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Gordon Institute of Business Science
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Title

Improving the success rate of organisational change with the 3-part habit routine

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A research proposal submitted to the Gordon Institute of Business Science, University of Pretoria, in partial fulfilment of the requirements for the degree of Master of Business Administration

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Abstract

Purpose - The objective of the research was to align the 3-part habit routine to intended organisational change initiatives that use discrete methodologies like Lean Six Sigma to achieve outcomes that are more successful than change initiatives deployed only from a technical systematic approach.

Design/methodology/approach – An infield quantitative experiment designed to measure the longitudinal effects of mindfulness, organisational routines, and job satisfaction.

Findings – This study does not provide empirical proof that the outcome to intended change initiative have improved with contextual cues over the predetermined time horizon.

Research limitation/implications – The results suggest the 20-day time horizon of the study was insufficient to establish automaticity. The language used in the assessment tools chosen, posed a challenge in the context of a South African services organisation. Not including considerations for affective and behavioural factors into intended change programmes will continue to influence the effectiveness of change agents, and practitioners.

Originality/value – Within the context of intended organisational change, this study aimed to amend embedded routines and/or automatic behaviours by providing contextual cues at a specific time of day.

Keywords - Organisational change, 3-Part habit routine, Mindfulness, Lean six sigma, habits

Declaration

I declare that this research project is my own work. It is submitted in partial fulfilment of the requirements for the degree of Master of Business Administration at the Gordon Institute of Business Science, University of Pretoria. It has not been submitted before for any degree or examination in any other University. I further declare that I have obtained the necessary authorisation and consent to carry out this research.

Signature J Coleman Date 11 November 2013

Acknowledgements

It is with profound gratitude that I thank everyone for the support and advice during this MBA journey.

To my family thank you for enduring the absence, and understanding that my priorities had shifted to complete the MBA.

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Thank you to Verity Hawarden for taking up my supervision so late in the game, and providing the necessary guidance I so dearly needed. The constant reminders of context, to ensure I communicate my passion and profound interest in the topic were tremendously helpful.

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TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF ABBREVIATIONS AND ACRONYMS

i.	ANOVA	Analysis of variance
ii.	CI	Confidence interval
iii.	DMAIC	Define-Measure-Analyse-Improve-Control
iv.	FFMQ	Five facet mindfulness questionnaire
v.	GPS	Global positioning system
vi.	JIT	Just-in-time
vii.	JSS	Job satisfaction survey
viii.	LSS	Lean six sigma
ix.	Mdn	Median
x.	MIT	Massachusetts Institute of Technology
xi.	PDCA	Plan-Do-Check-Act
xii.	SMS	Short Message Service
xiii.	SRHI	Self-Report Habit Index
xiv.	StDev	Standard deviation
xv.	TQM	Total quality management

GLOSSARY OF TERMS

i. **Affect** an expressed or observed emotional response

ii. **Field staff** Staff employed by organisation in various geographic areas that do not work within an office environment.

iii. **Initiative** Designed change programme following Lean Six Sigma methodology

iv. **Violations** Electronic measure of policy and procedure infringement, related to driving behaviour of field staff within scope of Lean Six Sigma project

v. **Zero-Harm culture** Name of strategic objective to target safety practices within organisation

1. Definition of the problem

1.1. Introduction

A fundamental dimension identified to ensure successful organisational change is human behaviour (Choi, 2011; Kotter & Cohen, 2002) and yet not many theories of intentional organisational change (Cummings & Worley, 2009) incorporate the construct in the context of organisational change.

Organisations' inability to achieve the intended results has given rise to studies that examine the contribution that employees make toward organisational change (Choi, 2011). Attitudinal constructs identified include (1) readiness for change, (2) openness to change, (3) commitment to change, and (4) cynicism about organisational change, and represent key variables in literature on organisational change. These are defined as the mental precursor to the behaviours towards change, either resistance or support. (Shin, Taylor, & Seo, 2012; Choi, 2011) The categories (or themes) all these attitudinal constructs centre around include (1) change content (Appendix 9.1), (2) change context (Appendix 9.2), change process (Appendix 9.3), and the individual level construct (Appendix 9.4) (Choi, 2011).

Literature from the 1990s on organisational change highlights similar themes or categories: (1) content issues, (2) contextual issues, (3) process issues and (4) criterion issues (Armenakis & Bedeian, 1999) which align closely to the themes highlighted by Choi (2011). The theme identified as criterion issues in the 1990s has been repositioned from affective and behavioural criteria (Armenakis & Bedeian, 1999) to the individual level construct (Choi, 2011), and specifically highlights the significance of the individual's role toward change.

A more granular view of the individual level construct, highlight numerous antecedents, which, Choi (2011) clusters into two areas; (1) General

attitudes in the workplace and (2) personality (states) (Appendix 9.4). The antecedents which recur across the constructs, potentially signifying a higher order of importance are (1) Change self-efficacy and (2) Job satisfaction (Choi, 2011).

Holt and Vardaman (2013) further emphasise that even when organisations and individuals have positive attitudes toward organisational change, without being mindful, routine or automatic behaviours will remain unchanged.

The habit routine was discovered by a team of scientists at Massachusetts Institute of Technology (MIT), and is principally a simple neurological loop; the core of every habit (Duhigg, 2012). The significance of this study is highlighted in the fact that one's brain actually stops participating in decision making (James, 2012; Sweeney, 2012; Lally et al., 2011) when performing repetitive activities (Becker, 2004).

Neal, Wood, and Quinn (2006) define habits as follows "...are response dispositions that are activated automatically by the context cues that co-occurred with responses during past performance" (Neal, Wood, & Quinn, 2006, p. 198). This definition highlights three components, namely, past behaviour or performance, response automaticity, and contextual cues.

This might explain why change initiatives are not successful. If the need for change is not recognised, the habit is not changed to foster the new behaviour. People will generally continue to do what they have always done simply because they are not actively engaged in the decision making process.

The extended period the organisational change community are plague with less than acceptable results, makes it paramount to take heed of the research into attitudinal and behavioural and combine it into a accepted change methodology to improve the success rate.

1.2. Motivation for the problem selection

No significant progress has been made in the field of organisational change theory, which concretely points to an approach that has consistently high levels of success in organisational change. Choi (2011) quotes two-thirds of change projects actually fail. Various sources of research cite there is evidence that up to 70% of change initiatives fail (Amis & Aïssaoui, 2013; Vakola, 2013; Shin et al., 2012; Beer & Nohria, 2000; Kotter, 1996).

Organisational change initiatives are operationalised through discrete development processes (Armenakis & Bedeian, 1999), including Lean Six Sigma[1] (LSS), Just-in-time (JIT), total quality management (TQM) and similar methodologies (Mousa, 2013). These technical change methodologies focus on the organisation and/or group level, despite the fact that organisational change involves the group and individual change processes (Rafferty, Jimmieson, & Armenakis, 2013; Vakola, 2013; Shin et al., 2012). Groups and more specifically, individuals need to learn new sets of behaviour (Holt & Vardaman, 2013; McNabb & Sepic, 1995).

In the Power of Habit: Why We Do What We Do in Life and Business written by Charles Duhigg (2012), scenarios are represented that explore how behaviour changed, and by implication new habits fostered (Prewitt, 2012).

Just Google 'organisational change success rate' and the extracts displayed are full of content citing failure. The low success rates of organisational change initiatives highlight the need to improve change methodologies. The focus on individual change processes and/or behaviour and therefore, by implication, habits should lead to a more comprehensive understanding of the role of the individual, in the context of organisational change.

[1] If readers are not familiar with the methodology, it would be useful to read the journal article by Mousa, A, (2013) from the International Journal of Scientific & Engineering Research, Volume 4, Issue 5.

1.3. What evidence verifies the identification of the problem?

Empirical studies suggest that individual readiness for change is an important driver of successful change. (Rafferty & Simons, 2006). Holt and Vardaman (2013) agree with both Gärtner (2013) and Gondo, Patterson, Palacios (2013), that the understanding of readiness for change can further be enhanced by obtaining an understanding of how the embedded routines and/or automatic behaviours can be identified.

Enhancing, mindful employee's support for organisational change is achieved by making employees more aware of pessimistic thinking patterns, they more likely to change them (Gärtner, 2013).

Therefore, gaining insight into automatic behaviours or habits makes it highly relevant and pertinent to look into the 3-part habit routine as a means to identify the embedded routines and/or automatic behaviours, and therefore by implication influence the success rate of organisational change in a positive way.

1.4. What is the relevance of the topic to business?

Organisations are facing significant challenges (Holt & Vardaman, 2013), and the ability to change in the business environment is necessary.

A summary of lessons learnt from the interviews done with over a 130 organisations essentially points to need to change people's behaviour (Kotter & Cohen, 2002). Lawson & Price (2003) reiterate supporting the thinking that organisations need to transform attitudes and behaviour changes by applying psychological breakthroughs. (Aiken & Keller, 2009).

Conventional change management is not achieving a consistent level of success (Beer & Nohria, 2000); companies need to focus on employees' mindsets and behaviour to be more successful. (Keller & Meaney, 2010)

According to Clark (2012) Prophet Analytics' research, the public- and private-sector productivity has declined. This low labour productivity is indicative that South African workers are destroying value, resulting in retrenchments by the company's concerned (Clark, 2012).

The significance of improving the success rate of organisational change has gained importance particularly from management researchers, but more notably, practitioners (Gondo et al., 2013). Change experts have expressed a greater interest in how organisations can achieve strategic change (Gondo et al., 2013).

This narrow review of business rationale included above highlights a consistent theme that the organisational change success levels need to be improved. Opinions offered suggests the need to integrate human behavioural concepts (Lawson & Price, 2003) with the current discrete methodologies to address organisational change (Aiken & Keller, 2009), to achieve outcomes that are more successful.

1.5. Purpose of the research paper

The objective of the research was to investigate if the 3-part habit routine (Duhigg, 2012; Prewitt, 2012) can be applied to planned organisational change initiatives that use discrete methodologies like Lean Six Sigma (LSS) to achieve outcomes that are more successful than change initiatives deployed only from a technical step-by-step approach.

Below Figure 1, a graphical representation of the antecedents aligned to the 3-part habit routine, as the framework for the study

The literature review (Chapter 2) furls the topic of organisational change, into the four main identified attitudinal constructs (Choi, 2011) and focusses on readiness for change. Further this, the four main categories of change are considered, and attention allied to the individual level construct (Appendix 9.4). The antecedents presented in the literature review done by Choi (2011) are aligned to the 3-part habit routine. A section on the history of organisational change is included before the more current research presented.

The 3-part habit routine identified as (1) cue or trigger, (2) a routine, and (3) a reward (James, 2012; Rice, 2012; Sweeney, 2012) focuses on the individual level.

The literature review on mindfulness makes the case to align the cue or trigger component of the 3-part habit routine (Becker, 2004), and similarly a simple argument offered on the alignment of job satisfaction to the reward component (Swanson, 2013).

The routine component of the 3-part habit routine is positioned as the technical change methodology. The chosen organisation utilise the LSS technical change methodology. Within the context of the categories of change, the methodology is constant and therefore in the design of the methodology mitigates variation relating to the process of change identified by Choi (2011).

Chapter 4 outlines the research methodology, which essentially attempts to mitigate the other change categories identified by Choi (2011) (1) content of change (Appendix 9.1) and (2) context of change (Appendix 9.2) within the ‘readiness for change’ construct.

The results of the data collection plan, for the three components of the 3-part habit routine as disclosed in chapter 5. Chapter 6 discussed the results, with concluding remarks following in chapter 7.

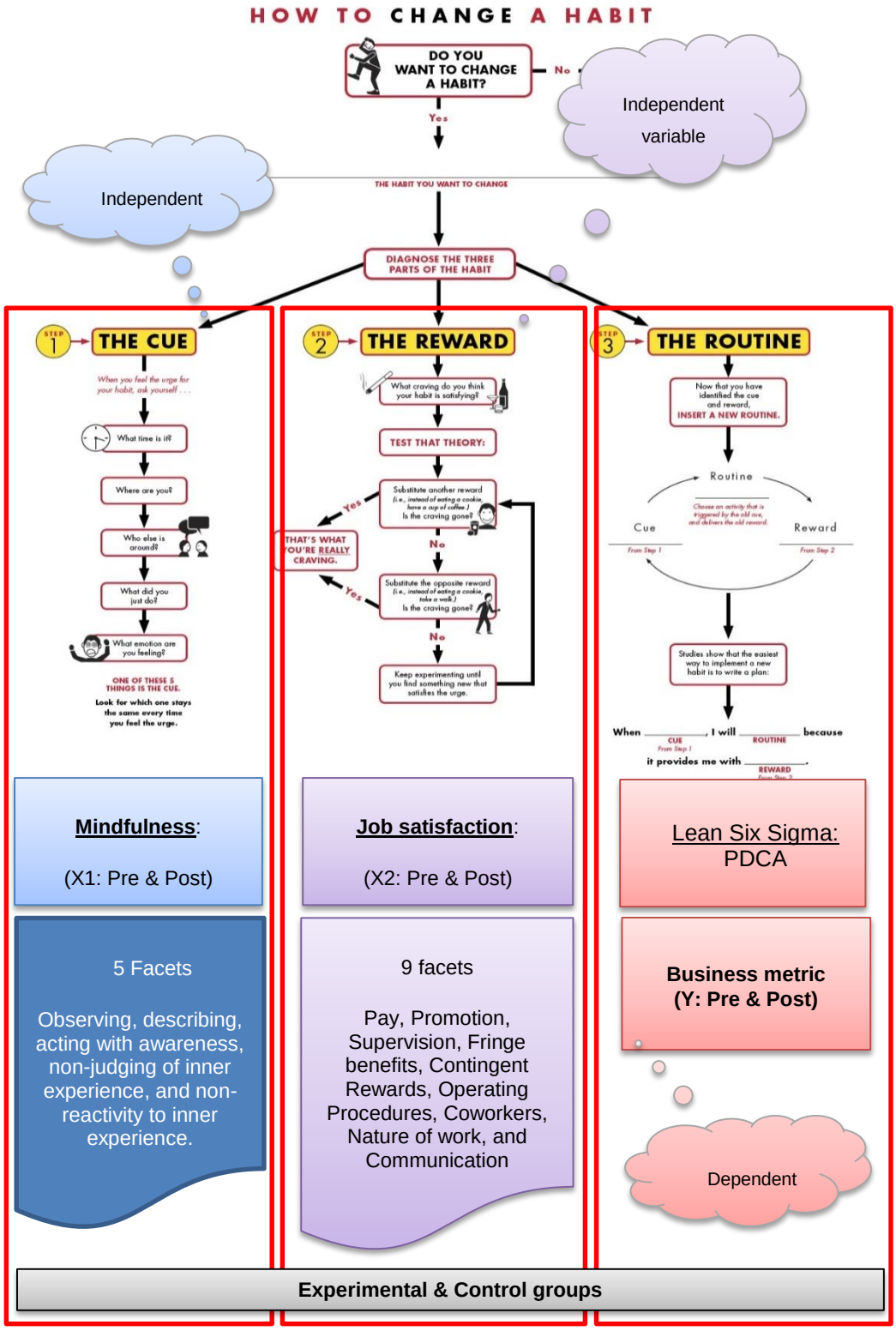


Figure 1: Graphical representation of research (Adapted from Power of Habit (Duhigg, 2012))

2. Theory and Literature review

Change in any circumstance, has been thwarted in some instances with inherent complexity influencing its success (Amis & Aïssaoui, 2013). The cultural, social, and political issues are continually investigated to shed light on the subject matter. Figure 2 provides an illustration of the process and context discussed in this chapter, starting with the history of organisational change, with subsequent focus on the individual level construct and narrowing to a discussion around the 3-part habit routine.

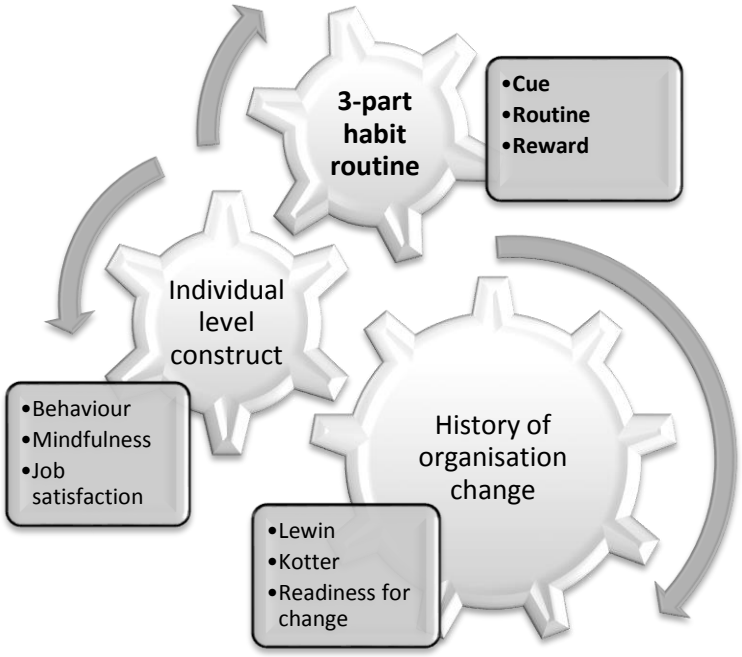


Figure 2: Graphical representation of literature review

2.1 History of organisational change

2.1.1 Lewin's change model

Armenakis and Bedeian (1999) very aptly highlight the roots of research on implementing change as a process, by referring to Lewin's model dating back to 1947.

Lewin's model is a three phase (1) unfreezing, (2) movement and (3) re-freezing approach to modification of those forces keeping a system's behaviour stable (Cummings & Worley, 2009). The forces are a particular set of behaviours that are working to either maintain the status

of the system or push for change. Lewin's approach to achieving the organisational change requires developing new behaviours and attitudes through changes to organisational structures and processes. Lewin specifically makes mention that habits of a person at a given time can and have to be considered as parts of the system (Lewin, 1943).
Lewin's model is a general framework for understanding organisational change, and has been further developed to provide a more detailed step-by-step approach to the organisational change process (Armenakis & Bedeian, 1999). However, most research within the context of change as a process has not focussed on behavioural and attitude changes.

Researchers today are still citing Lewin's idea that "the commitment that exerts the strongest influence is that which has the greatest psychological proximity" (Choi, 2011, p. 483).

2.1.2 . Kotter's 8 steps model

When reviewing organisational change, as seminal as Lewin, it would not be complete without considering the work of Kotter.

Kotter's eight-step process expands on Lewin's three-phase model (Cummings & Worley, 2009). The steps Kotter established are outlined as (1) establishing a sense of urgency, (2) creating a guiding coalition, (3) developing a vision and strategy, (4) communicating the change vision, (5) empowering broad-based action, (6) generating short-term wins, (7) consolidating gains and producing more change and finally (8) anchoring new approaches in the cultures (Kotter, 1996).

Kotter's 'broad-based action' step is described as getting rid of obstacles, changing systems or structures that undermine the change vision and finally encouraging risk taking and non-traditional ideas, activities and actions.

Similarly, ‘generating short-term wins’ outlines an approach to identify the plan to work towards achieving the short-term wins quickly and visibly recognising and rewarding people for the change. Duhigg (2012) provides evidence of the importance of small wins, and the powerful effect they have on fostering future achievements (Prewitt, 2012). Armenakis and Bedeian (1999) offered reinforcement of the concept that when considering affective reactions to change, the outcomes are more successful.

The two steps highlighted from the full systematic process, illustrates an approach to organisational change incorporating actions required, based on behavioural changes in an effort to create better performance.

2.1.3 Organisational change in the 1990s

This section is to establish the relevance of the research done in the 1990’s, with the content covered in the remaining sections (2.2) of the chapter. The focus on Armenakis and Bedeian (1999) is due to the publications emphasis on reviewing organisational change from a perspective of the dynamics underlying organisational change.

Their review of the theory and research relating to organisational change in the 1990’s highlight four research themes or common issues; (1) content issues, (2) contextual issues, (3) process issues, and finally (4) criterion issues (Armenakis & Bedeian, 1999).[2]

[2] The themes discussed from the full paper include some, not all the underlying dynamics in the paper. Interested parties, who would like a perspective of all the dynamics discussed, should read the article in the Journal of Management (Organisational change: A Review of Theory and Research in the 1990’s).

The focus of the content research theme is on the substance of contemporary organisational changes. The dynamics outlined attempt to define the factors that have both a positive and negative effect on change efforts. The studies reviewed included the Burke-Litwin that predicts individual and organisational performance, and deals with organisational conditions (causes) and the resultant effects. Noteworthy, this model requires new employee behaviours because of the external and internal environmental pressures (Armenakis & Bedeian, 1999).

Organisational structures, systems including policies and procedures, task requirements and individual skills or abilities and performance-incentive structures emerge among the factors explored that underpin an organisation's long-term relationship to it environment (Shin et al., 2012; Armenakis & Bedeian, 1999).

Contextual issues are forces or conditions existing in the organisation's external and internal environments (Armenakis & Bedeian, 1999).

Process issues deal with themes addressing the actions actually taken during the deployment of the intended change (Armenakis & Bedeian, 1999). The reviewed models and approaches include both Lewin and Kotter's step-by-step models. The emergence of the 'readiness for change' concept is included in Armenakis' model, underpinned by an operational mechanism, that a basic change message is conveyed (Armenakis & Bedeian, 1999).

The consensus that most models follow an on-going process reveals (1) context and content factors are as important as the plan or process and (2) the change process takes considerable time (Armenakis & Bedeian, 1999).

The final theme addressed relates to outcomes in organisational change. Affective and behavioural criteria are highlighted and assessed against organisational change efforts (Armenakis & Bedeian, 1999). A

compelling rationale for using commitment toward change emerges, as well as cynicism toward change. Factors emerging from the review include employees' faith in senior management, the history of failed change programmes and inadequate sharing of information about the intended change program (Armenakis & Bedeian, 1999). Strong influence is exerted on employee outcomes of commitment, motivation, and job satisfaction by cynicism toward change.

