of the VM board to assist in the solving of problems online. • There should be a committee to implement solutions related to problem-solving that is made up of a mixed-disciplinary team from maintenance, logistics and quality, etc. This is a suggestion for Engine Cooling. • Follow-up's on solution implementation should be allocated to a responsible person. In most cases, the implementation is being given to the wrong person. The situation in the Tube plant is that open 5 Why's aren't being escalated properly, there is no black belt who is responsible, no levels of escalation so no attention is given to the problem and the solution implementation.	• We have tools in place, but they are not used. We know about Shop Floor Management, but it is not implemented. We know that 5 Whys are supposed to be done by a team but there is no team practice. • It is bad that 5 Why's are just a paper exercise. 5 Why's are not implemented so the Shop Floor don't take them seriously.

In terms of practical suggestions relating to (2.1) it is clear that training on the 4 or 10 step change management tools will assist Team Leaders to meet the Shop Floor's expectations because properly implemented change management requires a structured communication plan as part of the change roll-out. A change initiative is made-up of a representative team which would solve the implementation problems.

Escalation seems to be a big problem especially when looking at the questionnaire results in 4.4.4) where Company A should ask their teams why certain problem-solving tools aren't escalated. A thorough consultation needs to take place.

Responsibility is a big problem, there is no mention from Company A that there is for example a black and green belt structure with experts who are there to advise Team Leaders if they are stuck with a particular method of problem-solving. There seems to be no adjudication process.

The lack of trust between the Shop Floor and the Team Leaders is very concerning and this may be easily solved if regular team meetings took place and problem-solving was part of the agenda.

2.2) Do you have examples where change management has been applied to solution implementation (of problem-solving), what was the outcome?

Team Leader	Shop Floor
• In most cases, focus group participants could not recall a project that had proper change management practices applied to it. • BIQ project where defective tubes and calibration devices had elements of change management and communication. There was a follow-up after the implementation of the project. The project members engaged with the Shop Floor and gave feedback, this was appreciated. • The layout change in the Service Centre due to a factory move. • Injection Moulding relating to the BMW Project. There was an introduction to the new parts, Work Instructions were updated, the department was kept informed of changes. • Change management is not always used in terms of project communication. • Sometimes a change plan is done half-way through the project. • No, change management is done badly.	• No full change management process. • Very difficult to think of examples, but RSM tubes should to run at lower speed. Change management is needed in RSM. • The Off-Line Cutter might be an example because it is good that scrap was reduced, and blades are saved. We were told in advance of idea, but the Shop Floor was not given an opportunity to have input.

Company A must take note that change management has not been applied to projects. There are only a few, very weak examples that were given.

2.3) What behavioural traits should a change champion have?

Team Leader	Shop Floor
• Welcome change and have a real interest in it • Positive attitude • Be genuine • Show real interest • Able to deal with excuses from others	• Listen / listener • Not proud / arrogant • Must be able to communicate at all levels • Work hand-in-hand with people • Approachable

• Lead by example • Firm/ assertive but not aggressive • Listen to understand (active listener) • Constructive feedback • Communicate at different levels (simple and effective – get the message across) • Involve people • Convince others • Open minded • Adjust your communication depending on the level of person • Knowledgeable • Effectiveness • Integrity • Respectful (don't humiliate others, don't laugh it off, don't abuse your job grade) • Not emotive but able to confront people.	• Good communicator (communicate at all levels) • Good manners • No favouritism • Honesty • Integrity (don't just sign off if something is not done) • Don't know how to speak (humane) "treat like human being". • Respectful • Good attitude

There is a great deal of correlations between the Shop Floor and Team Leader responses, they seem to agree on what traits a Change Champion should have. Having a consensus in places will assist Company A to easily implement Change Champions in their organisation.

2.4) What job grade should change champions have?

Team Leader	**Shop Floor**
Grade dependent comments (minority opinion) • The type of change required should be grade related in terms of the level of change champion • Change champions should be supervisory level and above Not grade dependent (majority opinion) • Any job grade is suitable just as long as the person has the required skill and knowledge • Any job grade if the person is deserving, even an operator • Depends on the project and the level of change required • A champion must be able to speak to people of the same level in terms of knowledge • Need to have the right set of behaviours	No. Anyone. Must have the behaviours necessary (as listed above). • Can be any grade • Have a change champion each level. • Shop Floor like to speak at own level • Need management level change champions to make decisions, they must not sit on the decisions.

• Level of authority is not a problem if the person is convincing • It is best to have change champions at different levels to deal with Shop Floor or management • Some of the best leaders and change champions are on the Shop Floor • Team Leader may not be good at communicating change so could request the support from an Operator. The Team Leader will support the Operator Change Champion with their level of authority.	

The feedback taking both groups into consideration is that a job grade is not important when it comes to being a Change Champion, it's the authority bestowed on the person and the support from senior management that will ensure the success of a Change Champion.

2.5) Do you consider a Suggestion Scheme's as a form of problem-solving, if so, please explain further?

Team Leader	Shop Floor
Yes, a suggestion scheme is a form of problem-solving because changes are made, and you see what happens practically in terms of solutions being implemented. Yes, suggestion schemes are a form of problem-solving for all employees at all levels. Yes, suggestion schemes solve problems. Yes, because 5 Why's and suggestions sometimes go hand-in-hand. Yes, suggestions help in solving workplace problems and making things better. Yes, suggestions are a form of problem-solving and to a certain extent they do solve problems. Yes, in order to change processes, you must use the suggestion scheme, but decent workmanship should also be required, and continuous improvement must be promoted. Yes, if you want something, ask the Shop Floor, they know best.	Yes. See that there is an easier way to doing things, make a suggestion. Yes, on the floor, suggestions gives us energy to think about changes. Yes, suggestions make a workplace better. Yes, it is good to have a cash incentive. Yes, but we don't get feedback see change, this is not fair. Yes, sometimes a suggestion solves a problem. Yes, you make suggestions because you get something in return. Yes, the Shop Floor does appreciate the encouragement. The, Tube Plant receives no credit, but Engine Cooling does receive credit No, suggestions don't always help, we want to be safe in the workplace but then the suggestions don't get implemented;

Yes, an Operator in their area makes a suggestion and solves a problem because of it. Yes, you have something to gain if you submit suggestions, there is financial gain and an easier life at work. Yes, the suggestion scheme helps with some problems, especially during VM meetings, the Operators give good input because they work with the machines 8 hours a day. Yes, suggestion schemes involve everyone and part of change management too.	- Example of moving a control or having the pins redesigned. You could have this suggestion implemented if it was in your department. - Problems don't get fixed if they are outside the control of your department.

Consensus was reached between Team Leaders and the Shop Floor that suggestion schemes are a form of problem-solving. The complaint from the Shop Floor is a lack of feedback which could easily be addressed if problem-solving with the inclusion of suggestion schemes was given as feedback in team meetings. If this feedback is not given it could result in the demoralisation of the Shop Floor and they will no longer want to submit suggestions.

2.6) Would a person's culture affect their willingness to submit Suggestions?

Team Leader	**Shop Floor**
No, haven't seen any examples of where a person's culture stops them from submitting suggestions. No, there isn't an age issues where younger people won't submit suggestions to older people or to improve processes that older people implanted in the past. No, there aren't issues with status and ego blocking a junior person's suggestion. No, diversity does not impact on suggestions or continuous improvement, it is an authority problem. Egotistical. No, you may be from a different culture and you are able to be promoted if you perform well, people do still listen to you. Best to speak English as the business language to assist by not having any cultural differences. No, there are no gender issues or gender issues related to culture.	Yes, there seems to be a specific "look" and favouritism. Yes, Tube plant; in some cases where there are Indian Managers, Indian operators get their suggestion money first. Yes, people feel put off making suggestions because other people will get more benefit. Yes, people of some races get preferences in terms of suggestions. Yes, in some instances, there is a single antagonist that spoils the suggestion scheme. Yes, in most instances, the acceptance of suggestions seems to be race related. Yes, Indians seem to be more superior than Africans when it comes to suggestions being accepted. The recognition in terms of names, the Shop Floor sees more Indian names and more money allocated to Indians but maybe they are cleverer, they have had a better