Finally, additional affective and behavioural factors emerging include employee stress levels and job satisfaction. Workplace demands impact employee stress levels (Shin et al., 2012), particularly in a climate of constant change.

The conclusions of the paper highlight various salient points related to content, context, procedural, and criterion issues. The most pertinent observation that points toward the contributions that individuals make toward change, is that more research is required to understand the behaviour and attitudinal reactions (Armenakis & Bedeian, 1999).

This research paper from the 1990's focusses on reviewing organisational change from a perspective of the dynamics underlying organisational change, and what is apparent is that the impact, which individuals have on change efforts and organisational change as a whole, is still not an isolated theme. Recognition that behavioural changes are required on the individual level is superficially highlighted (Armenakis & Bedeian, 1999).

2.2 The role of the individual : Individual level construct

Central to the theme of organisational change is individuals' behaviour. With the understanding that individuals make up the team, and ultimately the organisation, it is important to engage with individuals to gain that support and acceptance for change initiatives (Choi, 2011; Armenakis &

Bedeian, 1999). These views are iterated by Amis and Aïssaoui (2013) and shared by Armenakis, Harris and Mossholder, George & Jones, Greenhalgh, Robert, Macfarlane, Bate and Kyraikidou, Hall and Hord, Isabella and Lau & Woodman (as cited by Choi, 2011).

The impetus on employee support for organisational change has resulted in the identification of various attitudinal constructs: (1) readiness for change, (2) commitment for change, (3) openness to change, and (4) cynicism about organisational change. These four constructs represent different aspects of employees' attitudes towards organisational change. It is important to note that an absence of one attitude does not imply an absence in another (Choi, 2011).

Choi (2011) summarises the literature review findings of the four attitudinal constructs into additional categories or themes, including (1) change content, (2) change context, (3) change process, and (4) the individual level construct.[3] This dissemination of literature creates a four-by-four grid of constructs and themes.

The literature review into these core categories has resulted in a consensus of the antecedents that have an impact on each construct. Noteworthy is the overlap of antecedents across the core categories (Choi, 2011).

2.2.1 . Readiness for change construct

Empirical studies suggest that individual readiness for change is an important driver of successful change. (Rafferty & Simons, 2006).

Armenakis and Bedeian (1999), Holt and Vardaman (2013), both agree "readiness for change in the organizational context involves individual impressions about organisations' capacity to make a successful

[3] Appendixes 9.1– 9.4 provide a summarised view of the constructs by category

change, the extent to which the change is needed, and the benefits the organisation and members can gain from change" (Choi, 2011, p. 482; Rafferty & Simons, 2006, p. 326).

Readiness for change is created by influencing the beliefs, values, intentions and behaviour of individuals (Amis & Aïssaoui, 2013), which essentially translates into (1) belief that the organisation can change successfully and (2) the intention to exhibit behaviours that will support the change (Rafferty & Simons, 2006)

2.2.2 . Antecedents of readiness for change

The antecedents identified within the individual level construct split into a two-level conceptualisation model are; (1) general attitude in workplace and (2) personality (Choi, 2011)(Appendix 9.4). Further narrowing on the conceptual model into general attitudes in the workplace, Choi has classified the antecedents as (1) change self-efficacy, (2) perceived personal competence, (3) job satisfaction, and (4) organisational commitment.

This view has however been expanded by highlighting the importance of mindfulness. Mindfulness defined as "an acute and refined awareness of what is taking place in the present." (Holt & Vardaman, 2013, p. 14). Holt and Vardaman (2013) further emphasise that even when organisations and individuals are willing and able to change, without being mindful, routine or automatic behaviours will remain unchanged.

The resulting conceptualisation model of readiness for change can further be enhanced by obtaining an understanding of how the embedded routines and/or automatic behaviours can be identified (Holt & Vardaman, 2013). Lewin agrees that unlearning the embedded

routines and/or behaviours is difficult (as cited by Rafferty & Simons, 2006).

Limitations of this conceptualised model of antecedents to readiness for change is that it does not address affective components of change readiness. Theorists including Holt and Vardaman acknowledge that affect[4] is an important component of the readiness for change construct (Rafferty et al., 2013).

Armenakis and Bedeian (1999) suggest that the primary mechanism for creating readiness for change is a message about the change (Amis & Aïssaoui, 2013). Ziber (2007) suggests that management of meaning; influencing how other understand, frame, and make sense is essential to establishing new structures, practices, and behaviours.

2.3 3-Part habit routine

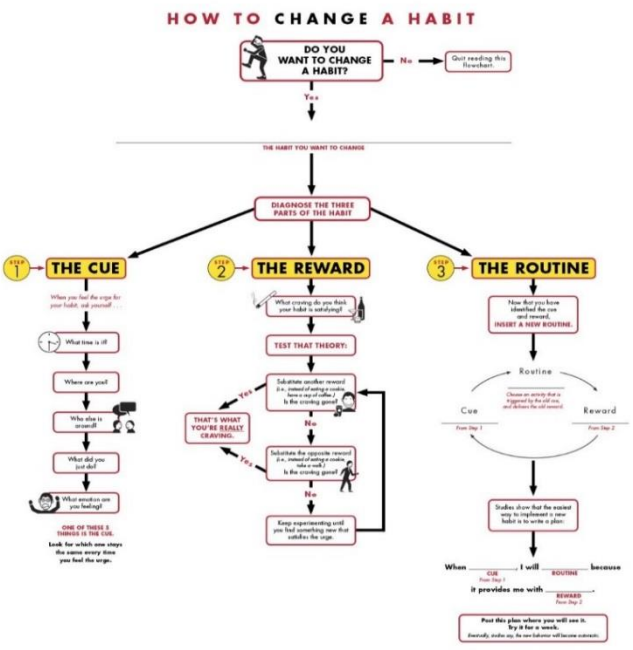


Figure 3: How to change a habit (Duhigg, 2013)

The 3-part habit routine discovered by a team of scientists at MIT is principally a simple neurological loop, the core of every habit (Duhigg, 2012).

The three parts identified are (1) cue or trigger, (2) a routine, and (3) a reward highlighted in Figure 3, indicating the steps required to change

[4] Affect referring to an expressed or observed emotional response.

a habit (James, 2012; Rice, 2012; Sweeney, 2012). Skinner experimented on rats in the late 1920s and 1930s and found that the right triggers or cues and reward motivated the rat to complete a boring task of negotiating a maze. (Duhigg, 2012; Rice, 2012; Lawson & Price, 2003).

The significance of this above study is highlighted by the fact that the brain actually stops participating in decision-making (James, 2012; Lally et al., 2011; Sweeney, 2012). This might explain why change initiatives are not successful. If the need for change is not recognised, and the habit not changed to foster the new behaviour, a person will continue to do what they have always done. Simply because one is not actively engaged in the decision making process.

2.3.1 . Cue/trigger component of 3-part habit routine

In Triandis's research it is evidenced that habits are actually activated outside of awareness by context cues (Neal, Wood, Labrecque, & Lally, 2012).

The cues are by either an actor-related trigger or external stimuli (Neal et al., 2012; Bargh, 1994). For instance, eating a meal does not require a decision on how to do so, but rather when and what you would like to eat as a meal. The need to eat either triggered by an actor-related trigger of hunger, or prompted by something external, like the smell of food. The literature expands this actor-related cue to infer that it is goal driven, and completed in pursuit of a reward (Neal et al., 2012).

A variety of contextual cue are explained, the most pertinent to the study being the specific time of day (Wood, Tam, & Witt, 2005).

2.3.1.1 Mindfulness

Holt and Vardaman (2013) emphasise that even when organisations and individuals have positive attitudes toward organisational change, without being mindful, routine or automatic behaviours will remain unchanged. Armenakis and Bedeian (1999) suggest that the primary mechanism for creating readiness for change is a message about change. A well-formulated message will ensure establishing new structures, practices and behaviours are achieved (Ziber, 2007).

2.3.1.2 Five Facet Mindfulness Questionnaire (FFMQ)

A new five factor measure created from the amalgamation of several mindfulness measures has been reviewed and appears to be the most inclusive assessment of mindfulness at present (Baer, Smith, Lykins, Button, Krietemeyer, & Sauer, 2008). The five facets are observing, describing, acting with awareness, non-judging of inner experience, and non-reactivity to inner experience (Association for Behavioral and Cognitive Therapies, 2008).

2.3.1 . Routine component of 3-part habit routine

If we really stopped and thought about what organisations do to conduct their business on a daily basis, it is a number of repetitive actions called organisational routines (Becker, 2004). Becker (2004) includes a definition of routines "…as behavioural patterns" (p664). These organisation routines performed by the employees, are completed collectively (Becker, 2004) within a group or departmental structure. If we consider the extent to which people participate in the decision making of the repetitive activities, it is done mindlessly (Becker, 2004), or as James (2012) explained, without making a decision and therefore by implication habitually (Sweeney, 2012).

"Habits are response dispositions that are activated automatically by the context cues that co-occurred with responses during past performance" (Neal, Wood, & Quinn, 2006, p. 198). This definition highlights three components: past behaviour or performance, response automaticity, and contextual cues. Conceptual and operational definitions of habit include the concept of automaticity.

Bargh (1994) elaborates by including the behavioural dimensions to include efficiency, lack of awareness, unintentionality, and/or uncontrollability.

There is however an alternative position, supported by empirical evidence that organisational routines are “not mindless but ‘effortful accomplishments’” (Becker, 2004, p. 648).

2.3.1.1 Lean six sigma (LSS)

Lean is an improvement approach that seeks to eliminate waste from the flow in the value stream, whereas Six Sigma is a statistical methodology that relies on a robust framework (DMAIC) to reduce variation. The combination of both approaches provides an improvement strategy that incorporates data-driven tools to solve and create rapid improvements at lower cost (Mousa, 2013) called Lean six sigma (LSS).

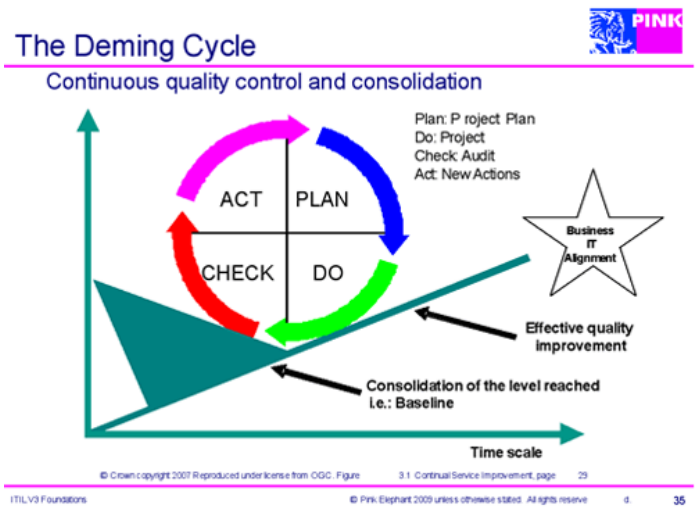


Figure 4: The deming cycle (Sparkling, 2010)

The quicker approach aligned to the LSS change

methodology is the Deming cycle, or Plan-Do-Check-Act (PDCA) as illustrated in Figure 4.

To fully scope and implement the robust DMAIC framework traditionally takes more time, and therefore the PDCA is a more appropriate procedure considering the time constraints.

The first phase in the model covers planning, which is linked to the LSS define, measure and analyse steps (DMA as part of the DMAIC abbreviation). The plan phase includes establishing a view of the existing situation or status quo of what is happening in the organisation. The extent of the investigation can be focussed onto a small process, team, or on a larger scale, a department. The complexity of the underlying process has an impact on the time horizon that this process will take. Determining relevant team members to assist with the project work from the organisation is important. Ensure an inherent business knowledge is present in team discussions, and their involvement in the process empowers them with the contributing toward the decisions. Once determined, the investigation into the area of interest includes obtaining the relevant data, reviewing processes, and analysing the data to address the problem identified (Mousa, 2013).

The next step in the deming cycle is to ‘do’. This practically means implement the action steps identified from the data analysis. Subsequent steps are to review the results of the actions taken, and revisit to determine additional actions to improve the process.

2.3.2 . Reward component of 3-part habit routine

2.3.2.1 Job satisfaction

Job satisfaction is highlighted across the antecedents of change in both readiness for change and commitment to change (Choi, 2011). A body of literature suggests job satisfaction is a measure of an intrinsic reward (Swanson, 2013), and therefore aligned to the reward-part of the 3-part habit routine. This will be measured using a job satisfaction assessment tool.

2.3.2.2 Job satisfaction survey (JSS)

The chosen job satisfaction survey (JSS) measures 9 facets, including pay, promotion, supervision, fringe benefits, contingent rewards, operating procedures, coworkers, nature of work, and communication (Spector, 2012).

“The Job Satisfaction Survey, JSS is a 36 item, nine facet scale to assess employee attitudes about the job and aspects of the job. Each facet is assessed with four items, and a total score is computed from all items. A summated rating scale format is used, with six choices per item ranging from "strongly disagree" to "strongly agree". Items are written in both directions, so about half must be reverse scored. …. Although the JSS was originally developed for use in human service organizations, it is applicable to all organizations.” (Spector, 2012, p. 4)

2.4 Conclusion

The literature review above walks through the history of organisational change highlighting the complexity of the field of study. A compelling rationale is put forward to consider all attitudinal constructs, particularly if success in an intended change programme is the desired outcome. At the root of this, behaviour and attitude changes are required by the “parts of the system” (Lewin, 1943, p. 304), the individuals (Amis & Aïssaoui, 2013; Shin et al., 2012; Choi, 2011; Rafferty & Simons, 2006; Armenakis & Bedeian, 1999; Kotter, 1996).

Empirical studies suggest that individual readiness for change is an important driver of successful change (Rafferty & Simons, 2006). What exerts a positive influence and what the underlying mechanism is to achieve that success, is the next consideration. The antecedent identified to measure this behavioural change, mindfulness (Holt & Vardaman, 2013) is mechanised with contextual cues (Neal D. T., Wood, Labrecque, & Lally, 2012) as part of the 3-part habit routine. This cue puts the 3-part habit routine in motion resulting in behavioural response changes (Neal D. T., Wood, Labrecque, & Lally, 2012; Neal, Wood, & Quinn, 2006).

3. Integration of theory and literature; research question(s)

The objective of the research was to investigate if the 3-part habit routine can be applied to planned organisational change initiatives that use discrete methodologies like Lean Six Sigma (LSS) to achieve outcomes that are more successful than change initiatives deployed only from a technical approach.

3.1 Hypotheses

3.1.1 Cue component of 3-part habit routine

The attitudinal construct of readiness for change improves with a message about change (Armenakis & Bedeian, 1999) and habits are triggered with context cues (Neal D. T., Wood, Labrecque, & Lally, 2012). Holt and Vardaman (2013) provide evidence that even with positive attitudes towards change without being mindful; the automatic behaviours will remain unchanged. The hypothesis tests the validity of providing context cue at specific times to participants, to increase mindfulness.

H1: Contextual cues combined with the project communication related to the intended change initiative increase the mindfulness measure of the participants.

- Variable: Mindfulness.
- Measurement tool: Mindfulness Assessment Tool (FFMQ).

3.2 Routine component of 3-part habit routine

Applying the broadly accepted change process of LSS (Mousa, 2013) to effect behavioural changes to the organisational routine (Becker, 2004; Lewin, 1943) by eliminating obstacles (Kotter, 1996) is paramount in change programmes. Particularly when the success rates of change

programmes are reportedly, below expectation (Amis & Aïssaoui, 2013; Vakola, 2013; Beer & Nohria, 2000; Kotter, 1996).

H2: Applying the components of the 3-part habit routine to a technical change methodology is more successful (than change initiatives deployed only using a technical approach).

- Variable: Business metric (Violations).
- Technical change methodology: LSS PDCA methodology.

3.3 Reward component of 3-part habit routine

Habits are repeated responses to contextual cues (Neal, Wood, & Quinn, 2006) in pursuit of a reward (Neal D. T., Wood, Labrecque, & Lally, 2012). Swanson (2013) suggests it is an intrinsic measure of job satisfaction that covers various aspects including operating procedures, nature of work, and communication. The hypothesis tests the validity of providing context cue at specific times to participants, to increase mindfulness with a subsequent consequence of increasing job satisfaction.

H3 Contextual cues and communication about the change initiative to participants have the subsequent consequence of increasing job satisfaction.

- Variable: Job satisfaction.
- Measurement tool: JSS assessment tool (JSS).

3.4 Dimensional hypotheses

Additional dimensions added to each hypothesis to deal with context, content, and process issues (Choi, 2011; Armenakis & Bedeian, 1999)will be included for each main hypothesis highlighted above.

As discussed in the literature review, with specific reference to process issues highlighted from Armenakis and Bedeian (1999) time is a factor that has an impact on the results from any change initiative, regardless of which model or methodology used to implement the change. Similarly, time taken practicing new behaviours affects habits. The significant variation in the asymptote of automaticity adds the complexity of time (Lally, Van Jaarsveld, Potts, & Wardle, 2010). Additional dimensions added to the study, with corresponding hypotheses to address these as discussed below.

Dimension 1 (D1)

- Post-survey measurements increase after a period of time (with messaging)

Dimension 2 (D2)

- Post-survey measurement increase after a time horizon utilising a standard technical change methodology.

Dimension 3 (D3)

- Measures the status or climate of the internal environment; the status quo under normal operating conditions

A summary of the hypotheses to be tested are included in Table 1.

Table 1: Summary of hypothesis test for 3-part habit routine components

Habit part (Testing instrument)	**Cue (FFMQ)**	**Routine (LSS PDCA)**	**Reward (JSS)**
Main hypothesis	Mindfulness measure increases with messaging [H1]	Violations decrease with messaging [H2]	Job satisfaction increases with messaging [H3]
Dimension 1 (Time aspect) [D1]	Post Mindfulness measure with messaging greater than Pre- measure	Post Violation measure with messaging smaller than Pre- measure	Post Job satisfaction measure with messaging greater than Pre- measure
Dimension 2 (Methodology) [D2]	Post Mindfulness measure with no messaging greater than Pre- measure	Post Violation measure with no messaging smaller than Pre- measure	Post Job satisfaction measure with no messaging greater than Pre- measure
Dimension 3 (Control) [D3]	Mindfulness measure will not change over period	Violations will not change over period	Job satisfaction measure will not change over period

4. Research methodology and design

The decisions applied to the research methodology are discussed below. Reasoning for these are outlined in depth following the layers highlighted in the research onion from Saunders and Lewis (2012).

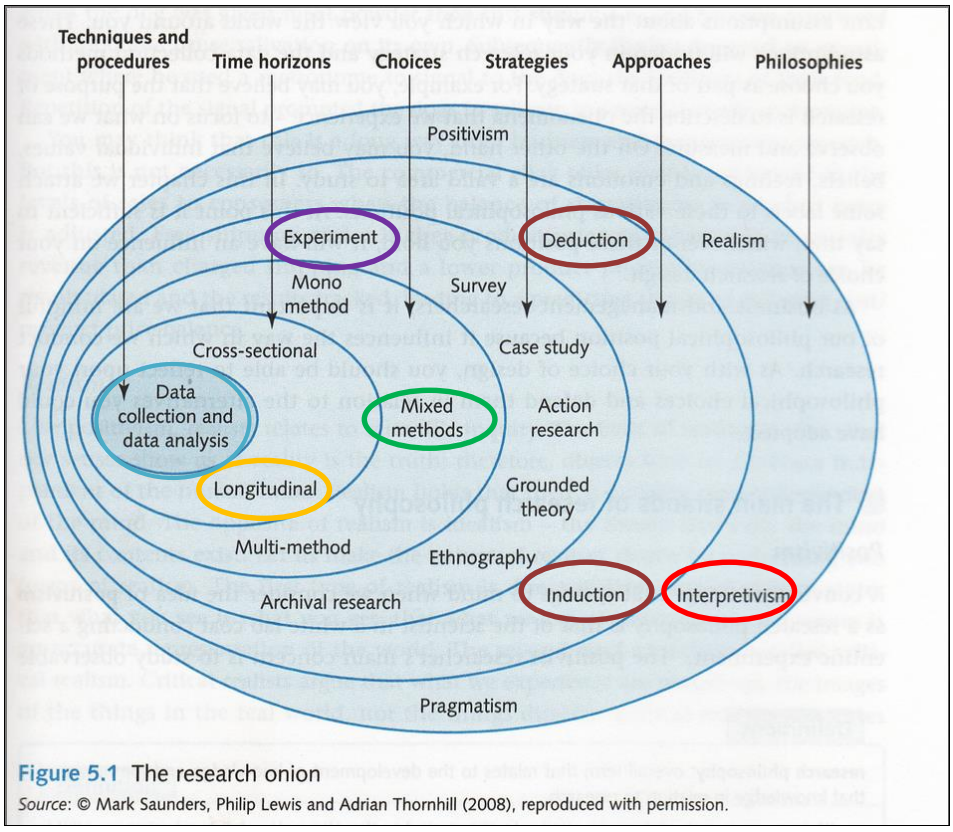


Figure 5: The research onion (Saunders & Lewis, 2012)

4.1. Philosophy

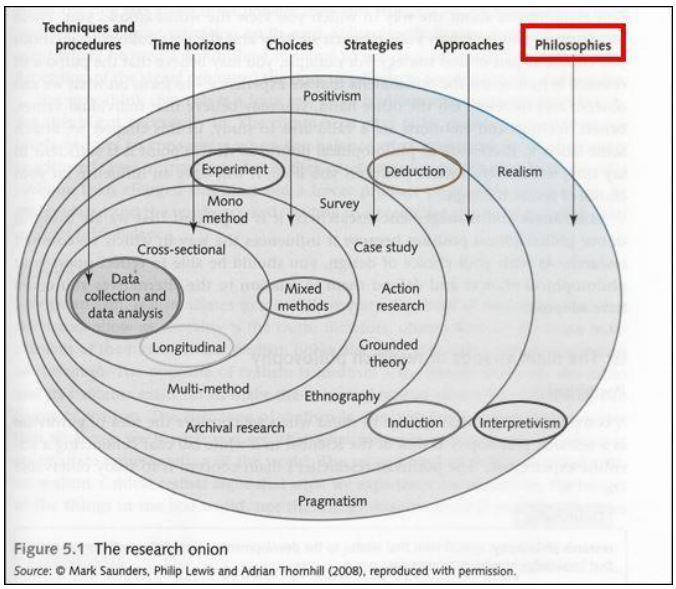


Figure 6 : Philosophy highlight on the research onion

Saunders et al define realism as "a research philosophy which stresses that objects exist independently of our knowledge of their existence." (Saunders & Lewis, 2012, p. 105). To this end, the fact that one automatically perform tasks without thinking about them (i.e. driving), because they have become habits and are performed without any conscious thought (Lally et al., 2011) indicates that a realism philosophy is appropriate. This however was not the only consideration when deciding on the appropriate research methodology.

Organisational complexity compounded the decision criteria to consider, related to the correct philosophy for the research. The concern with organisational complexity in the realist perspective points toward interpretivism. Interpretivism advocates the need to understand differences between humans/individuals in their role as social actors (Saunders & Lewis, 2012).

Schwandt defines interpretivism as "the term denotes those approaches to studying social life that accord a central place to Verstehen as a method of the human sciences, that assume that the meaning of human action is inherent in that action, and that the task of the inquirer is to unearth that meaning." (pp. 161-162). Mathison (2005) evaluates interpretivism as "contextualized meaning involving a belief that reality is socially constructed, filled with multiple meanings and interpretations, and that

emotions are involved. As a result, interpretivists see the goal of theorizing as providing an understanding of direct lived experience instead of abstract generalizations." (pp. 210-211).

The complexity of a changing operating environment and interpretation of the stimulus to each individual dictates a philosophy, which will compensate for the complexity. Added to this complexity, the research was conducted in the field, and viewed as 'a 'direct lived experience' (Mathison, 2005) making it appropriate to apply an interpretivism philosophy.

4.2. Approach

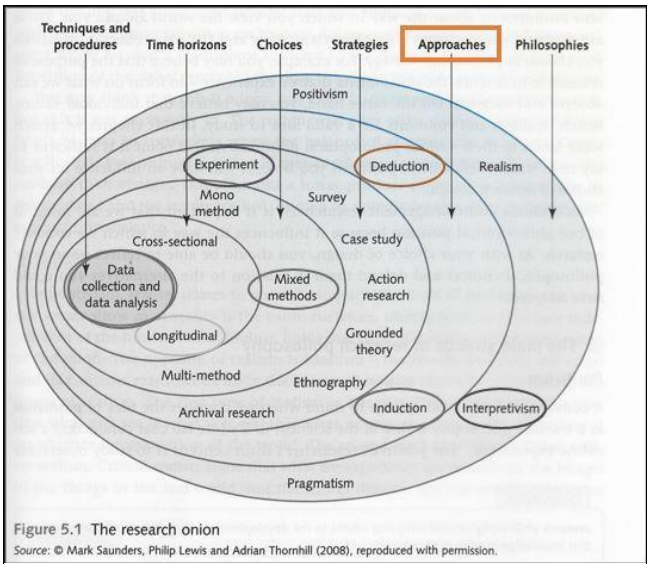


Figure 7: Approach highlight on the research onion

An explanatory study focusses on a situation or problem in order to explain the relationships between variables (Saunders & Lewis, 2012).

The study isolated the antecedents to the individual level construct of change identified in the literature; mindfulness and job satisfaction (Choi, 2011).

The intent of the research was to conduct an explanatory study to tentatively arrive at a theory inductively before testing the theory in a deductive piece of quantitative work.

At the onset of the proposed methodology, it was unclear if the proposed study would have a positive impact on the mindfulness measure. Similarly, there was no conclusive evidence to substantiate if the effects of the proposed study would have an impact on the job satisfaction measures.

The proposed data collection plan was executed to test the hypotheses to arrive at the results as discussed in Chapter 6.

4.3. Strategy: type of study

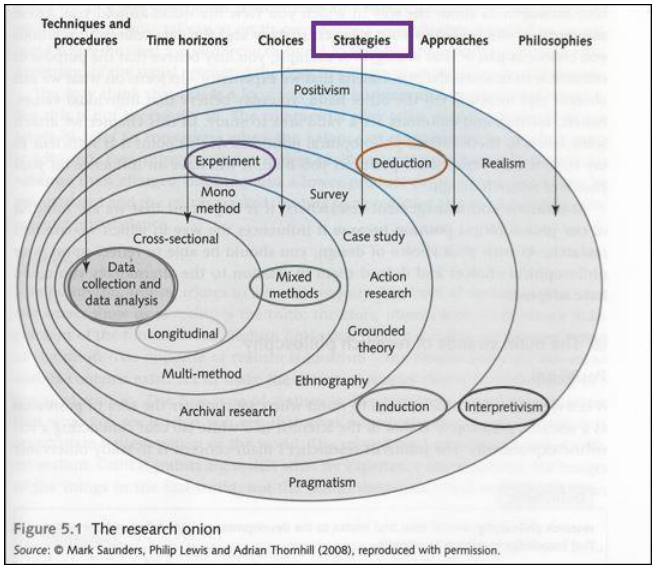


Figure 8: Strategy highlight on the research onion

The importance of the chosen strategy should aid in answering the particular research question(s) posed and meet the research objectives (Saunders & Lewis, 2012).

An experiment is intended to study causal links between variables, to establish whether a change in one independent variable produces a change in another dependent variable (Saunders & Lewis, 2012). Causal links are very difficult to establish, so the experiment was designed to facilitate the study of potential relationships between variables.

The variables identified as follows:-

X1 = Mindfulness which includes the subset of five facets outlined in the mindfulness assessment tool; observing, describing, acting with awareness, non-judging of inner experience, and non-reactivity to inner experience (Baer, et al., 2008).

X2 = Job satisfaction includes the nine facets outlined in the job satisfaction survey; pay, promotion, supervision, fringe benefits, contingent rewards, operating procedures, coworkers, nature of work, and communication (Spector P. E., 1997)

Figure 9 illustrates the data collection plan, dividing the operational field staff into three groups. Two control groups across two distinct geographical areas and the third the experimental group. The measurements undertaken using tested measuring instruments for each group included the mindfulness questionnaire aligned to the mindfulness variable, and a job satisfaction survey providing a measure of job satisfaction.

Further decisions including population, sampling procedure, size, and nature of sample, relating to the graphical representation are disclosed in subsequent sections within this chapter.

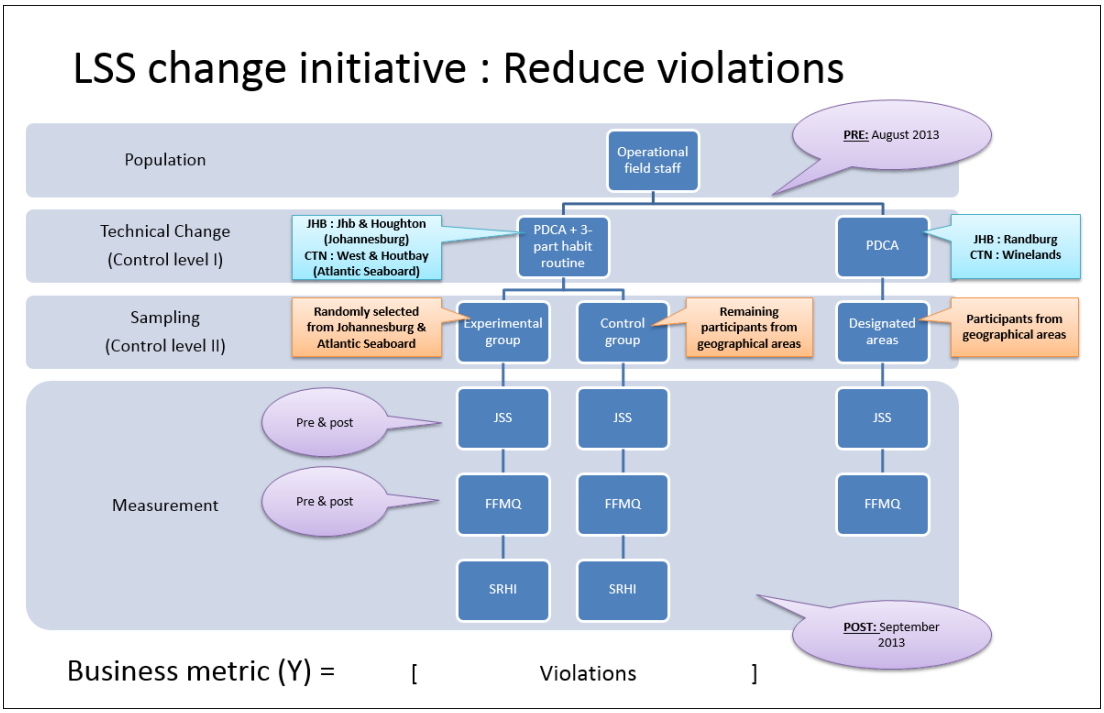


Figure 9: Graphical representation of data collection plan

Saunders, Lewis (2012) highlights the following components of an experimental design:-

- Manipulate the independent variable.
    - The mindfulness variable was influenced through contextual cues, with the intended result to increase the mindfulness measure across the experimental group.

- Contextual cues took the form of sms messages delivered to the target population of the experimental group, at specific times. On reviewing business practices, the estimated best time to deliver the contextual cues, would be at approximately the time at which the participants arrived at work to start their shift. Shifts were 12-hours and changes occurred at 6:30 and 18:30. The pre-determined delivery time was impacted by more significant business activities. Depending on operating conditions, which included high levels of activity and short staff levels, contextual cues were delayed or not sent at the pre-determined time. The message content was in line with communicating the need to be more safety conscious, with the aim to create an awareness of behaviours that arise in infringements measured and classified as violations. A full list of contextual cues delivered via sms is included in Appendix 9.7. Consistent delivery of contextual cues to all participants was ensured by setting up groups on the operating system across the two geographical areas.

- The control groups did not receive the same contextual cues to influence the mindfulness measure.

- Job satisfaction, positioned as the reward part of the 3-part habit routine, was treated as an intrinsic measure (Swanson, 2013), and therefore not implicitly manipulated.

- Control the experiment by holding all the variables constant, except the dependent variable.

    - This was ensured by performing the assessments for both mindfulness and job satisfaction prior to the LSS change initiative was implemented, across the target population. The

target population was split into two groups, which covered the way in which the technical change would be implemented, namely the (1) LSS initiative to reducing violations and the (2) LSS initiative to reduce violations with the contextual cues.

- Observe the effect of the manipulation on the independent variable on the dependent variable.
    - The LSS PDCA change initiative was conducted over a 20-day time horizon, with an identical measure taken for the preceding 20 days to establish a baseline or pre-initiative measurement.
- Predict the events that will occur in the experimental setting.
    - The hypotheses outlined all the relationships tested.

4.4. Choice

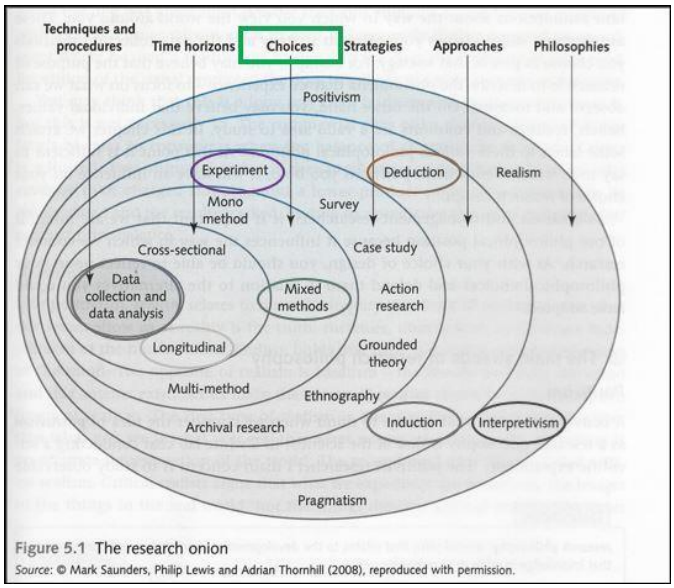


Figure 10: Choices highlight on the research onion

The pre-initiative surveys were collected via hard copy, because the participants involved did not have access to an electronic means to capture their responses. The pre-printed surveys were presented to the participants by their supervisors after their shifts were completed. The opportunity to participate in the pre-initiative surveys was open for a period of 5 days during August 2013. The communication to the

supervisors was simply to collect the completed forms from the participants and co-ordinate the collection and forwarding to their area managers.

The completed questionnaires were subsequently captured on an electronic survey tool (Survey Monkey) to create an electronic record that enabled the data analysis that was required.

Communication about the LSS initiative was distributed to all executives and senior managers, ensuring everyone was aware of the intended change and the intent.

A smaller operational team was formed to discuss implementation and actions required to correct the root causes of the problems relating to the infringements being recorded as violations.

The subsequent data analysis was completed using a statistical software tool, Minitab ®. Scoring information for all the questionnaires was applied in accordance with the assessment tool's guidelines, ensuring the findings were really, what they appear to be about (Saunders & Lewis, 2012).

4.5. Time horizon

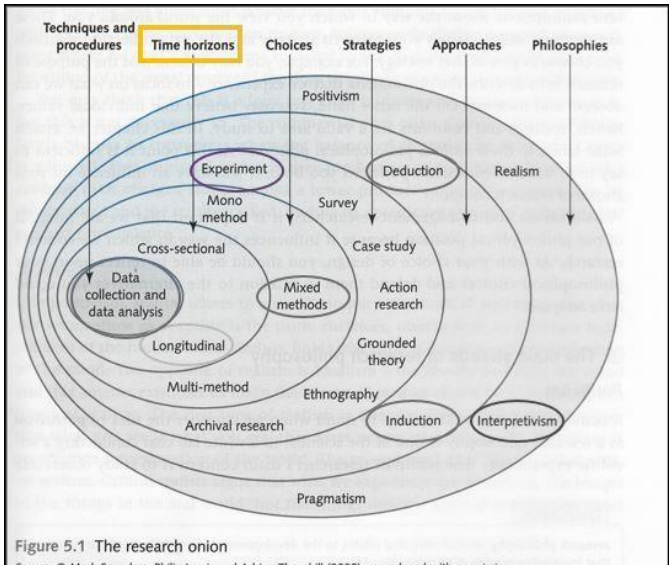


Figure 11: Time horizon highlight on the research onion

Available literature on the question of how long it takes a habit to form is not conclusive.

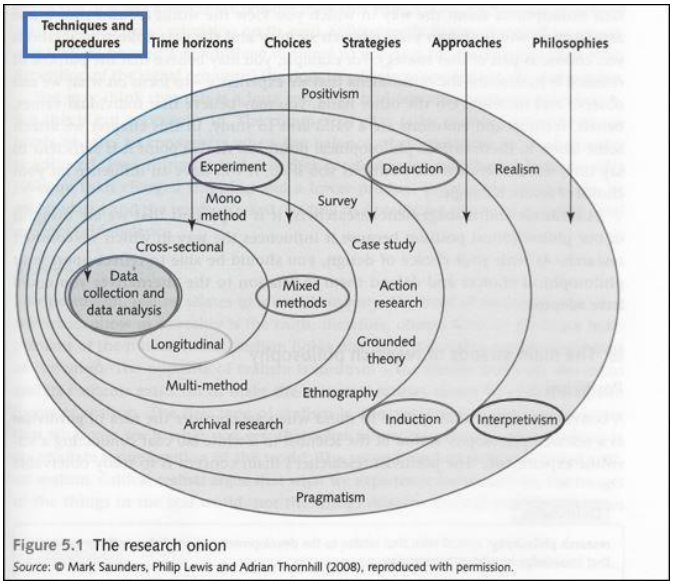
Lally et al. (2010) claim that the asymptote of automaticity ranges between 18 and 254 days. In another study using the Self-Report

Habit Index (SRHI) the measures were taken 1 week apart.

The significant variation highlighted the challenge in determining the correct time horizon to have run the study. In additional, the time constraints of completing the research paper added more pressure in determining an appropriate time horizon.

A decision was made to conduct the data collection for the LSS PDCA component of the research over a period of 20 days.

4.6. Technique and procedure



The study applied to a standard change initiative within the organisation. The accepted technical change approach adopted within the organisation was utilised: Lean Six Sigma (LSS).

Figure 12: Technique and procedures highlight on research onion

4.6.1. LSS - PDCA: Business Case

The intended change initiative following the LSS PDCA methodology was to look at ways to reduce the infringements recorded as violations in the daily operations of the department, to support the strategic objective of driving the zero-harm (safety) culture.

The proposed plan was to establish the baseline or pre-measure for all violations, within the four chosen geographic areas and focus the improvement on these areas that could reduce the infringements.

4.6.2. Target population

The field staff within a specified operations department in a South African services organisation is the target population or universe. The scoped department included field staff that drive vehicles in the performance of their core duties.

The study tested the hypothesis that the 3-part habit routine can improve the success ratio of change initiatives when positioned next to the adopted technical change approach, and not, test the effectiveness of the technical change approach used.

To effect the necessary change, the LSS PDCA approach was positioned as the routine part of the 3-part habit routine. The change initiative was scoped to change behaviours of individuals in performing the prescribed organisational routine. The measurement of the outcome of the change initiative was measured consistently across the two groups of participants; the control and experimental groups.

The operational footprint of the four geographical areas are serviced by 140 vehicles, which would form the basis of the data collection plan. The quantitative study was conducted using data extracted from a fully utilised business operating system used for daily operational decision making for the identified 98 vehicles. The vehicles are operational on a daily basis, and are driven by as many as three individuals within a seven day cycle.

4.6.3. Sampling procedure

A complete list of the population was available (Saunders & Lewis, 2012) which made a probability sampling technique appropriate for the study.

The department included in the LSS initiative to reduce violations operate in various geographic locations across South Africa. The choice of geographical areas to include discussed by the LSS PDCA initiative team covered the following two considerations. The geographical areas had to be (1) different, and (2) be large enough to meet sample size considerations. The resultant decisions were to include areas from both Gauteng and the Western Cape, which included the geographical areas as highlighted in Figure 9 and summarised in Table 2.

Table 2: Geographical areas

Methodology	**Gauteng**	**Western Cape**
PDCA (Control)	Randburg 38 vehicles	Winelands 38 vehicles
PDCA + Messaging (Experiment)	Johannesburg = Johannesburg + Houghton 34 vehicles	Atlantic Seaboard = West + Houtbay 30 vehicles

The process to randomly select the participants that would actually receive the contextual cues within the designated geographical areas; Johannesburg and Atlantic Seaboard was done using Minitab's random function. The full list of participants was captured in the tool, and the random functionality used to select the required number of participants. The decision was made to split the full list of participants in half to

determine the number of participants that would receive the contextual cues over the pre-determined time horizon. Therefore, a typical purposive sampling technique was applied. The cluster of participants were illustrative and considered to be representative, albeit not statistically (Saunders & Lewis, 2012).

4.6.4. Size and nature of the sample

Included in Table 3 are the responses tabulated for the various assessment tools used to collect the data for the study.

Table 3: Participant response rates

Response rates across measuring instruments

Region	Tool	No. of vehicles	Min. employee count	Pre-survey response	Pre-response rate	Post-survey response	Post-response rate
Atlantic Seaboard	FFMQ	30	60	40	67%	44	73%
Johannesburg	FFMQ	34	68	41	60%	39	57%
Winelands	FFMQ	38	76	50	66%	20	26%
Randburg	FFMQ	38	76	40	53%	73	96%
OVERALL		**140**	**280**	**171**	**61%**	**176**	**63%**
Atlantic Seaboard	JSS	30	60	38	63%	32	53%
Johannesburg	JSS	34	68	39	57%	44	65%
Winelands	JSS	38	76	42	55%	66	87%
Randburg	JSS	38	76	55	72%	19	25%
OVERALL		**140**	**280**	**174**	**62%**	**161**	**58%**

4.7 Data validity and reliability

The FFMQ and JSS assessment tools were selected because it is generally applicable and has been tested for reliability and validity.

A potential risk highlighted prior to the research plan was the language used in the assessment tools. The surveys distributed to a small pilot group of potential participants to solicit feedback on understanding rendered no meaningful feedback to prompt amendments. The preparation work to

ensure a high level of understanding did not mitigate language challenges effectively, and is evidenced in the results.

5. Results

The subsequent chapter covers the results from the data collection plan implemented, presented in sequence to address the 3-part habit routine alignment. Context established separately for each component, which is in some cases appears re-iterative.

5.1 Cue component of 3-part habit routine

The results from the mindfulness questionnaire were analysed to establish if the mindfulness score improved over the designated time horizons, classified as pre- and post-survey. Figure 13 highlights the mindfulness variable alignment to the cue part of the 3-part habit routine.

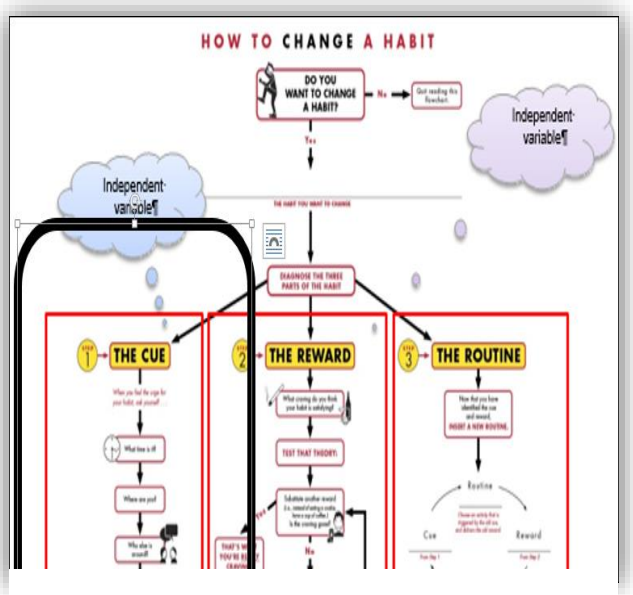


Figure 13: Cue-part highlight of 3-part routine

The quantitative study conducted used the tested Five Facet Mindfulness Questionnaire (FFMQ) as discussed in section 2.3.1.2.