Yes, operators do not have a culture of change. In terms of changing process that were put in place by others, they do feel threatened. Yes, there is a cultural problem, blacks can't tell an older person what to do therefore they can't make a suggestion. Yes, there is a problem with women in line management. Upbringing is a problem where a women line Manager as a child may have been forced to listen to men, Now that these women are at work, they refuse to listen to men, even if the man is being reasonable because they are tired of submitting to men at home. Women should just go to work to do their jobs and not take advantage of their gender and think that they can abuse men in the workplace. Yes, culture does play a part in the submission of suggestions. I am an old baba, you can't tell me what to do. Older Africans resist change. A young African will be very respect and quiet, they do not talk much but try their best (similar responses given on several occasions relating to youth versus age in the African culture). Yes, people do have preconceived ideas, a person's culture can inhibit progress for example Zulu's versus Xhosa's.	education and they can do better calculations for suggestions or show how their suggestion would make a profit for the company. The Shop Floor don't really know the criteria for suggestions to be accepted. No, there is no impact on gender, we are equal when it comes to submitting suggestions. No impact on age either, all are free to submit suggestions.

There are differences in opinion in amongst the Shop Floor and Team Leader groups that took part in the focus groups. There is very little consensus between the opinions of the Team Leaders and that of the Shop Floor that are very concerning.

For Company A to deal with the disparities between the Team Leader and Shop Floor groups;

- Diversity training for both Team Leader and Shop Floor groups where a mix of both groups attends this training in order to facilitate discussion
- Company A needs to have their own Diversity Charter that is facilitated with representatives from the different job categories and grades are present and that those sub-groupings reflect the different races and cultures found in Company A as well as being gender inclusive
- The sentiments around suggestions that are linked to race, gender, culture, generational differences and favouritism should not be ignored by Company A.

These are very difficult conversations to have but are worth the time invested since suggestion schemes provide huge cost savings to Company A

2.7) Explain whether change management has been applied to Suggestion close outs?

Team Leader	Shop Floor
No, there is feedback but only one-one-one not via the proper change management communication process No, there is no formal reinforcements. With suggestions, the foreman or supervisor is concerned about keeping the financial reward with them so want to pass on onto employee as quickly as possible. Maybe formal recognition can be given later at a forum. No, public recognition is lacking which is part of change management. It would be good to have public recognition of the people who submitted suggestions and a bit of the detail to confirm that a suggestion has been accepted and that a positive change is taking place. Share some of the detail in a team meeting (suggested meeting) - Team Meetings Meeting - Quarterly Feedback Meeting by Plant Manager No, people aren't made to feel important despite having a suggestion improved. No, which is why it would be a good initiative at Team Meetings to have a suggestion tracker that lists; - What, when who progress/status - Close-out date People really do want feedback and positive reinforcement. It does take time to get suggestions paid out, but it is worth it because machine problems are being dealt with. Suggestion targets are achievable. No, feedback is lacking when around change management and problem-solving. Feedback mechanisms should be in place or make announcements at meetings. You see the implementation but there is no praise.	No. They would like personal, positive reinforcement when money is issued. Monthly feedback of suggestion close-outs and implementation. A request was made to rank Indian and Black suggestion submitters for information purposes. The Shop Floor want to better understand the process, there is no hatred or dissention. A prize for top suggestions in each department - camp chair - gazebo - nice booze The Shop Floor are just issued their vouchers one-on-one and people do not grant public recognition. Maybe leave off financial value and focus on the detail if suggestions are going to be made public. People's suggestions were approved but not implemented so people don't care anymore. An operator was awarded a R500 voucher for a toilet upgrade suggestion for the Shop Floor toilet area. The supervisor's toilet was the only one that got an upgrade and not the Shop Floor toilets that are in a bad state of repair. Team Leaders need to better understand the suggestion scheme criteria so that they can communicate the reasons to the Shop Floor.

No, not to the correct extent. In Engine Cooling there are meetings where these is a close-out discussion but the same in not practiced in the Tube plant. No, it is a company culture issue, Managers must give more praise when a chart of suggestions is discussed. No, change management is not applied to suggestion close-outs. No, change is not considered, suggestions are not communicated and people's more who submitted the suggestions are not considered. People would be more enthusiastic if their suggestions were acknowledged publicly and the change the suggestion brought about communicated via proper change management channel. Yes, there is a good new process, but it is for safety related suggestions, only. The safety suggestions are minuted. It would be better to give feedback on the problem, the solution close-out and recommendations.	

Consensus was reached between the Team Leader and Shop Floor with both groups stating that no feedback is given on suggestions that have been submitted and there is an agreement that feedback would be greatly appreciated.

The process of giving feedback on suggestions needs to be formalised by Company A, put into a procedure and communicated throughout the organisation.

With regard to a suggestion scheme communication procedure, the following suggestions should be considered by Company A based on the feedback from both groups;

- Stipulate forums or an individual feedback form where the communication of the suggestion outcome is document whether positive or negative
- People do want recognition and a formalised process must be agreed, consulting the Union for input would be a good starting point
- Suggestions should be tracked just like any other production related documentation

The implementation of suggestions is a sore point for both Team Leaders and the Shop Floor. Senior Management is being blamed, the sentiment from both groups is that there is no commitment from the hierarchy which is resulting in a disinterest from the Shop Floor who want their effort to be acknowledged and see that their suggestions are taken seriously and add value to the business.

4.4.8) Conclusion

The contents of this chapter first described the participation rate from the industry and team leader questionnaires. An overview of the industry and team leader biographical information to assist with the categorisation of the responses to the questionnaire. The results of the utilisation rates of the problem-solving and change management tools from the two questionnaires were summarised. The next chapter discusses the questionnaire results and focus group outcomes and how these findings relate to the literature and objectives of the study.

CHAPTER FIVE

CONCLUSION & RECOMMENDATIONS

5.1) Introduction

Questionnaires were conducted which included industry respondents from automotive component manufacturers and Team Leaders from Company as well as focus groups from Company A.

The questionnaire responses culminated in viable feedback from the focus groups that Company A as well as industry respondents can use to assist problem causation in their automotive component manufacturing environment and subsequent solution determination and implementation which is more commonly referred to as change management.

5.2) Results and Findings

Company A has put a great deal of time and effort in order to diagnose the internal obstacles that need to be overcome in order to address problem-solving and relevant change management in order to ensure the success of initiatives or projects within their Automotive Component Manufacturing environment.

5.3.1) Conclusion aligned to objective 1; To identify effective problem-solving and change management tools;

From the questionnaire responses, there are common problem-solving tools used by both industry and Company A which are;

(1) 5 Why (2) DMAIC (3) Pareto (4) 8D (5) Control Chart (6) PDCA (7) Fish Bone

The only problem-solving tool that is not used widely is an FFA (Formal Failure Analysis) which is an advanced problem-solving tool for artisans to analyse and determine how the failure of every component in a system would affect production. According to AMS International (2015:2) the FMEA (Failure Mode and Effect Analysis) which brings about an FFA is completed with the assistance of a multi-disciplinary

which indicates that the Team Leaders should have knowledge of this problem-solving tool if it is part of their companies mandated problem-solving tools which according to Iuga and Rosca (2017:7) would fall into category CPX- Appropriate for complex problems.

Companies are at liberty to decide which problem-solving tools are best suited to their manufacturing processes but it is suggested that Company A consider this tool since there are specialist departments and there were complaints that artisans did not have adequate knowledge of specialised equipment to prevent break downs, a well-documented FFA would prevent reoccurring problems.

5.3.2) Conclusion aligned to objective 2; To examine the applicability of the tools, evaluate the effectiveness of the solving and change management tools in a manufacturing environment and critique their relevance.

The close of problem-solving tools showed disparities between industry respondents to the questionnaire and Company A, this is concerning because there are different categories of problem-solving tools and the ease of use depending on the complexity is standard, but Company A's responses do not correlate.

A focus area for both the Automotive Component Manufacturers and Company A would be to focus on the use of complex problem-solving tools such as FFA's and DMAIC because with complexity comes cost which means that the industry is losing productivity.

Regarding the escalation of problem-solving tools, again there are no similarities between industry respondents and Company A. What is noticeable is that there is a high escalation rate of simple problem-solving tools by Company A such as Control Charts and Fish Bone Analysis, these tools according to Iuga and Rosca (2017:4-5) should be under category 4, IS - Immediate solution oriented. Company A needs to investigate why their Team Leaders are not solving simple problems on their own.

5.3.3) Conclusion aligned to objective 3; Models for both problem-solving and change management in an Automotive Component Manufacturing environment will be developed in order to have a conceptual and theoretical framework for Managers

within the industry to use assist root cause analysis as well as solution determination and implementation;

Since there are 7 common problem-solving tools in industry, Automotive Component Manufacturers will be able to develop models with standard definitions and examples of applications for the following problem-solving tools (1) 5 Why (2) DMAIC (3) Pareto (4) 8D (5) Control Chart (6) PDCA (7) Fish Bone

With industry wide standardisation of definitions for problem-solving tools and their applications, the result will be smoother root cause analysis and solution determination.