5.1.1. Full response data set details

The full response data points obtained from the participants across four geographical areas. The three hundred and forty seven (n=347) responses were received for both pre- and post-surveys. The questionnaires forming the pre-survey results were applied before the 20-day LSS initiative and the post-survey for a shorter period after the

20-day LSS initiative. Anonymity was retained over the two time horizons, and therefore no individual response could be paired.

Table 4: All FFMQ response data descriptive statistics

Survey	Area	Msg?	Mean	StDev	Variance	Median	SSQ	Skewness	Kurtosis	Count
Pre	Atlantic Seaboard	0	120,825	10,573	111,789	120	588 307	0,825	1,103	40
Post	Atlantic Seaboard	0	119,538	16,210	262,769	112	188 916	1,040	0,755	13
Post	Atlantic Seaboard	1	112,452	5,202	27,056	111	392 818	2,406	9,216	31
Pre	Johannesburg	0	130,341	12,631	159,530	128	702 926	0,270	-0,549	41
Post	Johannesburg	0	121,471	13,370	178,765	119	253 697	0,668	0,079	17
Post	Johannesburg	1	124,455	13,369	178,736	118	344 510	0,243	-1,747	22
Pre	Randburg	0	129,300	14,499	210,215	125,5	676 938	0,924	0,715	40
Post	Randburg	0	127,548	15,696	246,362	125	1 205 337	0,584	-0,262	73
Pre	Winelands	0	129,660	13,376	178,923	128,5	849 353	0,754	0,736	50
Post	Winelands	0	128,900	18,459	340,726	122,5	338 778	0,656	-0,881	20
		TOTAL	**125,545**	**14,461**	**209,110**	**123**	**5 541 580**	**0,734**	**0,046**	**347**

Special cause variation was investigated on the geographical level. Consistency checks included normality, stability, reliability and looking at Cronbach alpha scores across the facets identified in the FFMQ assessment tool.

5.1.2. Statistically adjusted response data details

Details of the different steps followed for each geographical area presented below. A sequential process was followed using the statistical output of each iteration of the Cronbach alpha results to establish if the score was within the acceptable range (0,65 – 0,90). Each composite score was re-iteratively tested to achieve the resultant data set, following the omitted item statistics.

5.1.2.1 Atlantic Seaboard geographical area

The first test performed on the full response data set, was to establish normality and investigate any special cause variation. This resulted in two responses being eliminated, reducing the responses to n=82. Unable to investigate the cause of the variation with the respondent, responses eliminated on the side of prudence.

The iterations of item analysis led to only eliminating questions impacting the 'observe', 'describe', and the 'nonjudge' facets highlighted in FFMQ. The resultant scores across the facets are included in Table 5, most are within the acceptable range of 0,60 - 0,90 with exception to 'nonjudge' which is noted as a poor measure of internal consistency. The level of understanding by the respondents from the language presented in the surveys used, mitigated with a small pilot group, did not assist in this instance. The result is a poor level of internal consistency, however retained for completeness.

Table 5: Cronbach alpha scores (Atlantic Seaboard FFMQ)

Atlantic Seaboard: Cronbach Alpha resultant scores across facets			
Facets	**1st test run**	**Omitted item**	**Resultant score**
Observe	0,6396	Q11	0,6744
Describe	0,4414	Q2, Q12, Q16, Q22, Q32, Q37	0,6352
Nonjudge	0,4917	Q17, Q25	0,5535
Act with awareness	0,7585		0,7585
Nonreact	0,6865		0,6865

The small sample size for the post-survey responses is noteworthy in Table 6, which represents the group of the statistically adjusted data set for the Atlantic Seaboard geographical area where messaging was not included in the implementation.

Table 6: Statistically adjusted data set (Atlantic Seaboard FFMQ)

Atlantic Seaboard: Descriptive statistics of statistically scrubbed data set								
Survey	**Mean**	**StDev**	**Variance**	**Median**	**SSQ**	**Skewness**	**Kurtosis**	**Count**
Pre (0)	86,667	8,901	79,228	86,0	295 944	0,039	0,421	39
Post (0)	85,154	12,335	152,141	81,0	96 091	0,897	0,155	13
Post (1)	80,500	4,747	22,534	81,0	195 061	0,177	-0,365	30
Total FFMQ	**84,171**	**8,713**	**75,921**	**83,0**	**587 096**	**0,736**	**0,857**	**82**

Following the hypothesis testing roadmap (Appendix 9.8), the first test performed was to ascertain normality. The data set p-value = 0,029 (Figure 14) indicating that the data set is not normally distributed.

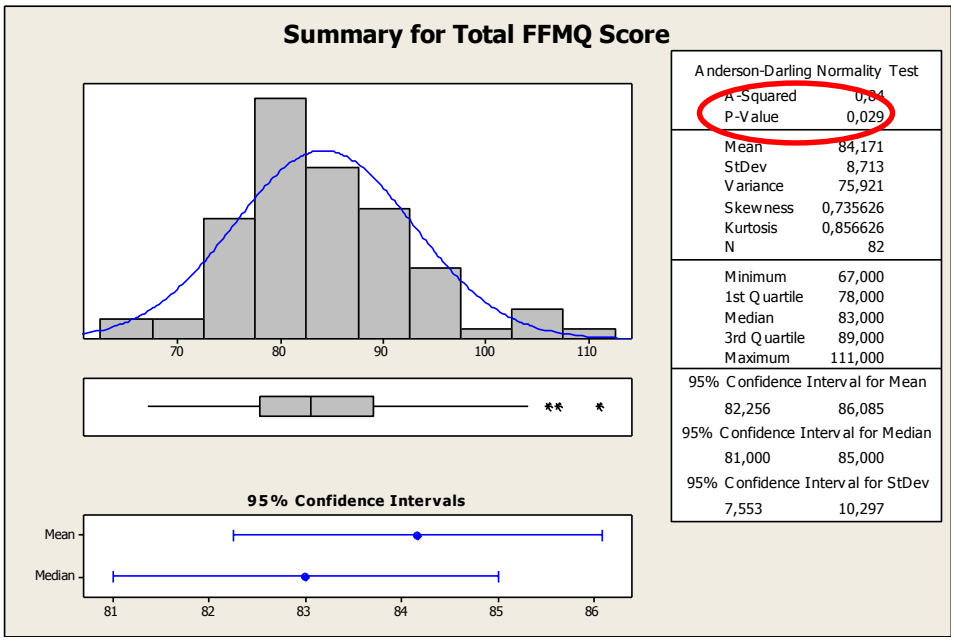


Figure 14: Normality (Atlantic Seaboard FFMQ)

The next consideration on the hypothesis testing roadmap (Appendix 9.8) is the level of interest. The three data sets mean the roadmap is followed to the level of consideration >2, which made it appropriate to run the test for equal variances. Based on the results of the normality test Figure 14 the Levene's Test result was utilised to determine the appropriate hypothesis test to perform.

The low p-value displayed in the Test in Figure 15 is indicative that the variances are equal.

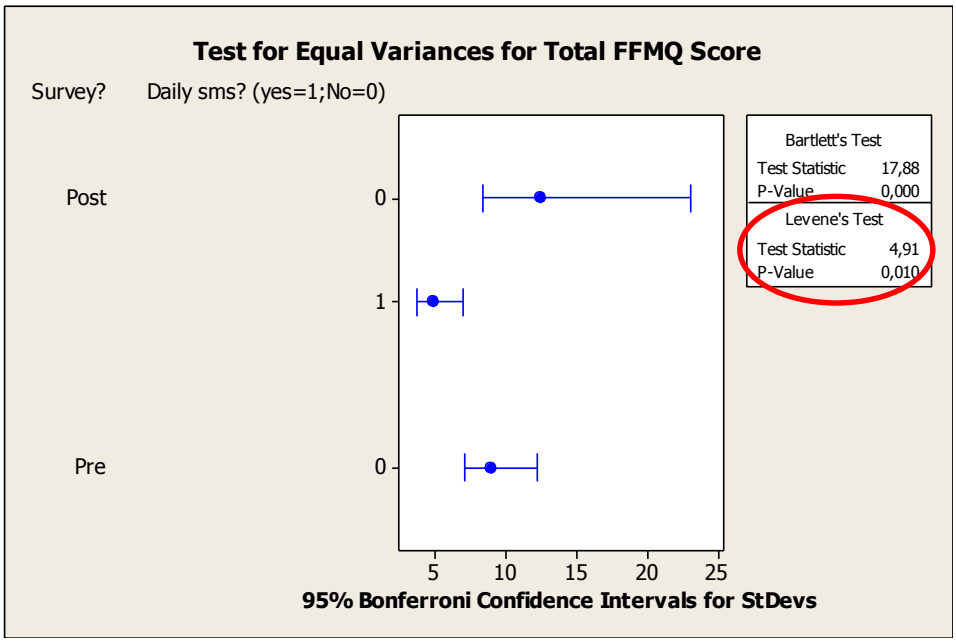


Figure 15: Test for equal variances (Atlantic Seaboard FFMQ)

The appropriate test for unequal variances for non-normal data is either the Kruskal-Wallis Test or Moods Median Test. The Moods Median Test used, being more robust to deal with outliers.

5.1.2.2 Johannesburg geographical

The first test performed on the full response data set, was to establish normality and investigate any special cause variation. No responses eliminated from the data set.

The iterations of item analysis led to only eliminating questions influencing the 'describe', 'nonjudge' and 'nonreact' facets highlighted in FFMQ. The resultant scores across the facets are included in Table 7. Most facets are within the acceptable range of 0,60 - 0,90. The 'nonjudge' facet result for internal consistency is poor and 'nonreact' omitted completely.

Table 7: Cronbach alpha scores (Johannesburg FFMQ)

Johannesburg: Cronbach Alpha resultant scores across facets			
Facets	**1st test run**	**Omitted item**	**Resultant score**
Observe	0,6740		0,6740
Describe	0,5918	Q12, Q22, Q16	0,6659
Nonjudge	0,4079	Q14, Q35, Q3	0,5623
Act with awareness	0,6684		0,6684
Nonreact	0,3185	Q4, Q33	0,4639

The statistically adjusted data set represented in Table 8. Nothing noteworthy highlighted, although the borderline sample size for the Post (0) group is considered.

Table 8: Statistically adjusted data set (Johannesburg FFMQ)

Johannesburg: Descriptive statistics of statistically scrubbed data set								
Survey	**Mean**	**StDev**	**Variance**	**Median**	**SSQ**	**Skewness**	**Kurtosis**	**Count**
Pre (0)	88,244	12,494	156,089	89,0	325 510	0,184	-0,498	41
Post (0)	85,588	11,275	127,132	87,0	126 565	0,103	-0,578	17
Post (1)	90,045	10,083	101,665	88,0	180 515	0,293	-1,278	22
Total FFMQ	**88,175**	**11,585**	**134,222**	**88,0**	**632 590**	**0,157**	**-0,572**	**80**

Following the hypothesis testing roadmap (Appendix 9.8), the first test performed was to ascertain normality. The data set p-values < 0,005 indicating that data set is not normally distributed (Figure 16).

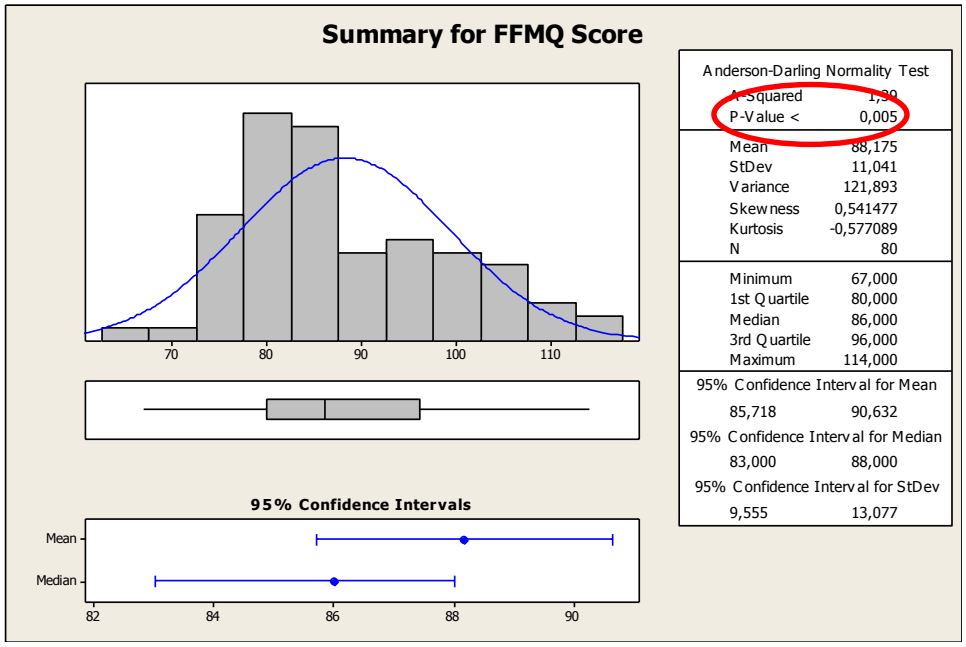


Figure 16: Normality (Johannesburg FFMQ)

The next consideration on the hypothesis testing roadmap is the level of interest. The three data sets highlighted the level of consideration to be >2, which made it appropriate to run the test for equal variances. Based on the results of the normality (Figure 16) the Levene's Test was utilised to determine the appropriate hypothesis test to perform.

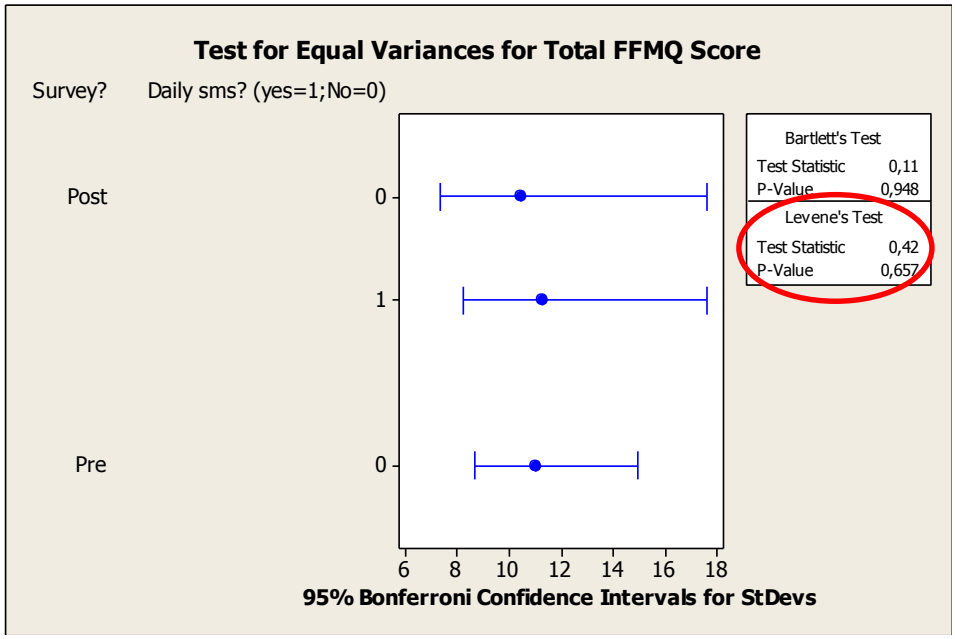


Figure 17: Test for equal variances (Johannesburg FFMQ)

The high p-value displayed in the Levene's Test in Figure 17 is indicative that the variances are not equal. The appropriate test for unequal variances for non-normal data is either the Kruskal-Wallis Test or Moods Median Test. The Kruskal-Wallis selected, as it is more powerful than Moods for many distributions, except outliers.

5.1.2.3 Randburg geographical area

The first test performed on the full response data set, was to establish normality and investigate any special cause variation. This resulted in three responses being eliminated, reducing the

responses to n=110. Unable to investigate the cause of the variation with the respondent, responses eliminated on the side of prudence. The iterations of item analysis led to only eliminating three questions influencing the 'describe' and 'nonreact' facets highlighted in FFMQ. The resultant scores across the facets are included in Table 9, and most are within the acceptable range of 0,60-0,90. The 'nonreact' score is a poor result for internal consistency.

Table 9: Cronbach alpha scores (Randburg FFMQ)

Randburg: Cronbach Alpha resultant scores across facets			
Facets	**1st test run**	**Omitted item**	**Resultant score**
Observe	0,7579		0,7579
Describe	0,6387	Q12, Q22	0,6660
Nonjudge	0,6802		0,6802
Act with awareness	0,8187		0,8187
Nonreact	0,5501	Q21	0,5592

The statistically adjusted data set represented in Table 10.

Table 10: Statistically adjusted data set (Randburg FFMQ)

Randburg: Descriptive statistics of statistically scrubbed data set								
Survey	**Mean**	**StDev**	**Variance**	**Median**	**SSQ**	**Skewness**	**Kurtosis**	**Count**
Pre (0)	112,297	11,389	129,715	112,0	471 265	0,327	-0,513	37
Post (0)	118,548	13,950	194,612	116,0	1 039 926	0,541	-0,282	73
Post (1)	No messaging							
Total FFMQ	**116,445**	**13,424**	**180,194**	**115,0**	**1 511 191**	**0,570**	**-0,095**	**110**

Following the hypothesis testing roadmap (Appendix 9.8), the first test performed was to ascertain normality (Figure 18). The data set is not normally distributed (p-value = 0,022).

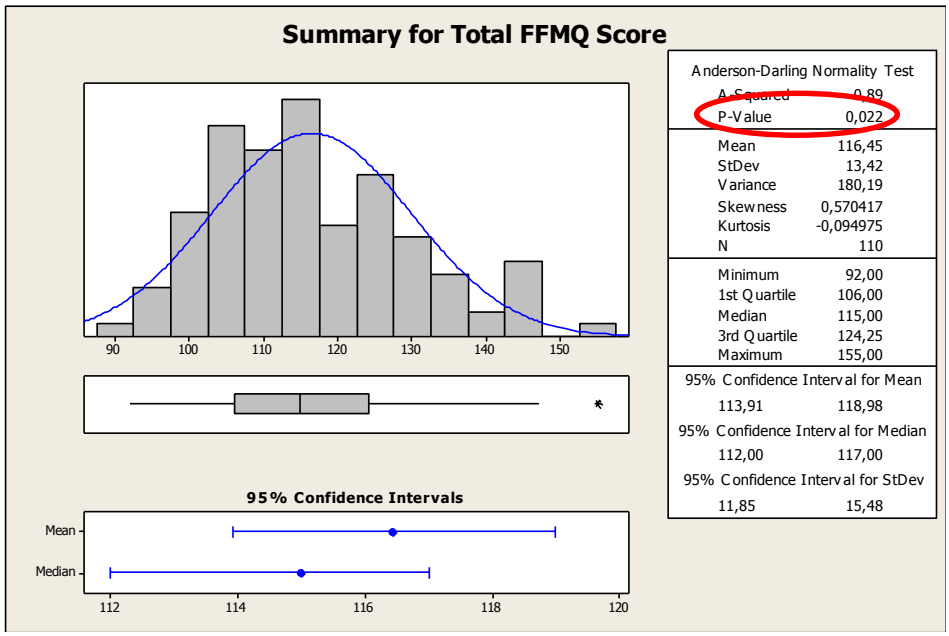


Figure 18: Normality (Randburg FFMQ)

The Levene's test statistic indicates the variances are not equal Figure 19.

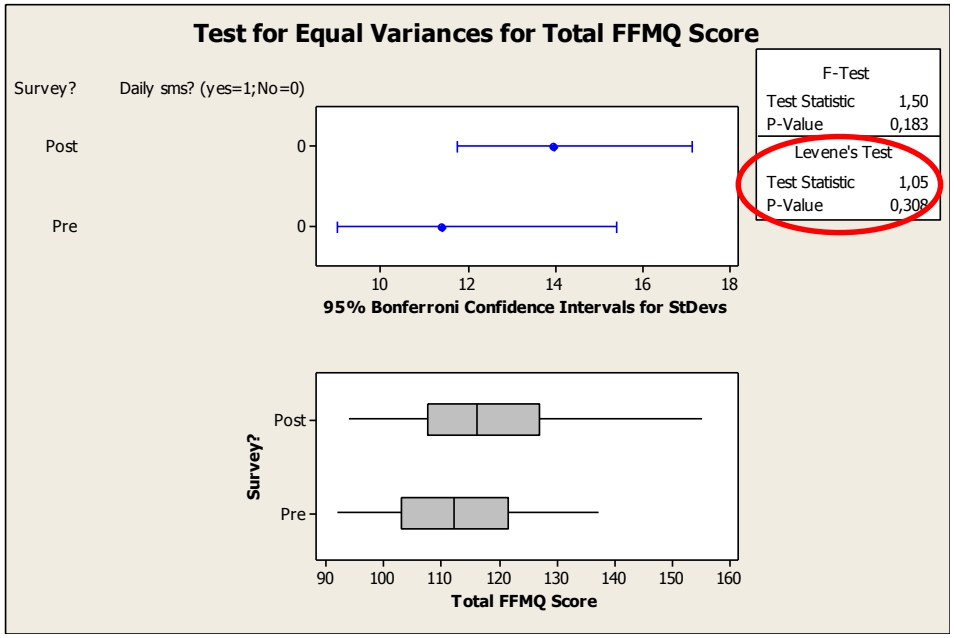


Figure 19: Test for equal variances (Randburg FFMQ)

The hypothesis testing roadmap (Appendix 9.8) indicates a 2-Sample t-Test is required for non-normal data, with unequal variances.