Each organisation will however have to bear in mind their own complex manufacturing organisation which is one of the solution implementation challenges of problem-solving that was found in the industry questionnaire. Each manufacturing organisation will have their own unique process challenges again which is seen as a challenge to problem-solving, but this is just part and parcel of manufacturing automotive components which are by nature, complicated.

FFA's as a problem-solving tool can only be implemented in organisations that have an advanced maintenance planning system that are able to record an in-depth failure analysis as indicated in AMS International (2015:3) where there are 9 steps listed for effective failure investigation. A definition such as the 9 steps may be provided in an industry model but the investment in the system would also require explanation.

Change management is understood very loosely by the participants in the Automotive Component Manufacturers questionnaire. The responses alluded to communication, as in talking to their staff, there was no mention of a model or tools.

Training on change management that has a specific model or theorist such as John Kotter's 8-step Change Model would allow for uniformed understanding of the change process to allow for effective solution implementation and clear communication of process changes to all employees.

5.3) Recommendations

The following recommendations will to provide a way forward to address problem causation in their automotive component manufacturing environment and subsequent solution determination and implementation which is more commonly referred to as change management.

5.4.1) Recommendations aligned to objective 1; To identify effective problem-solving and change management tools;

ASCCI's strategic priority - Supplier capability has been discussed and which includes World Class Manufacturing best practice with a skills development framework with major skills focus for Shop Floor workers and Team Leaders due to the varying levels of problem-solving competence within the industry has already been determined.

The research indicates that there are seven common tools plus an explanation of FFA's that can be defined and developed into a model for Shop Floor and Team Leader training that ASCCI can roll-out industry wide.

5.4.2) Recommendations aligned to objective 2; To examine the applicability of the tools, evaluate the effectiveness of the solving and change management tools in a manufacturing environment and critique their relevance;

Both Company A and the Automotive Component Manufacturers via ASCCI's Supplier Capability forum could further investigate Iuga and Rosca's categories of problem-solving in order to provide industry members with guidance on escalation processes for problem-solving. From the questionnaire respondents, Automotive Component Manufacturers are mostly small employers which is an indication that they are unable to afford a Black or Green Belt structure for Lean Six Sigma analysis, an industry initiative by ASCCI to provide training on the effectiveness of problem-solving tools based on Iuga and Rosca's categories would increase supplier Manufacturing Value Add (MVA).

Company A has well-structured change management tools, a recommendation is that they share their tools with ASCCI member companies along with the standard Kotter 8-step change management training that is readily available through accredited training providers.

5.4.3) Recommendations aligned to objective 3; Models for both problem-solving and change management in an Automotive Component Manufacturing environment will be developed in order to have a conceptual and theoretical framework for Managers within the industry to use assist root cause analysis as well as solution determination and implementation;

The investigation of Iuga and Rosca's categories as discussed in the recommendation related to objective 2 of this study would result in a Problem-solving Model for all South African Automotive Component Manufacturers to address root cause analysis and solution determination.

Kotter's 8-step Change Model is readily available, a recommendation to ASCCI would be to take a decision as to whether his would be a widely applied model for the industry in order to improve solution implementation.

5.4) Scope for further research

The scope of the research is limited to the Kwa-Zulu Natal Automotive Component Manufacturers context with an emphasis on Company A's Durban factory where the focus groups took place. The study does not represent the entire Automotive Component Manufacturing sector in South Africa. The research is also limited to the province of KwaZulu-Natal therefore it is valid for the above

Research results and findings should be extended to all ASCCI members since this organisation represents the whole of South Africa's Automotive Component Manufacturers. The sample size is representative of a small population of Kwa-Zulu Natal Automotive Component Manufacturers and the focus groups were only participants from Company A. Larger trials via ASCCI would prevent the generalization of findings.

The research questionnaires and focus groups were administered in English. There are eleven official languages in South Africa, English speaking participants may have had an advantage in understanding the questions better than those participates that are not first language or regular speakers of English.

Finally, due to limited time and resource constraints, the depth of the study and research findings may only be peripheral and a broader study via ASCCI would have greater merit.

5.5) Conclusion

In order for ASCCI to achieve their first strategic priority - Supplier capability for all South African Automotive Component Manufacturers, ASCCI must ensure that there are industry standards and an accepted model for problem-solving tools used in a manufacturing environment to enable root cause analysis as well as solution determination and implementation.

The objectives of the study have been realised and are meaningful and valid. The limitations posed no direct bearing on the outcomes of the research. Therefore, valid and practical recommendations related to problem-solving and change management were made based on the questionnaire findings and focus group feedback. The study has helped highlight the challenges faced by industry members, Team Leaders and the Shop Floor with a view that an industry approved problem-solving model including change management can be recommended.

Recommendations based on the findings of each of the tree objectives have been presented and it is perceived that if they are implemented Automotive Component Manufacturers in South Africa would benefit from the use of change management tools in relation to solution implementation to ensure that the employees impacted upon are ready for the changes in work practices and both support and understand the implications of the change.

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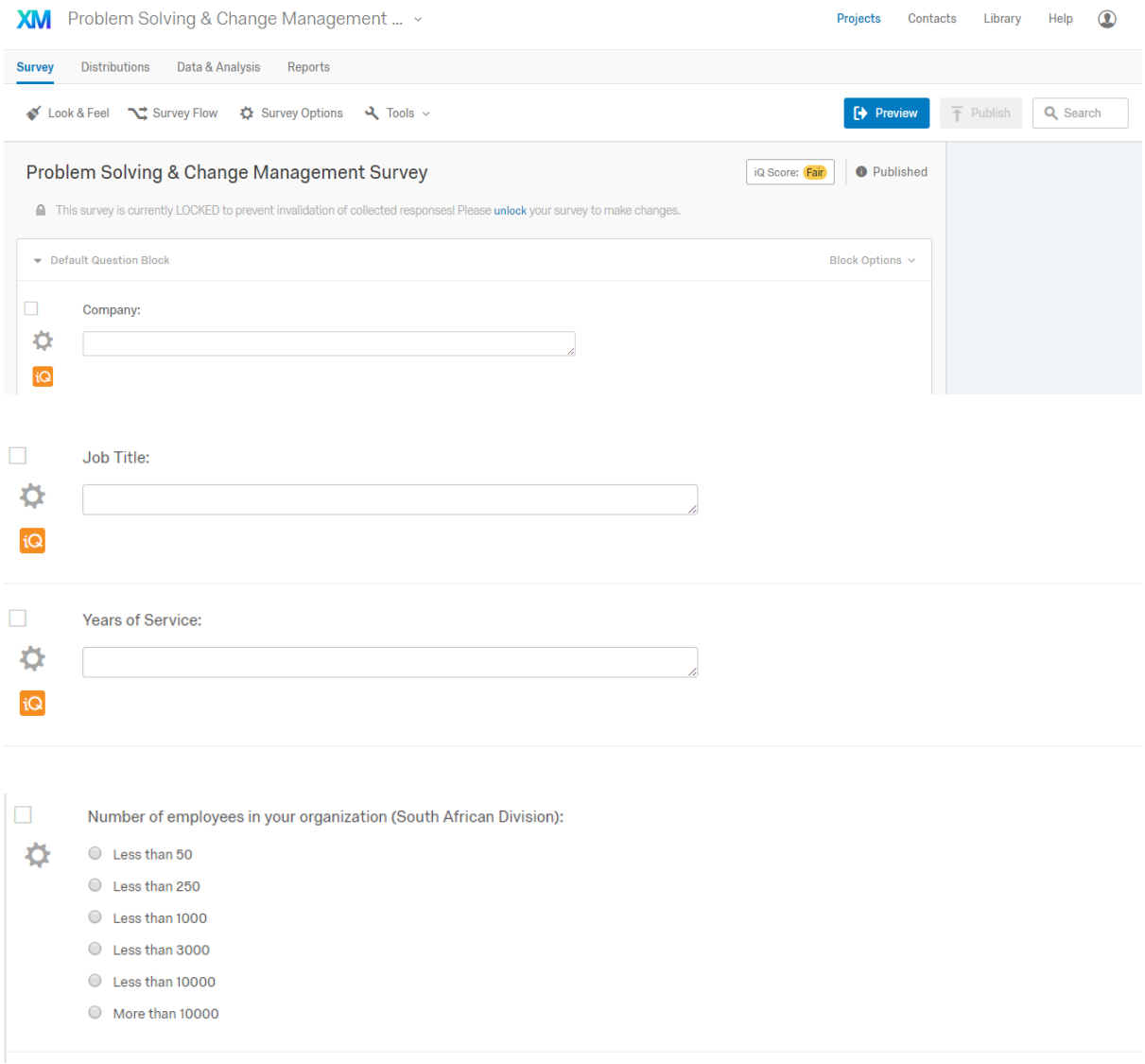
APENDIX A – Questionnaire Questions