5.1.2.4 **Winelands geographical area**

The first test performed on the full response data set, was to establish normality and investigate any special cause variation. This resulted in three responses being eliminated, reducing the responses to n=67. Unable to investigate the cause of the variation with the respondent, responses eliminated on the side of prudence. The iterations of item analysis led to only eliminating two questions influencing the 'describe' facet highlighted in FFMQ. The resultant scores across the facets are included in Table 11, and are all within the acceptable range of 0,60-0,90.

Table 11: Cronbach alpha scores (Winelands FFMQ)

Winelands: Cronbach Alpha resultant scores across facets			
Facets	**1st test run**	**Omitted item**	**Resultant score**
Observe	0,7438		0,7438
Describe	0,5761	Q12, Q16	0,6891
Nonjudge	0,6571		0,6571
Act with awareness	0,7884		0,7884
Nonreact	0,6968		0,6968

Table 12: Statistically adjusted data set (Winelands FFMQ)

Winelands: Descriptive statistics of statistically scrubbed data set								
Survey	**Mean**	**StDev**	**Variance**	**Median**	**SSQ**	**Skewness**	**Kurtosis**	**Count**
Pre (0)	119,896	11,499	132,223	119,0	696 215	0,306	-0,257	48
Post (0)	120,800	17,606	309,958	113,0	297 742	0,658	-0,956	20
Post (1)	No messaging							
Total FFMQ	**119,627**	**15,007**	**225,207**	**118,0**	**973 673**	**0,011**	**-0,324**	**67**

Following the hypothesis testing roadmap (Appendix 9.8), the first test performed was to ascertain normality. The data set for both pre- and post-surveys are normally distributed, the p-value = 0,194.

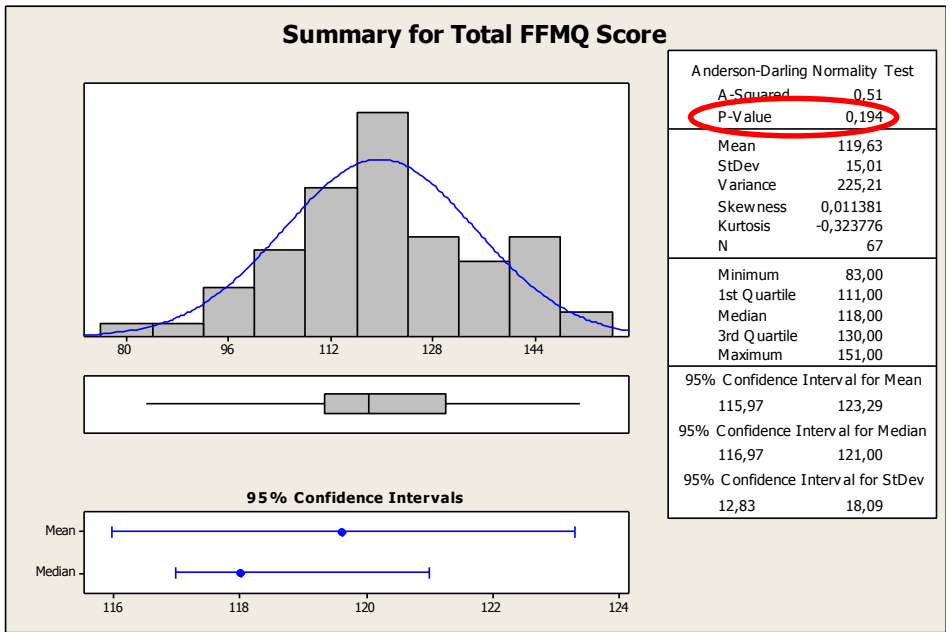


Figure 20: Normality (Winelands FFMQ)

The next consideration in the roadmap is the level of interest. The two data sets highlighted the level of consideration to be two, which made it appropriate to run the test for equal variances. Based on the results of the normality (Figure 20) the F-Test was utilised to determine the appropriate hypothesis test to perform.

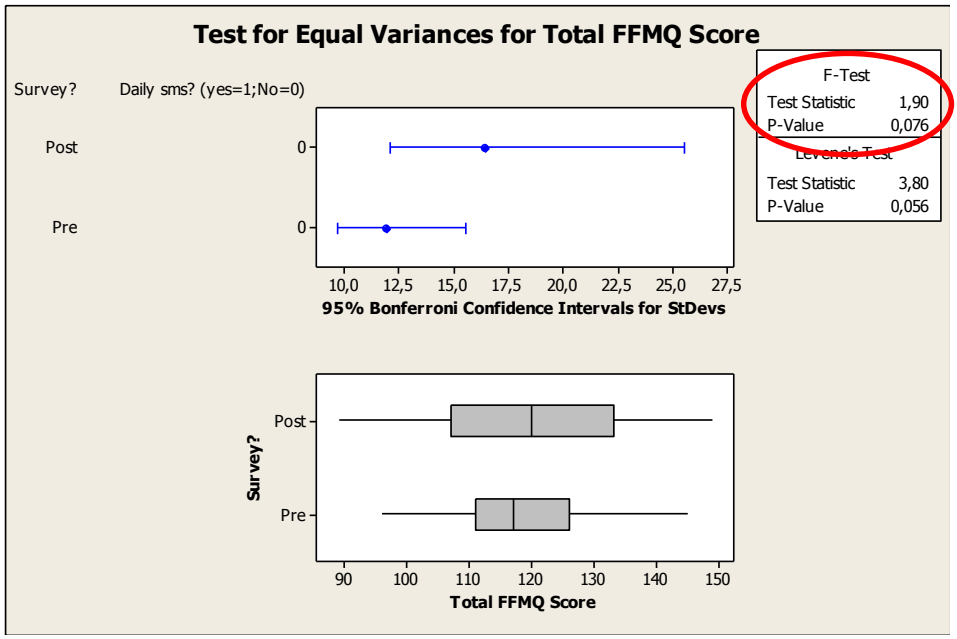


Figure 21: Test for equal variances (Winelands FFMQ)

The p-value > 0,05 for the F-test from Figure 21 indicates the variances are not equal, therefore the appropriate hypothesis test to complete is the 2-Sample t-Test.

The appropriate test applied to each data set across the geographical areas varied depending on normality and level of interest. Following the hypothesis testing roadmap (Appendix 9.8), decisions on the type of tests performed disclosed above, with the result of the test included in 5.1.3.

5.1.3. Hypothesis testing

5.1.2.1 Atlantic Seaboard geographical area

Hypothesis test: Mood Median Test

Mood Median Test: FFMQ Score versus Survey

```
Mood median test for FFMQ Score
Chi-Square = 14,84    DF = 2    P = 0,001

                                  Individual 95,0% CIs
Survey    N<=  N>  Median  Q3-Q1  ---------+---------+---------+-------
µPost(0)    8   5    81,0   17,5  (----------*----------------------)
µPost(1)   23   7    81,0    5,8       (-----*-)
µPre(0)    12  27    86,0   11,0                 (---*-----)
                                  ---------+---------+---------+-------
                                        80,0      85,0      90,0

Overall median = 83,0
```

Figure 22: Hypothesis test: Moods Median (Atlantic Seaboard FFMQ)

The sample is sufficient to detect differences among the medians Highlighted in section 5.1.2.1 some sample sizes were less than 15, normality can be an issue. Normality cannot reliably checked with small samples.

- N<= - The number of observations for each level of the factor that are less than or equal to the overall median. The Post-measurement results are below the overall median.

- N> - The number of observations for each level of the factor that are greater than the overall median. The pre-measurement is weighted above the overall median.
- Median - The median of the observations for each level. These sample medians provide estimates of the population medians for each level.
- Overall median - The median of all observations is 83,0.
- It can be concluded that there are differences among the means at the 0,05 level of significance, however the directional flow of the difference is not positive.

H1: Mdn Post(1) > Mdn Post(0)	Fail
D1: Mdn Post(1) > Mdn Pre(0)	Fail
D2: Mdn Post(0) > Mdn Pre(0)	Fail

5.1.2.2 Johannesburg geographical area

Hypothesis test: Kruskal-Wallis Test

Kruskal-Wallis Test: FFMQ Score versus Script

Kruskal-Wallis Test on FFMQ Score

Script	N	Median	Ave Rank	Z
µPost(0)	17	82,00	33,4	-1,43
µPost(1)	22	83,00	37,6	-0,69
µPre(0)	41	87,00	45,0	1,79
Overall	80		40,5	

H = 3,52 DF = 2 P = 0,172
H = 3,53 DF = 2 P = 0,171 (adjusted for ties)

Figure 23: Hypothesis test: Kruskal-Wallis Test (Johannesburg FFMQ)

Using Figure 23 the individual statistics of the data is assessed:

- Overall - Total number of observations corresponds to the statistically adjusted response data = 80
- Median - Median of the observations for each level, which provides an estimate of the population medians for each level; Pre- exceeds post-survey results

H1: Mdn Post(1) > Mdn Post(0)	Pass
D1: Mdn Post(1) > Mdn Pre(0)	Fail
D2: Mdn Post(0) > Mdn Pre(0)	Fail

5.1.2.3 **Randburg geographical area**

Hypothesis test: 2-Sample t-Test

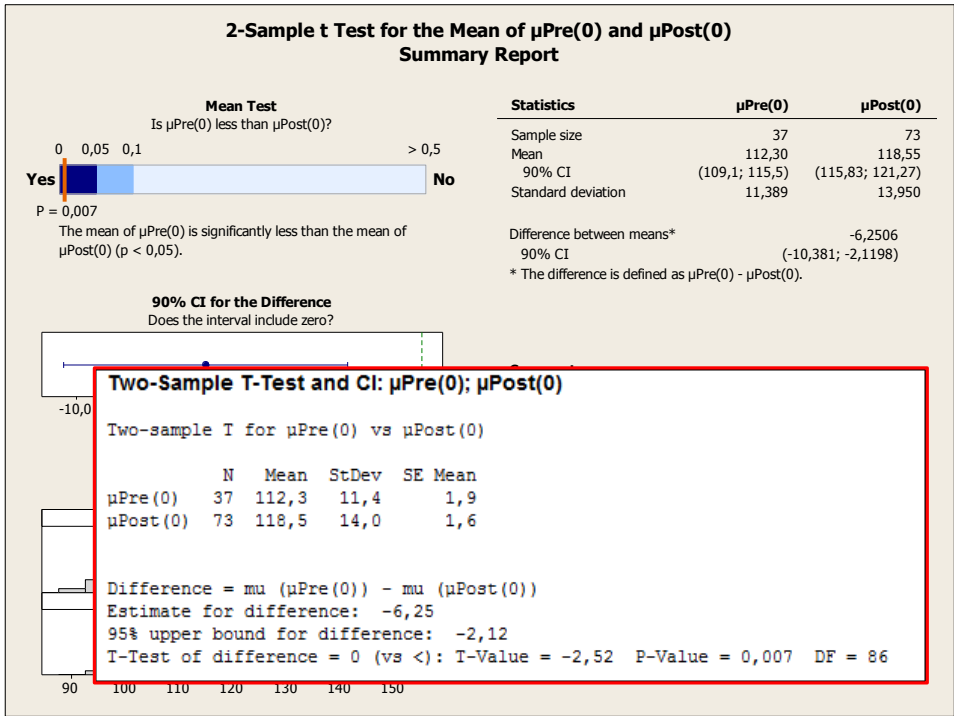


Figure 24: Hypothesis test: 2-Sample t-Test (Randburg FFMQ)

There are no unusual data points. Unusual data can have a strong influence on the results. Because both sample sizes are at least 15 (Figure 24), normality is not an issue. The test is accurate with non-

normal data when the sample sizes are large enough. The sample is sufficient to detect a difference between the means. The 2-sample t used does not assume or require that the two samples have equal variances. Research shows that the test performs well with unequal variances, even when the sample sizes are not equal as highlighted in Figure 19.

- Test: The mean of µPre(0) is less than µPost(0) at the 0,05 level of significance.

  D3: µPost(0) > µPre(0) Pass

- CI: Quantifies the uncertainty associated with estimating the difference from sample data. With a 90% confident the true difference is -2,12.

5.1.2.4 **Winelands geographical area**

Hypothesis test: 2-Sample t-Test

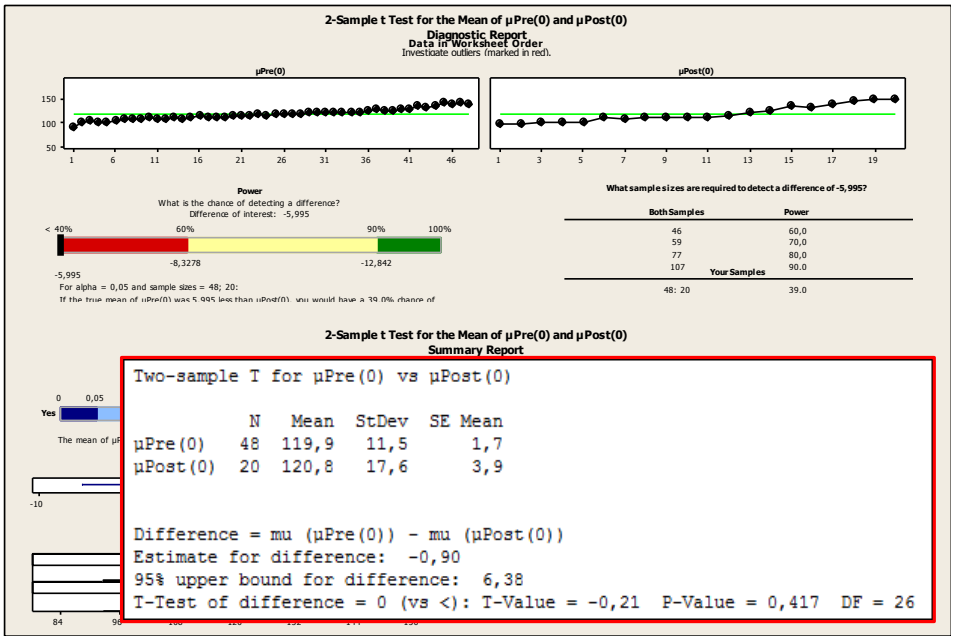


Figure 25: Hypothesis test: 2-Sample t-Test (Winelands FFMQ)

There are no unusual data points, which would have a strong influence on the results. Both sample sizes are at least 15 (Figure 25), normality is not an issue and presented in Figure 20. Based on the sample sizes, standard deviations, and alpha, there is only a 39,0% chance of detecting a difference of -5,995 between the means. To have a 90% chance of detecting a difference of -5,995 you need to increase both sample sizes to 107. The 2-sample t used does not assume or require that the two samples have equal variances; however, this is established as indicated in Figure 21.

- CI: Quantifies the uncertainty associated with estimating the difference from sample data. With a 90% confidence the true difference is between -8,1911 and 6,3827.

- Test: There is not enough evidence to conclude that the mean of µPre(0) is less than µPost(0) at the 0,05 level of significance, therefore:

  D3: µPost(0) > µPre(0) Failed

5.1.4. Summary of results

Table 13: Summary of FFMQ hypothesis testing results

Methodology	Western Cape	Gauteng
PDCA + Messaging (Experiment)	<u>Atlantic Seaboard</u> Mdn Post(1) > Mdn Post(0) Fail Mdn Post(1) > Mdn Pre(0) Fail Mdn Post(0) > Mdn Pre(0) Fail	<u>Johannesburg</u> Mdn Post(1) > Mdn Post(0) Pass Mdn Post(1) > Mdn Pre(0) Fail Mdn Post(0) > Mdn Pre(0) Fail
No change (Control)	<u>Winelands</u> µPost(0) > µPre(0) Failed	<u>Randburg</u> µPost(0) > µPre(0) Pass

5.2. Routine component of 3 part habit routine

The results from the LSS PDCA violations initiative detailed below. Figure 26 highlights the LSS PDCA violations variable alignment to the routine part of the 3-part habit routine. The deployment aligned to the deming cycle (Figure 4) included the data collection plan spanning 40 consecutive days. The baseline or pre-measurement was established using the first 20 days, with subsequent data collection for the remaining 20-day time horizon.

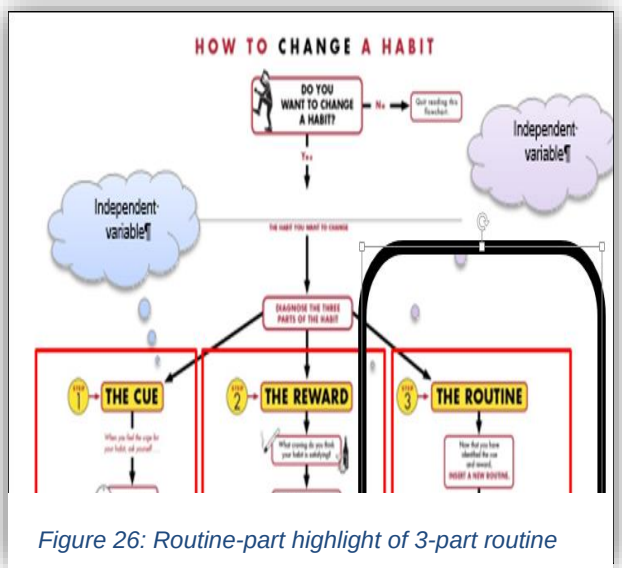


Figure 26: Routine-part highlight of 3-part routine

The LSS PDCA project team reviewed the baseline or pre-measurement results to determine root cause. Applying the 80-20 pareto principle it has been established that the focus should be on root causes of violations that would have the desired impact, of improving the awareness of the strategic objective to foster a zero harm culture and drive some cost efficiencies. The baseline data indicated high level issues centred round driver behaviour. Infringements like active speeding, and failing to perform duties within policy and procedure guidelines (stationary and over idle) are amongst the highest offences recorded.

Table 14: Infringement violation priority classifications (with actions)

Coded violation type	Baseline count (% contribution)	(Priority) Action required	Violation priority
Stationary	12,121 (39,8%)	(1) Advocate. Positive for operational cost cutting drive.	Policy override
Active speeding, Harsh acceleration	10,699 (35,2%)	(2) Reduce aligned to zero harm culture	Incentive driven
Over idle	6,065 (19,9%)	(3) Consequence of winter season; running of heater.	Low priority
No-go Area	720 (2,4%)	Retain focus to maintain low occurrence	High priority
Harsh braking	84 (2,7%)	Retain focus to maintain low occurrence	Medium priority

The LSS PDCA team operationalised the actions through the existing management structure and communicated at the shift changes, which, as previously stated occurred twice in a 24-hour period.

5.2.1. Full response data set details

The data collection from the operating system focussed on the four geographical areas. This included monitoring 107 vehicles across the time horizon as described in the section 4.6. The infringements logged amounted to 84,939 detailed in Table 15.

Table 15: LSS PDCA Full response data set details

Methodology	**Geographical area** **(vehicle count : violation recorded/count)**	
No change (Control)	Randburg 21 vehicles : **14,151**	Winelands 38 vehicles : **47,314**
PDCA + Messaging (Experiment)	Johannesburg Messaging 9 vehicles : **5,454** NO messages 9 vehicles : **5,080**	Atlantic Seaboard Messaging 17 vehicles : **7,151** NO messages 13 vehicles : **5,789**

Special cause variation investigated on the geographical level. Consistency checks included normality, stability, and reliability.

5.2.2. Statistically adjusted response data details

The statistically adjusted data set represents the basis of the discussion of results in chapter 6. The statistically adjusted data set consisted of 98 unique vehicles logging 59,759 infringements over the two time horizons. Infringements for nine vehicles omitted, mainly influencing the Winelands geographical area.

Table 16: LSS-PDCA statistically adjusted data set

Methodology	**Geographical area (vehicle count : violation recorded/count)**	
No change (Control)	Randburg 21 vehicles : **14,151**	Winelands 30 vehicles : **22,966**
PDCA + Messaging (Experiment)	Johannesburg Messaging 9 vehicles : **5,454** NO messages 9 vehicles : **5,080**	Atlantic Seaboard Messaging 16 vehicles : **6,319** NO messages 13 vehicles : **5,789**

Infringements on policies and procedures, including legislated safe driving behaviours classified as violations are recorded using a reliable GPS tracking mechanism provided by a service provider specialising in the technology.

5.2.2.1. Overall LSS PDCA initiative results

The decisions to address the violations in line with the 80:20 Pareto-principle reduced the actionable violations. Figure 27 reflects the extent of the practical implications for the organisation; however, the effective statistical implications include the violations, recorded as policy override. The results cover the fully recorded responses in the hypothesis testing section 5.2.3.

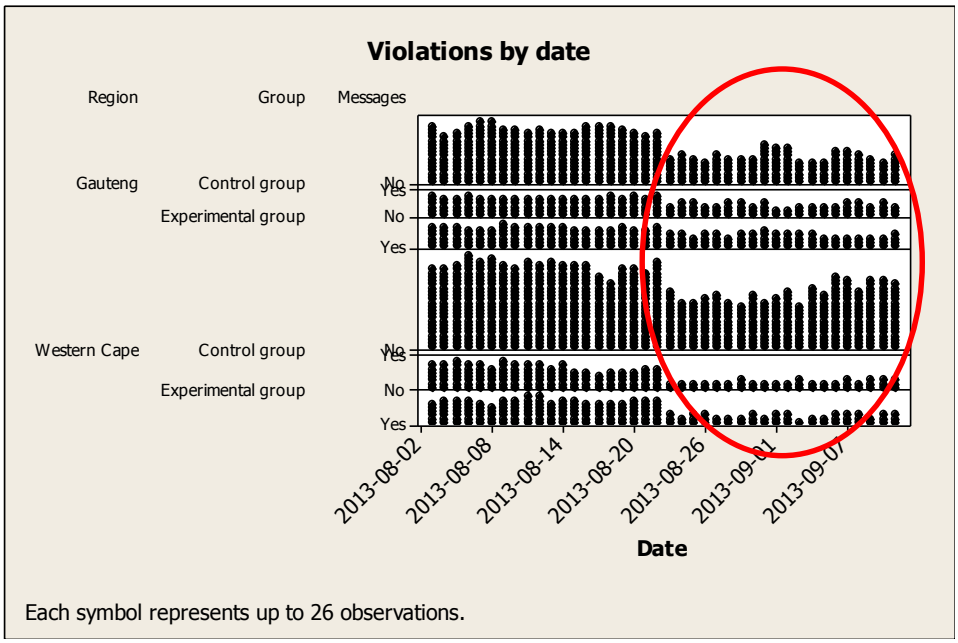


Figure 27: LSS PDCA Violations (40 day practical implication)

The detailed analysis is included in Appendix 9.9.

5.2.3. Hypothesis testing

The hypothesis testing roadmap (Appendix 9.8) sequential steps determined the appropriate test required for the data set for each geographical area.

5.1.2.1 Atlantic Seaboard geographical area

The first test performed on the statistically adjusted response data set where n=60, was to establish normality and investigate any special cause variation.

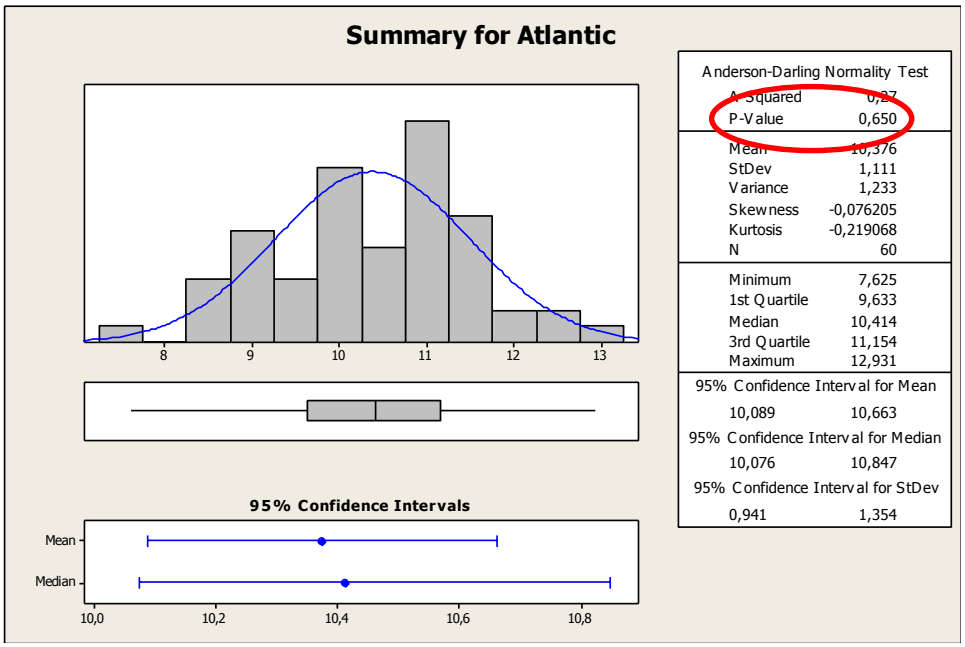


Figure 28: Normality (Atlantic Seaboard LSS PDCA)

The p-values > 0,05 indicating the data is normally distributed.

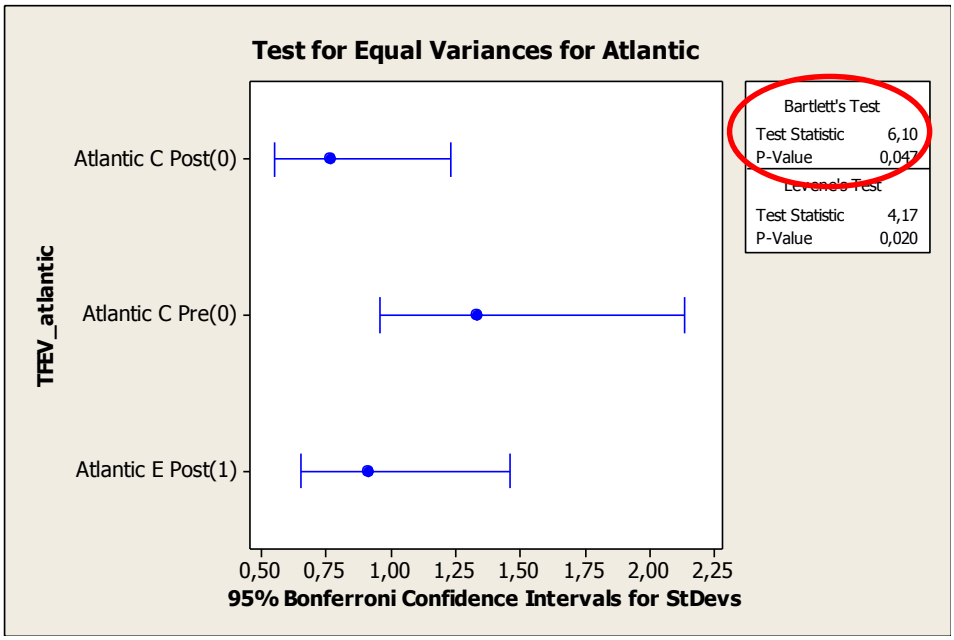


Figure 29: Test for equal variances (Atlantic Seaboard LSS PDCA)

The test for equal variances (Figure 29) utilising the Bartlett's Test result indicates a low p-value = 0,047 indicating equal variances. The hypotheses testing roadmap indicates the appropriate test to perform is One-way ANOVA.

One-way ANOVA: Atlantic C Pre(0); Atlantic C Post(0); Atlantic E Post(1)

Source	DF	SS	MS	F	P
Factor	2	11,90	5,95	5,57	0,006
Error	57	60,87	1,07		
Total	59	72,77			

S = 1,033 R-Sq = 16,35% R-Sq(adj) = 13,42%

Level	N	Mean	StDev
Atlantic C Pre(0)	20	10,719	1,333
Atlantic C Post(0)	20	10,662	0,768
Atlantic E Post(1)	20	9,747	0,914

Individual 95% CIs For Mean Based on Pooled StDev

```
                    (--------*---------)
                   (--------*--------)
(--------*--------)
----+---------+---------+---------+-----
  9,50     10,00     10,50     11,00
```

Pooled StDev = 1,033

Figure 30: Hypothesis testing One-way ANOVA (Atlantic Seaboard LSS PDCA)

There are no unusual data points, which could have a strong influence on the results. The sample is sufficient to detect differences among the means. All the sample sizes are at least 15, so normality is not an issue. There are differences among the means at the 0,05 level of significance; however, the directional flow is not as intended as observed in Figure 30.

H2: µPost(1) < µPost(0)	Fail
D1: µPost(1) < µPre(0)	Pass
D2: µPost(0) < µPre(0)	Fail

5.1.2.2 Johannesburg geographical area

The first test performed on the statistically adjusted response data set where n=60, was to establish normality and investigate any special cause variation.

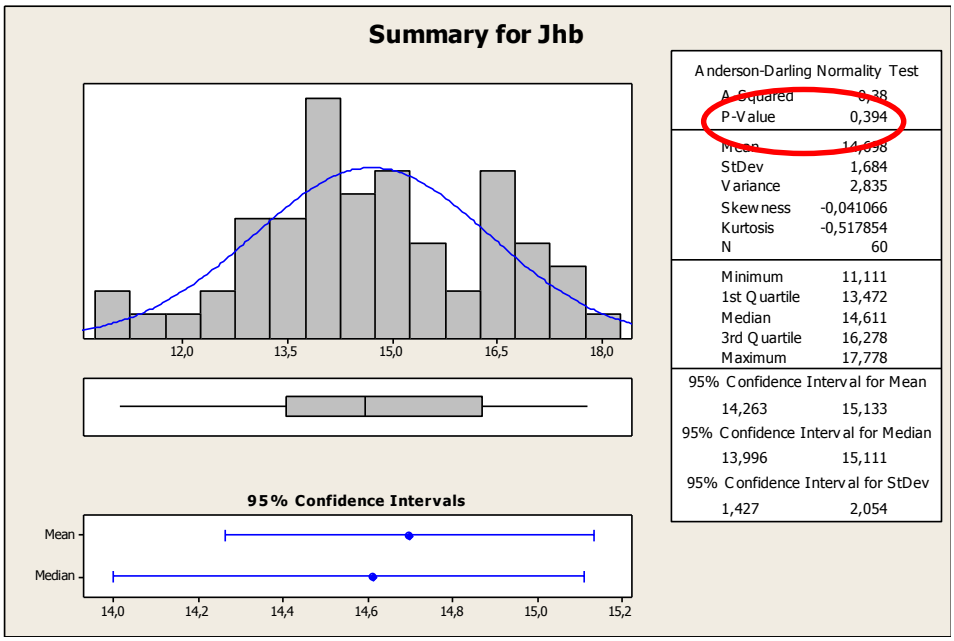


Figure 31: Normality (Johannesburg LSS PDCA)

The p-values = 0,394 indicating the data is normally distributed.

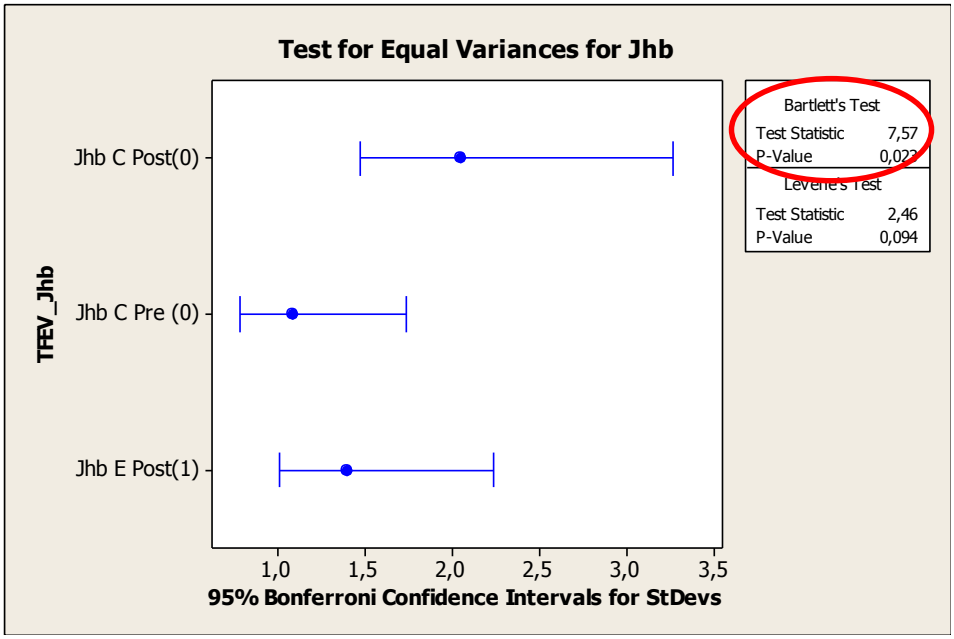


Figure 32: Test for equal variances (Johannesburg LSS PDCA)

Based on the normally distributed data set, the Bartlett's test statistic results used to determine the outcome of the test for equal variances. The low p-value indicates the variances are equal.

The hypotheses testing roadmap indicates the appropriate test to perform is One-way ANOVA

One-way ANOVA: Jhb C Pre (0); Jhb C Post(0); Jhb E Post(1)

Source	DF	SS	MS	F	P
Factor	2	28,51	14,25	5,86	0,005
Error	57	138,76	2,43		
Total	59	167,27			

S = 1,560 R-Sq = 17,04% R-Sq(adj) = 14,13%

Level	N	Mean	StDev	Individual 95% CIs For Mean Based on Pooled StDev
Jhb C Pre (0)	20	14,428	1,085	(-------*--------)
Jhb C Post(0)	20	14,022	2,043	(-------*--------)
Jhb E Post(1)	20	15,644	1,397	(--------*-------)

13,60 14,40 15,20 16,00

Pooled StDev = 1,560

Figure 33: Hypothesis testing One-way ANOVA (Johannesburg LSS PDCA)

There are no unusual data points, which could have a strong influence on the results. The sample is sufficient to detect differences among the means. All the sample sizes are at least 15, so normality is not an issue.

H2: µPost(1) < µPost(0)	Fail
D1: µPost(1) < µPre(0)	Fail
D2: µPost(0) < µPre(0)	Pass

5.1.2.3 **Randburg geographical area**

The first test performed on the statistically adjusted response data set where n=40, was to establish normality and investigate any special cause variation.

The p-value = 0,554 indicating the data is normally distributed.

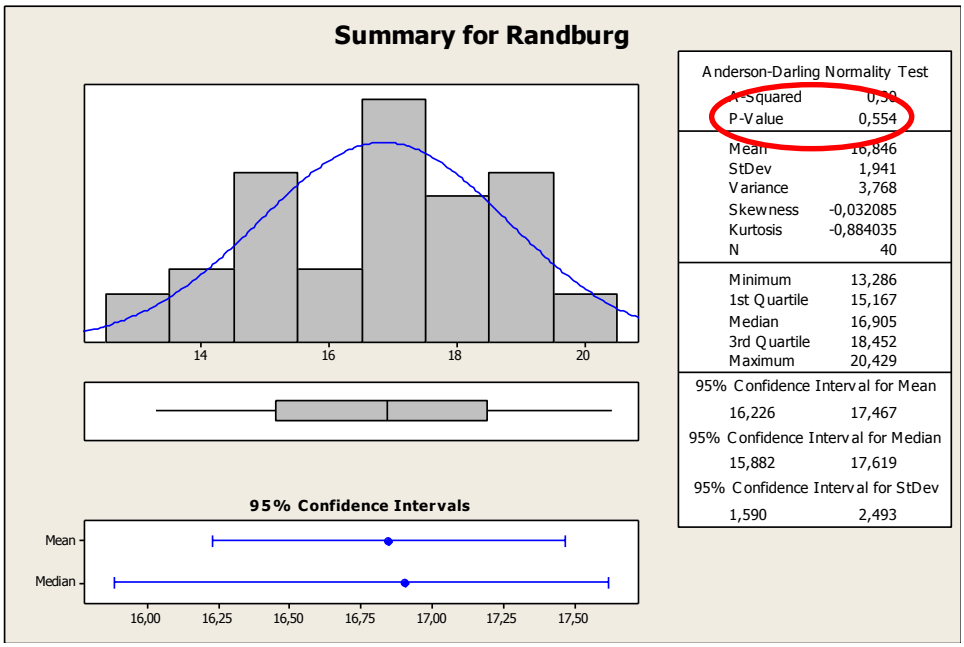


Figure 34: Normality (Randburg LSS PDCA)

The normal data distribution requires the F-Test statistic (Figure 35) from the Test for equal variances to determine if the variances are equal; the result indicates the variances are not equal.

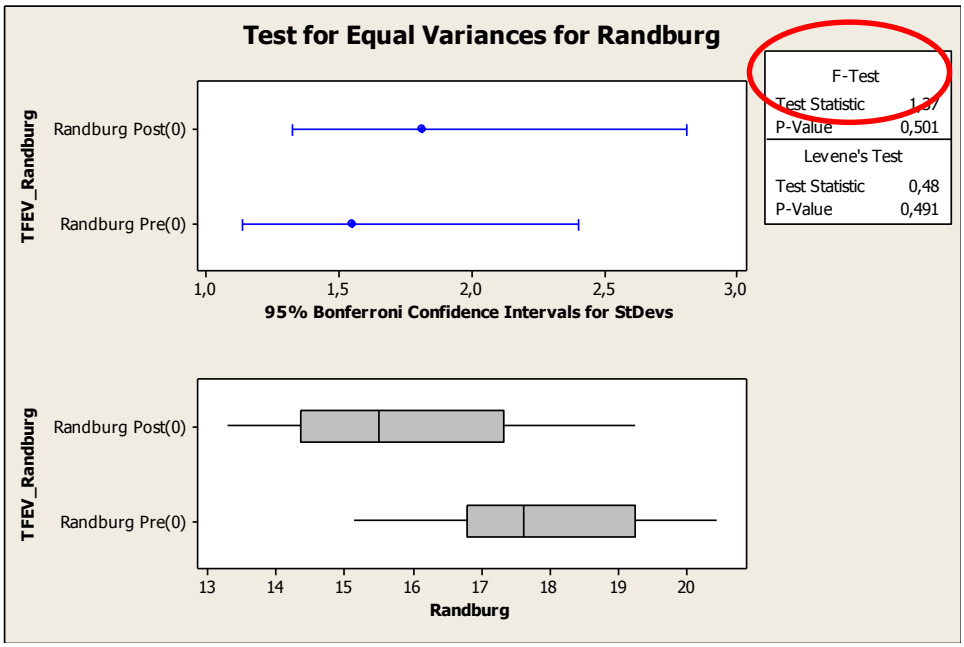


Figure 35: Test for equal variances (Randburg LSS PDCA)

The appropriate hypothesis test for normally distributed data with variances that are not equal is the 2-Sample t-Test.

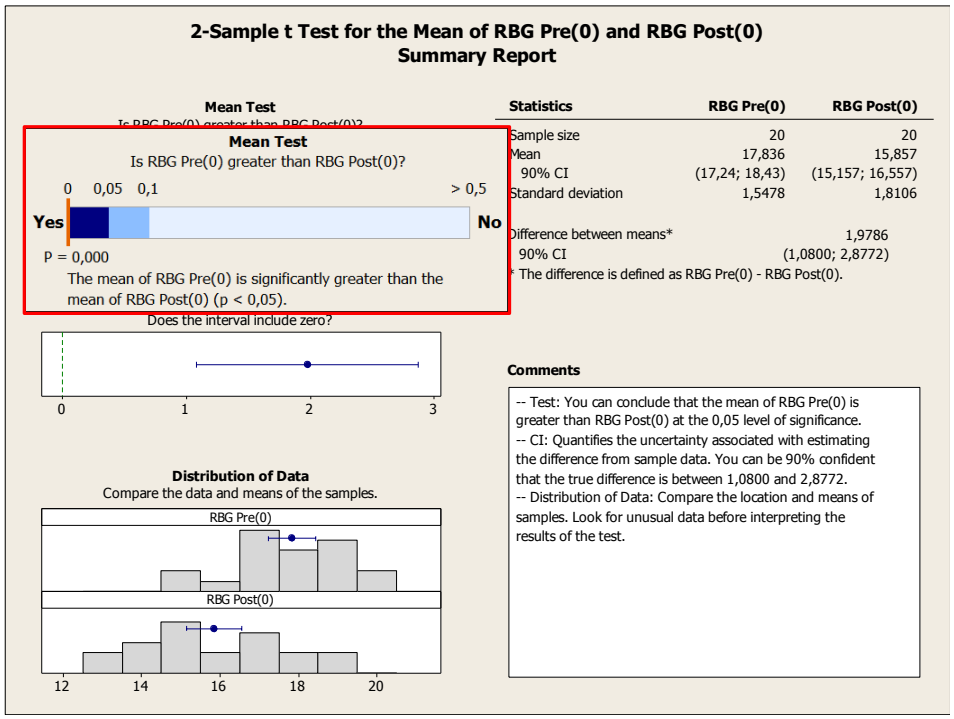


Figure 36: Hypothesis testing 2-Sample t-Test (Randburg LSS PDCA)

There are no unusual data points. Both sample sizes are at least 15, normality is not an issue. The sample is sufficient to detect a difference between the means.

- Test: The mean of Pre(0) is greater than Post(0) at the 0,05 level of significance.
- CI: Quantifies the uncertainty associated with estimating the difference from sample data. You can be 90% confident that the true difference is between 1,0800 and 2,8772.

D3: μPost(0) < μPre(0) Pass

5.1.2.4 **Winelands geographical**

The first test performed on the statistically adjusted response data set where n=40, was to establish normality and investigate any special cause variation.

The p-value = 0,835 indicating the data is normally distributed.

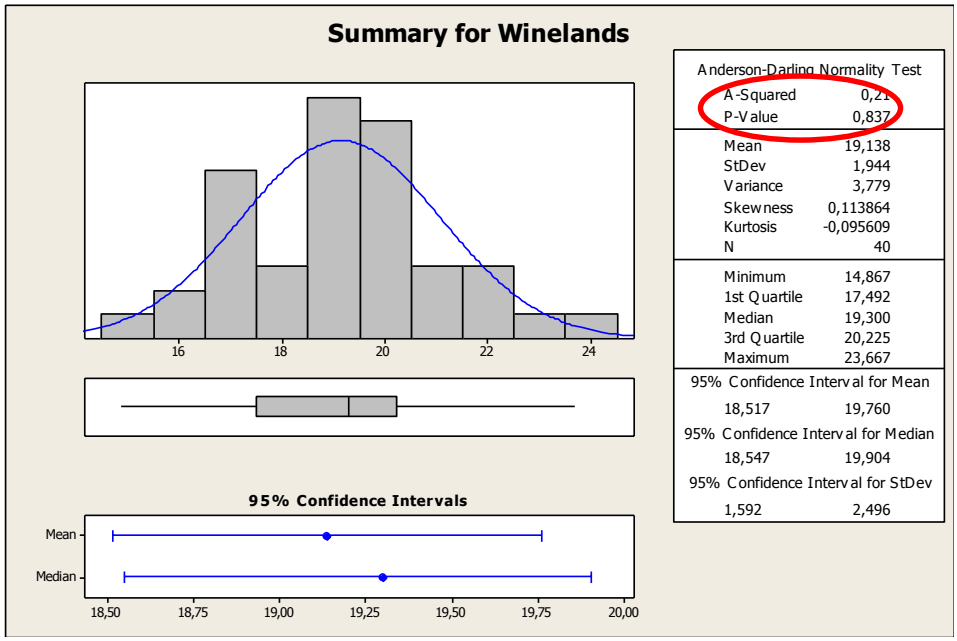


Figure 37: Normality (Winelands LSS PDCA)

The normal data distribution requires the F-Test statistic (Figure 38) from the Test for equal variances to determine if the variances are equal; the result indicates the variances are not equal.