1 What type of problem solving tools are most frequently used?

	Not Used	Seldom Used	Regular Use	Daily Use
5 WHY	○	○	○	○
FFA	○	○	○	○
DMAIC	○	○	○	○
8D	○	○	○	○
Pareto	○	○	○	○
Control Chart	○	○	○	○
PDCA	○	○	○	○
Fish Bone	○	○	○	○

2 Do the types of problem solving tools used result in solution determination (what is the close-out rate)?

	× Not Used	Seldom Closed Out	Eventually Closed Out	Easily Closed Out
5 WHY	○	○	○	○
FFA	○	○	○	○
DMAIC	○	○	○	○
8D	○	○	○	○
Pareto	○	○	○	○
Control Chart	○	○	○	○
PDCA	○	○	○	○
Fish Bone	○	○	○	○

3 What is the escalation rate from simple problem solving tools to more complex problem solving tools? (Escalation meaning, the problem requires additional time, resource and a more complex tool to solve it)

	× Not applicable	Seldom escalated	Regular escalation
5 WHY	○	○	○
FFA	○	○	○
DMAIC	○	○	○
8D	○	○	○
Pareto	○	○	○
Control Chart	○	○	○
PDCA	○	○	○
Fish Bone	○	○	○

4A What solution implementation challenges do you face with problem solving?

	Time	Budgt/Cost	Management Support	Maintenance Back-Log	Knowledge
Select relevant descriptions	☐	☐	☐	☐	☐

4B What solution implementation challenges that were not listed above do you face with problem solving?

5A Is change management taken into consideration during any of the problem solving steps?

Yes	No
○	○

5B Explain

APENDIX B – Ethical Clearance

UNIVERSITY OF KWAZULU-NATAL
INYUVESI YAKWAZULU-NATALI

05 October 2018

Ms Jade Myra Strachan (971162762)
Graduate School of Business & Leadership
Westville Campus

Dear Ms Strachan,

Protocol reference number: HSS/1296/018M
Project title: The utilisation of Change Management and Problem Solving in the Automotive Component Manufacturing Industry

Approval Notification – Expedited Application

In response to your application received 27 August 2018, the Humanities & Social Sciences Research Ethics Committee has considered the abovementioned application and the protocol has been granted **FULL APPROVAL.**

Any alteration/s to the approved research protocol i.e. Questionnaire/Interview Schedule, Informed Consent Form, Title of the Project, Location of the Study, Research Approach and Methods must be reviewed and approved through the amendment /modification prior to its implementation. In case you have further queries, please quote the above reference number.

PLEASE NOTE: Research data should be securely stored in the discipline/department for a period of 5 years.

The ethical clearance certificate is only valid for a period of 3 years from the date of issue. Thereafter Recertification must be applied for on an annual basis.

I take this opportunity of wishing you everything of the best with your study.

Yours faithfully

[redacted]

Professor Shenuka Singh (Chair)

/ms

Cc Supervisor: Dr Emmanuel Mutambara
Cc Academic Leader Research: Professor Muhammad Hoque
Cc School Administrator: Ms Zarina Bullyraj

Humanities & Social Sciences Research Ethics Committee
Professor Shenuka Singh (Chair)
Westville Campus, Govan Mbeki Building
Postal Address: Private Bag X54001, Durban 4000
Telephone: +27 (0) 31 260 3587/8350/8557 **Facsimile:** +27 (0) 31 260 4609 **Email:** [redacted] / [redacted] / [redacted]
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APENDIX C - Turnitin

The Utilisation of Change Management and Problem-Solving in the Automotive Component Manufacturing Industry.

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