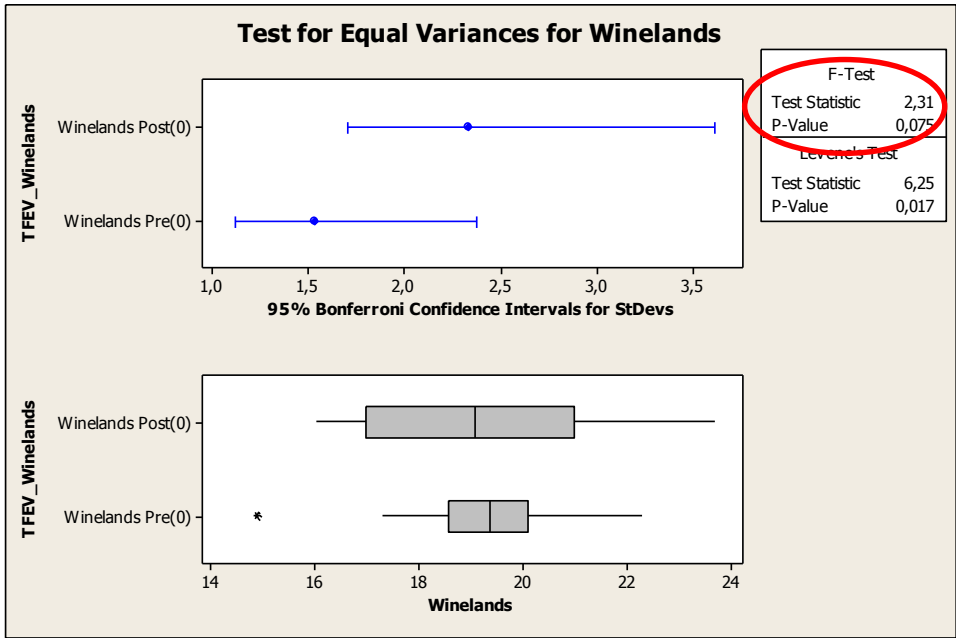


Figure 38: Test for equal variances (Winelands LSS PDCA)

The appropriate hypothesis test completed 2-Sample t-Test (Figure 39).

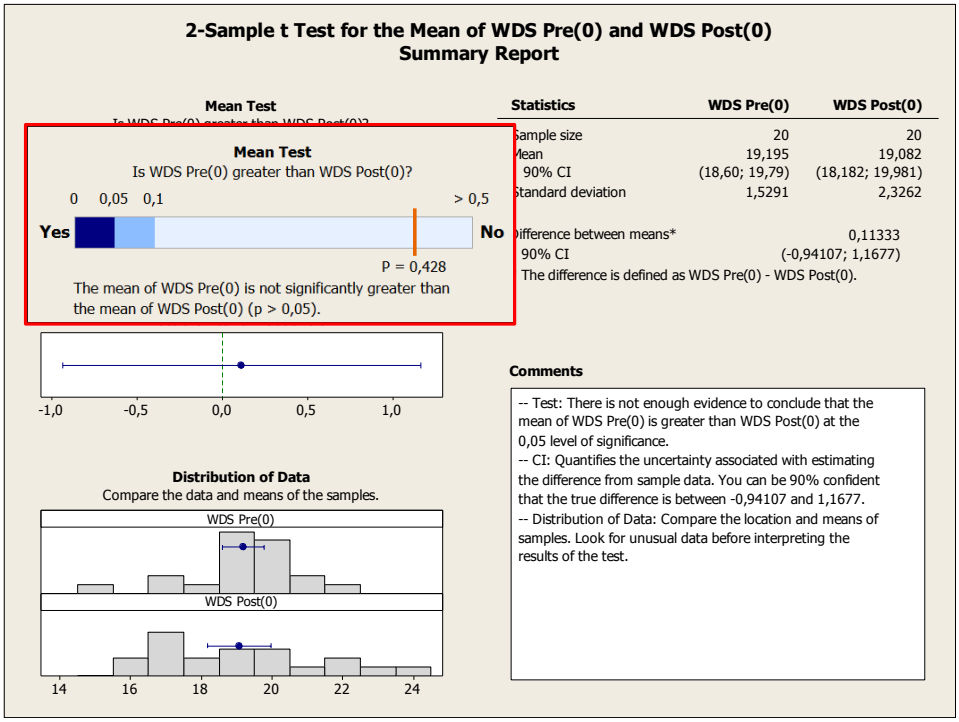


Figure 39: Hypothesis testing 2-Sample t-Test (Winelands LSS PDCA)

One data point is unusual compared to the others in pre-violation results. The unusual data point can have a strong influence on the results; however, there is no reason to omit based on special cause variation. Both sample sizes are at least 15, normality is not an issue.

- Test: There is not enough evidence to conclude that the mean of Pre(0) is greater than Post(0) at the 0,05 level of significance. The small sample sizes may be influencing the results.

- CI: Quantifies the uncertainty associated with estimating the difference from sample data. You can be 90% confident that the true difference is between -0,94107 and 1,1677.

D3: μPost(0) < μPre(0) Failed

5.2.4. Summary of results

Table 17: Summary of LSS PDCA hypothesis testing results

Methodology	Western Cape	Johannesburg
PDCA + Messaging (Experiment)	Atlantic Seaboard µPost(1) < µPost(0) Fail µPost(1) < µPre(0) Pass µPost(0) < µPre(0) Fail	Johannesburg µPost(1) < µPost(0) Fail µPost(1) < µPre(0) Fail µPost(0) < µPre(0) Pass
No change (Control)	Winelands µPost(0) < µPre(0) Fail	Randburg µPost(0) < µPre(0) Pass

5.3. Reward component of 3 part habit routine

The results from the pre-and post-surveys presented below. Figure 40 highlights the job satisfaction variable alignment to the reward part of the 3-part habit routine. The quantitative study conducted used the tested Job Satisfaction Survey (JSS) tool discussed in section 2.3.2.2.

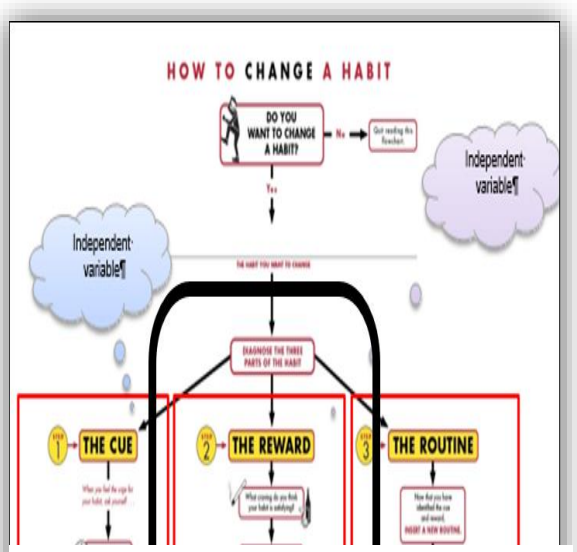


Figure 40: Reward-part highlight of 3-part routine

5.3.1. Full response data set details

All the job satisfaction responses are were from field-line staff. The distributions of the data is non-normal ($p<0.05$) and outliers are present. The two distinct data collection time horizons required reviewing the data separately (labelled pre and post). Splitting the data, similar non-normal distributions and outliers are evident, highlighting potential special cause variation.

Before investigating the special cause variation the data (n=345) was segmented into the four geographical areas. The four geographical areas represent four control groups and two experimental groups.

Table 18: All JSS response data descriptive statistics

Job satisfaction: Descriptive statistics of full response data set									
Survey	Survey	Mean	StDev	Variance	Median	SSQ	Skewness	Kurtosis	Count
Atlantic Seaboard	Pre (0)	129,816	23,948	573,506	128,0	661 601	0,086	0,880	38
Atlantic Seaboard	Post (0)	116,455	18,272	333,873	123,0	152 517	-2,098	4,029	11
Atlantic Seaboard	Post (1)	128,839	20,546	422,140	128,0	527 246	-0,954	2,443	31
Johannesburg	Pre (0)	135,077	31,026	962,599	134,0	748 164	-0,276	-0,501	39
Johannesburg	Post (0)	135,500	18,908	357,526	129,5	373 998	0,377	0,833	20
Johannesburg	Post (1)	131,458	33,892	1 148,694	127,5	441 171	-0,017	0,189	24
Randburg	Pre (0)	140,643	26,472	700,772	135,0	859 509	0,305	-0,184	42
Randburg	Post (0)	138,500	24,364	593,608	137,5	1 304 613	0,492	0,396	66
Winelands	Pre (0)	135,382	24,357	593,240	132,0	1 040 088	0,236	0,400	55
Winelands	Post (0)	149,789	30,662	940,175	154,0	443 224	-0,404	-0,335	19
Total JSS		**135,307**	**26,184**	**685,620**	**132,0**	**6 552 131**	**0,087**	**0,330**	**345**

Special cause variation was investigated on this level. Consistency checks included normality, stability, and reliability including looking at Cronbach alpha scores across the facets identified in the survey tool. The subsequent statistically adjusted data set represents the basis of the discussion completed in Chapter 6.

5.3.2. Statistically adjusted response data details

Details of the different steps followed for each geographical area presented below. A sequential process was followed using the statistical output of each iteration of the Cronbach alpha scores to establish if the score was within the acceptable range (0,65 – 0,90). Each composite was re-iteratively tested to achieve the resultant data set. Borderline cases were not subjected to the same methodology, facets with slightly lower scores retained for completeness.

5.1.2.5 Atlantic Seaboard geographical

The first test performed on the full response data set, was to establish normality and investigate any special cause variation. This resulted in nine responses being eliminated, reducing the responses to n=71. Unable to investigate the cause of the variation with the respondent, responses eliminated on the side of prudence.

Table 19: Statistically adjusted data set (Atlantic Seaboard JSS)

Atlantic Seaboard: Descriptive statistics of statistically scrubbed data set								
Survey	Mean	StDev	Variance	Median	SSQ	Skewness	Kurtosis	Count
Pre (0)	62,028	9,981	99,628	60,5	141 995	0,064	-0,495	36
Post (0)	53,778	4,944	24,444	52,0	26 224	0,490	0,565	9
Post (1)	59,154	7,058	49,815	59,0	92 224	-0,198	1,432	26
Total JSS	**59,930**	**8,818**	**77,752**	**59,0**	**260 443**	**0,311**	**0,030**	**71**

The iterations of item analysis led to eliminating questions impacting most of the facets highlighted in the JSS tool, with exception to 'nature of work'. The resultant scores across the facets are included in Table 20, most are within the acceptable range of 0,60 - 0,90, however where highlighted in red these facets were omitted. A single question retained for completeness. The retained question had the lowest standard deviation (StDev). The level of understanding by the respondents from the language presented in the surveys used, mitigated with a small pilot group, did not assist in this instance.

Table 20: Cronbach alpha scores (Atlantic Seaboard JSS)

Atlantic Seaboard: Cronbach Alpha resultant scores across facets			
Facets	**1st test run**	**Omitted item**	**Resultant score**
Pay	0,5559	Q10, Q19	0,6802
Promotion	0,4859	Q2, Q33	0,6308
Supervision	0,5398	Q3, Q12, Q30 (retained Q21)	**0,5828**
Frings benefits	0,2577	Q4, Q13, Q29 (retained Q22)	**0,5945**
Contingent rewards	0,4454	Q5, Q14	0,6993
Operating conditions	0,1714	Q6, Q15, Q24 (Retained Q31)	**0,3928**
Co-workers	0,4179	Q16, Q34	0,8088
Nature of work	0,6483		0,6483
Communication	0,4414	Q9, Q26, Q18 (Retained Q36)	0,5364

Following the hypothesis testing roadmap (Appendix 9.8), the first test performed was to ascertain normality. The data set p-value = 0,113 (Figure 41) indicating that the data set is normally distributed. The next consideration on the hypothesis testing roadmap (Appendix 9.8) is the level of interest. The three data sets mean the roadmap is followed to the level of consideration >2, which made it appropriate to run the test for equal variances.

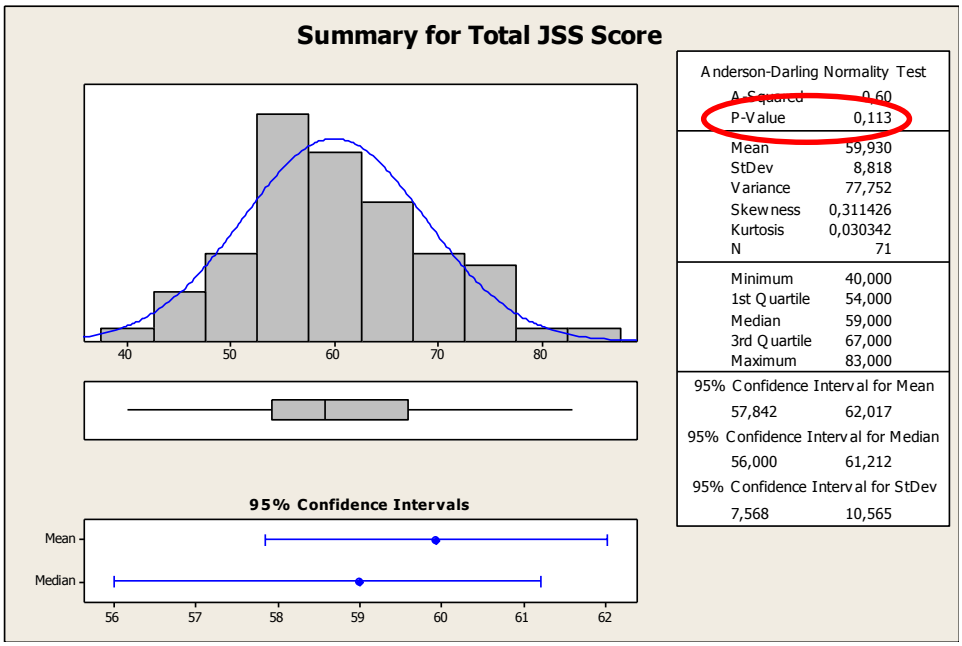


Figure 41: Normality (Atlantic Seaboard JSS)

Based on the results of the normality test (Figure 14: Normality (Atlantic Seaboard FFMQ) the Bartlett's Test result was used to determine the appropriate hypothesis test to perform.

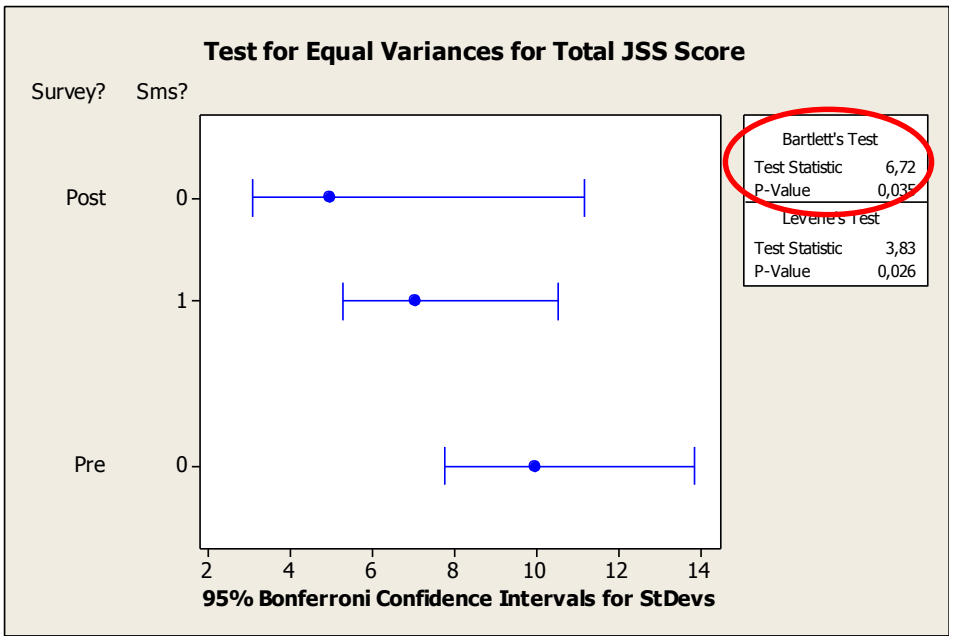


Figure 42: Test for equal variances (Atlantic Seaboard JSS)

The hypotheses testing roadmap indicates the appropriate test to perform is One-way ANOVA.

5.1.2.6 Johannesburg geographical

The first test performed on the full response data set, was to establish normality and investigate any special cause variation. This resulted in one responses being eliminated, reducing the responses to n=82. Unable to investigate the cause of the variation with the respondent, responses eliminated on the side of prudence.

Table 21: Statistically adjusted data set (Johannesburg JSS)

Johannesburg: Descriptive statistics of statistically scrubbed data set								
Survey	Mean	StDev	Variance	Median	SSQ	Skewness	Kurtosis	Count
Pre (0)	96,769	25,831	667,235	96,0	390 562	-0,229	-0,547	39
Post (0)	95,368	11,403	130,023	95,0	175 148	0,175	0,460	19
Post (1)	93,292	27,764	770,824	94,5	226 609	0,135	-0,172	24
Total JSS	**95,427**	**23,728**	**563,013**	**95,0**	**792 319**	**-0,085**	**-0,021**	**82**

The iterations of item analysis led to eliminating questions impacting most of the facets highlighted in the JSS tool, with exception to 'nature of work'. The resultant scores across the facets are included in Table 22, most are within the acceptable range of 0,60 - 0,90, however where highlighted in red these facets were omitted. A single question retained for completeness. The retained question had the lowest standard deviation (StDev). Similar to the challenges experienced in the Atlantic Seaboard geographical area, the language presented in the surveys used did not assist in ensuring an internal level of consistency.

Table 22: Cronbach alpha scores (Johannesburg JSS)

Johannesburg: Cronbach Alpha resultant scores across facets			
Facets	**1st test run**	**Omitted item**	**Resultant score**
Pay	0,6776		0,6776
Promotion	0,6821		0,6821
Supervision	0,7562		0,7562
Frings benefits	0,3293	Q4, Q13, Q22 (Retained Q29)	**0,4257**
Contingent rewards	0,6805		0,6805
Operating conditions	-0,0561	Q15, Q31	0,6449
Co-workers	0,5890	Q16, Q34	0,7226
Nature of work	0,6337	Q8, Q17, Q27 (Retained Q35)	**0,5211**
Communication	0,6595		0,6595

Following the hypothesis testing roadmap (Appendix 9.8), the first test performed was to ascertain normality. The data set p-value = 0,276 (Figure 43) indicating that the data set is normally distributed.

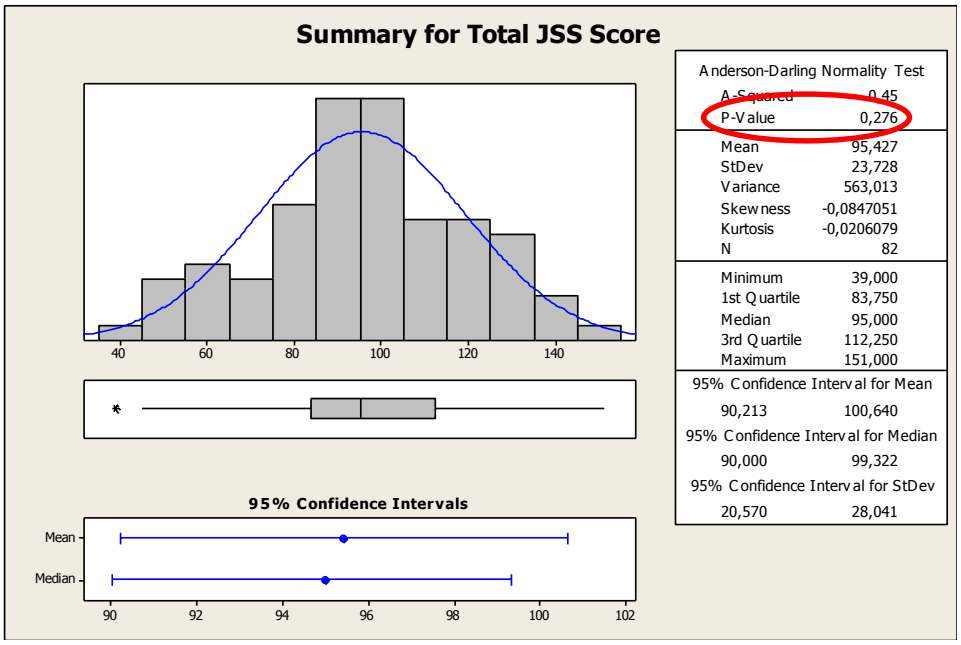


Figure 43: Normality (Johannesburg JSS)

The next consideration on the hypothesis testing roadmap (Appendix 9.8) is the level of interest. The three data sets mean the roadmap is followed to the level of consideration >2, which made it appropriate to run the test for equal variances.

Based on the results of the normality test (Figure 14: Normality (Atlantic Seaboard FFMQ) the Bartlett's Test result was used to determine the appropriate hypothesis test to perform. The low p-value indicates the variances are equal.

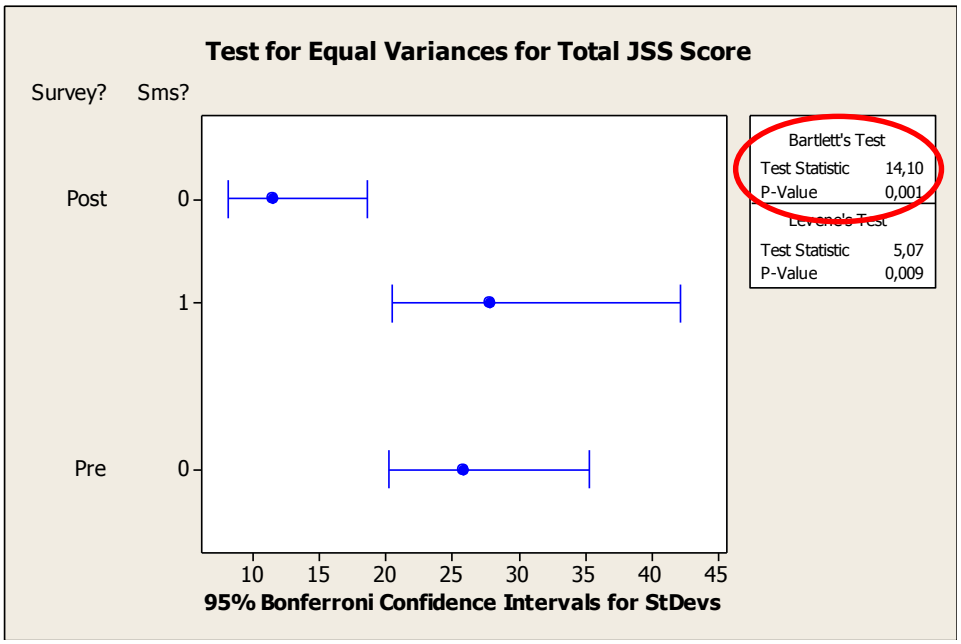


Figure 44: Test for equal variances (Johannesburg JSS)

The hypotheses testing roadmap indicates the appropriate test for normally distributed data with equal variances is a One-way ANOVA.

5.1.2.7 Randburg geographical area

The first test performed on the full response data set, was to establish normality and investigate any special cause variation. This resulted in one response being eliminated, reducing the responses to n=107. Unable to investigate the cause of the variation with the respondent, responses eliminated on the side of prudence.

Table 23: Statistically adjusted data set (Randburg JSS)

Randburg: Descriptive statistics of statistically scrubbed data set								
Survey	**Mean**	**StDev**	**Variance**	**Median**	**SSQ**	**Skewness**	**Kurtosis**	**Count**
Pre (0)	79,405	17,589	309,369	76,5	277 499	0,088	-0,187	42
Post (0)	76,062	15,520	240,871	75,0	391 464	-0,000	0,039	65
Post (1)	No messaging							
Total JSS	**77,374**	**16,364**	**267,783**	**75,0**	**668 963**	**0,078**	**-0,063**	**107**

The iterations of item analysis led to eliminating questions impacting most of the facets highlighted in the JSS tool. The resultant scores across the facets are included in Table 24, most are within the acceptable range of 0,60 - 0,90, however where highlighted in red these facets were omitted. A single question retained for completeness. The retained question had the lowest standard deviation (StDev). Similar to the challenges experienced in the Atlantic Seaboard geographical area, the language presented in the surveys used did not assist in ensuring an internal level of consistency. The 'fringe benefits facet was omitted completely.

Table 24: Cronbach alpha scores (Randburg JSS)

Randburg: Cronbach Alpha resultant scores across facets			
Facets	**1st test run**	**Omitted item**	**Resultant score**
Pay	0,6514		0,6514
Promotion	0,5114	Q20	0,6473
Supervision	0,6824		0,6824
Frings benefits	0,4244	Q4, Q13, Q22, Q29	0,3789
Contingent rewards	0,6199		0,6199
Operating conditions	-0,1887	Q15, Q24, Q31 (Retained Q6)	0,4543
Co-workers	0,3766	Q16, Q34	0,7142
Nature of work	0,5572	Q8, Q17, Q27 (Retained Q35)	0,5211
Communication	0,5761	Q9, Q26, Q18 (Retained Q36)	0,5131

Following the hypothesis testing roadmap (Appendix 9.8), the first test performed was to ascertain normality (Figure 45). The data set is normally distributed (p-value = 0,055).

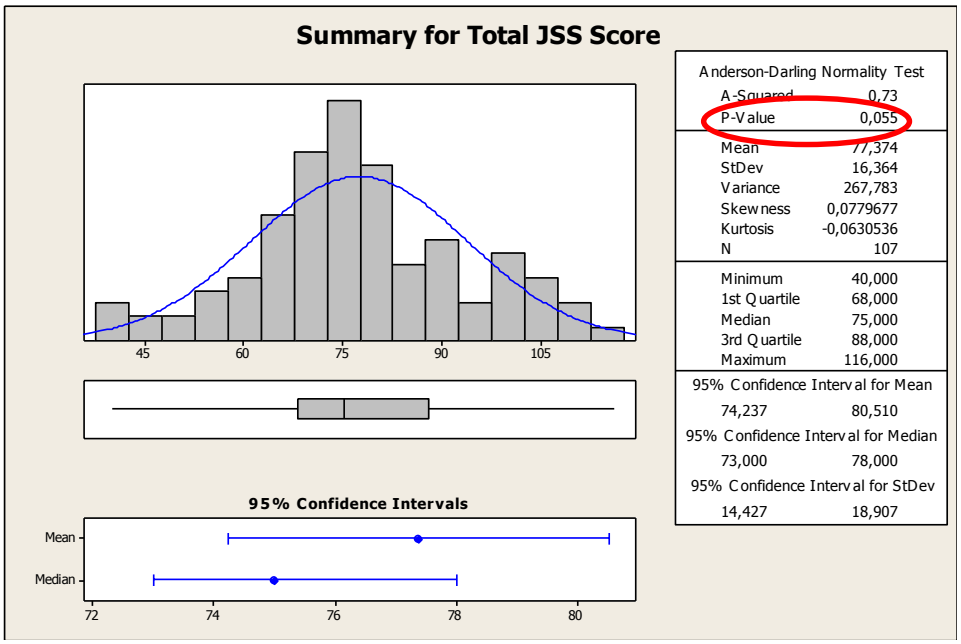


Figure 45: Normality (Randburg JSS)

The normal data distribution requires the F-Test statistic (Figure 46) from the Test for equal variances to determine if the variances are equal; the high p-value indicates the variances are not equal.

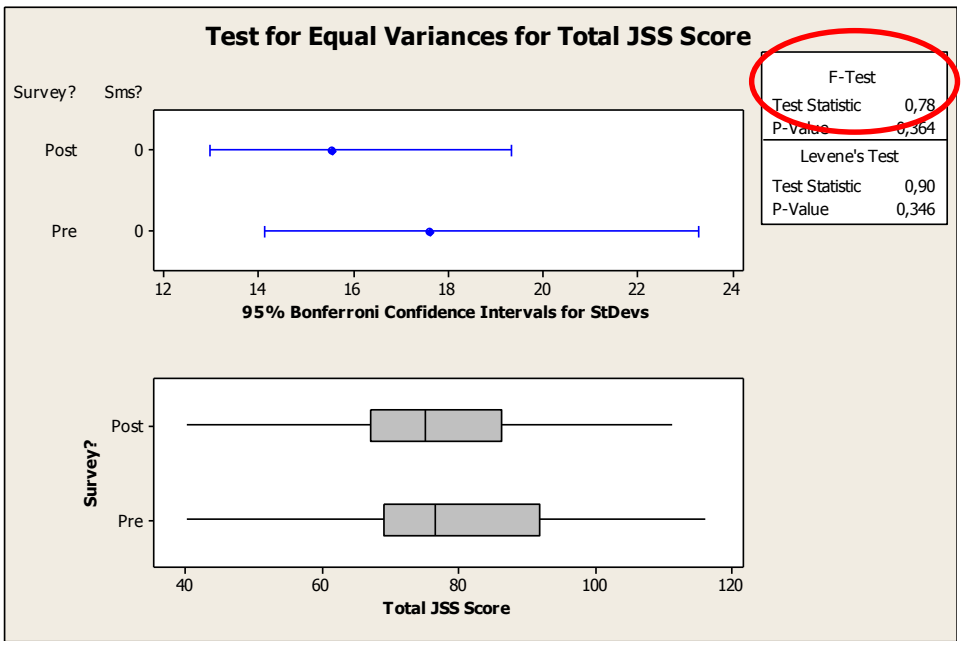


Figure 46: Test for equal variances (Randburg JSS)

The hypothesis testing roadmap (Appendix 9.8) indicates a 2-Sample t-Test is required for normally distributed data, with unequal variances.

5.1.2.8 Winelands geographical area

The first test performed on the full response data set, was to establish normality and investigate any special cause variation. This resulted in one response being eliminated, reducing the responses to n=73. Unable to investigate the cause of the variation with the respondent, responses eliminated on the side of prudence.

Table 25: Statistically adjusted data set (Winelands JSS)

Winelands: Descriptive statistics of statistically scrubbed data set								
Survey	Mean	StDev	Variance	Median	SSQ	Skewness	Kurtosis	Count
Pre (0)	83,333	16,029	256,943	81,0	388 618	0,475	0,041	54
Post (0)	94,211	19,756	390,287	94,0	175 662	-0,057	-0,788	19
Post (1)	No messaging							
Total JSS	**86,164**	**17,601**	**309,806**	**84,0**	**564 280**	**0,407**	**-0,357**	**73**

The iterations of item analysis led to eliminating questions impacting most of the facets highlighted in the JSS tool. The resultant scores across the facets are included in Table 26, most are within the acceptable range of 0,60 - 0,90, however where highlighted in red these facets were omitted. A single question retained for completeness. The retained question had the lowest standard deviation (StDev). Similar to the challenges experienced in the Atlantic Seaboard geographical area, the language presented in the surveys used did not assist in ensuring an internal level of consistency.

Table 26: Cronbach alpha scores (Winelands JSS)

Winelands: Cronbach Alpha resultant scores across facets			
Facets	**1st test run**	**Omitted item**	**Resultant score**
Pay	0,5859	Q10	0,6543
Promotion	0,5411	Q20, Q11, Q2 (Q33 remaining)	0,6035
Supervision	0,6668		0,6668
Frings benefits	0,5217	Q13, Q22	0,6250
Contingent rewards	0,6854		0,6854
Operating conditions	0,3105	Q6, Q15	0,6499
Co-workers	0,5682	Q7, Q16, Q34 (Retained Q25)	**0,5991**
Nature of work	0,6151	Q8, Q17, Q35 (Retained Q27)	**0,5500**
Communication	0,7303		0,7303

Following the hypothesis testing roadmap (Appendix 9.8), the first test performed was to ascertain normality (Figure 47). The data set is normally distributed (p-value = 0,112).

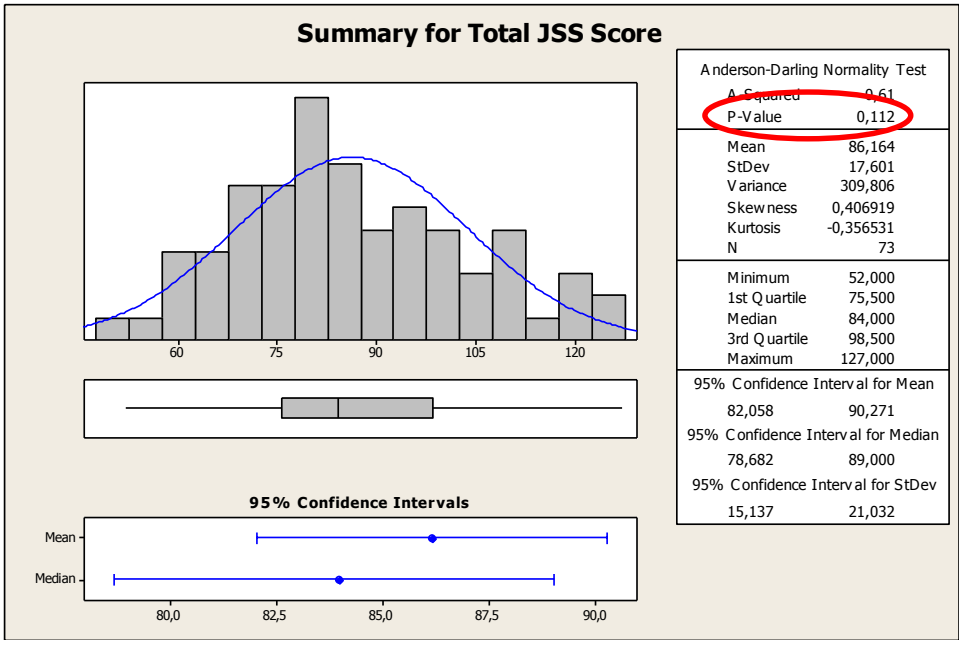


Figure 47: Normality (Winelands JSS)

The normal data distribution requires the F-Test statistic (Figure 48) from the Test for equal variances to determine if the variances are equal; the high p-value indicates the variances are not equal.

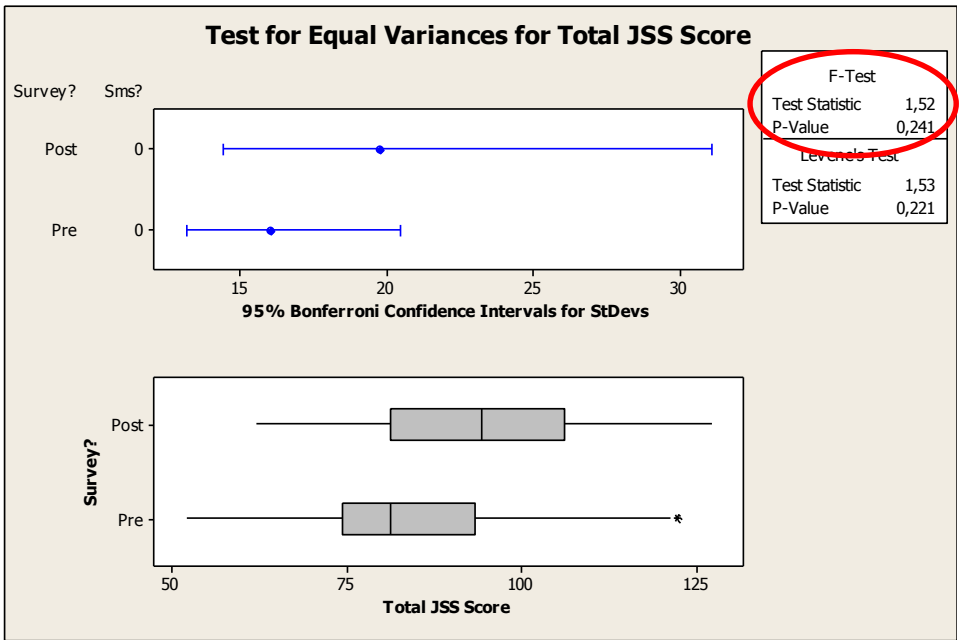


Figure 48: Test for equal variances (Winelands JSS)

The hypothesis testing roadmap (Appendix 9.8) indicates a 2-Sample t-Test is required for normally distributed data, with unequal variances.

5.3.3. Hypothesis testing

5.1.2.9 Atlantic Seaboard geographical

Hypothesis testing One-way ANOVA

One data point is unusual compared to the others in µPost (1), which can have a strong influence on the results. The sample is sufficient to detect differences among the means. Some sample sizes are less than 15, normality cannot be reliably checked, so the results are interpreted with caution.

One-way ANOVA: µPre (0); µPost (0); µPost (1)

Source	DF	SS	MS	F	P
Factor	2	514,7	257,4	3,55	0,034
Error	68	4927,9	72,5		
Total	70	5442,6			

S = 8,513 R-Sq = 9,46% R-Sq(adj) = 6,79%

Individual 95% CIs For Mean Based on Pooled StDev

Level	N	Mean	StDev	----+---------+---------+---------+-----
µPre (0)	36	62,028	9,981	(-----*-----)
µPost (0)	9	53,778	4,944	(----------*----------)
µPost (1)	26	59,154	7,058	(-----*------)
				----+---------+---------+---------+-----
				50,0 55,0 60,0 65,0

Pooled StDev = 8,513

Figure 49: Hypothesis testing One-way ANOVA (Atlantic Seaboard JSS)

- There are differences among the means at the 0,05 level of significance.

H3: µPost(1) > µPost(0)	Pass
D1: µPost(1) > µPre(0)	Fail
D2: µPost(0) > µPre(0)	Fail

5.1.2.10 Johannesburg geographical

Hypothesis testing One-way ANOVA

There are no unusual data points. Unusual data can have a strong influence on the results. The data does not provide sufficient evidence to conclude that there are differences among the means, which may be a result from having small sample. Based on sample sizes and alpha, you would have at least a 90% chance of detecting a difference of 25,7 between any two means. Sample sizes are at least 15 normality is not an issue. The test is accurate with non-normal data when the sample sizes are large enough.

One-way ANOVA: µPre (0); µPost (0); µPost (1)

```
Source  DF     SS   MS     F      P
Factor   2    180   90  0,16  0,856
Error   79  45424  575
Total   81  45604

S = 23,98   R-Sq = 0,39%   R-Sq(adj) = 0,00%


                              Individual 95% CIs For Mean Based on Pooled StDev
Level       N   Mean  StDev   -+---------+---------+---------+--------
µPre (0)   39  96,77  25,83             (-----------*------------)
µPost (0)  19  95,37  11,40       (-----------------*-----------------)
µPost (1)  24  93,29  27,76     (---------------*----------------)
                               -+---------+---------+---------+--------
                              84,0      90,0      96,0     102,0

Pooled StDev = 23,98
```

Figure 50: Hypothesis testing One-way ANOVA (Johannesburg JSS)

- You cannot conclude that there are differences among the means at the 0,05 level of significance; p-value =0,856.

H3: µPost(1) > µPost(0)	Fail
D1: µPost(1) > µPre(0)	Fail
D2: µPost(0) > µPre(0)	Fail

5.1.2.11 **Randburg geographical area**

Hypothesis testing 2-Sample t-Test

Two-Sample T-Test and CI: µPre (0); µPost (0)

```
Two-sample T for µPre (0) vs µPost (0)

            N  Mean  StDev  SE Mean
µPre (0)   42  79,4   17,6      2,7
µPost (0)  65  76,1   15,5      1,9


Difference = mu (µPre (0)) - mu (µPost (0))
Estimate for difference:  3,34
95% upper bound for difference:  8,88
T-Test of difference = 0 (vs <): T-Value = 1,00  P-Value = 0,841  DF = 79
```

Figure 51: Hypothesis testing 2-Sample t-Test (Randburg JSS)

There are no unusual data points. Both sample sizes are at least 15 normality is not an issue.

- Test: There is not enough evidence to conclude that the mean of µPre (0) is less than µPost (0) at the 0,05 level of significance.

  D3: µPost(0) > µPre(0) Fail

- CI: Quantifies the uncertainty associated with estimating the difference from sample data. With a 90% confidence level the true difference is between -2,1948 and 8,8813.

5.1.2.12 **Winelands geographical area**

Hypothesis testing 2-Sample t-Test

Two-Sample T-Test and CI: µPre (0); µPost (0)

```
Two-sample T for µPre (0) vs µPost (0)

             N  Mean  StDev  SE Mean
µPre (0)    54  83,3   16,0      2,2
µPost (0)   19  94,2   19,8      4,5


Difference = mu (µPre (0)) - mu (µPost (0))
Estimate for difference:  -10,88
95% upper bound for difference:  -2,30
T-Test of difference = 0 (vs <): T-Value = -2,16  P-Value = 0,020  DF = 26
```

Figure 52: Hypothesis testing 2-Sample t-Test (Winelands JSS)

One data point is unusual compared to the others in µPre (0). Both sample sizes are at least 15, normality is not an issue. The sample is sufficient to detect a difference between the means.

- Test: The mean of µPre (0) is less than µPost (0) at the 0,05 level of significance.

  D3: µPost(0) > µPre(0) Pass

- CI: Quantifies the uncertainty associated with estimating the difference from sample data. With a 90% confidence level the true difference is between -19,456 and -2,2982.

5.3.4. Summary of results

Table 27: Summary of JSS hypothesis testing results

Methodology	Western Cape	Gauteng
PDCA + Messaging (Experiment)	Atlantic Seaboard µPost(1) > µPost(0) Pass µPost(1) > µPre(0) Fail µPost(0) > µPre(0) Fail	Johannesburg µPost(1) > µPost(0) Fail µPost(1) > µPre(0) Fail µPost(0) > µPre(0) Fail
No change (Control)	Winelands µPost(0) > µPre(0) Pass	Randburg µPost(0) > µPre(0) Fail

5.4 All results aligned to 3-part habit routine

Table 28: Hypothesis testing results aligned to 3-part habit routine

Habit component	Cue (FFMQ) [H1]	Routine (LSS PDCA) [H2]	Reward (JSS) [H3]	Cue (FFMQ) [H1]	Routine (LSS PDCA) [H2]	Reward (JSS) [H3]
Area	**Western Cape**			**Gauteng**		
PDCA + Messaging (Experiment)	**Atlantic Seaboard**			**Johannesburg**		
	Mdn Post(1) > Mdn Post(0) Fail	µPost(1) < µPost(0) Fail	**µPost(1) > µPost(0) Pass**	**Mdn Post(1) > Mdn Post(0) Pass**	µPost(1) < µPost(0) Fail	µPost(1) > µPost(0) Fail
	Mdn Post(1) > Mdn Pre(0) Fail	**µPost(1) < µPre(0) Pass**	µPost(1) > µPre(0) Fail	Mdn Post(1) > Mdn Pre(0) Fail	µPost(1) < µPre(0) Fail	µPost(1) > µPre(0) Fail
	Mdn Post(0) > Mdn Pre(0) Fail	µPost(0) < µPre(0) Fail	µPost(0) < µPre(0) Fail	Mdn Post(1) > Mdn Pre(0) Fail	**µPost(0) < µPre(0) Pass**	µPost(0) > µPre(0) Fail
NO Change (Control)	**Winelands**			**Randburg**		
	µPost(0) > µPre(0) Failed	µPost(0) < µPre(0) Fail	**µPost(0) > µPre(0) Pass**	**µPost(0) > µPre(0) Pass**	**µPost(0) < µPre(0) Pass**	µPost(0) > µPre(0) Fail

Table 28 summarises the results from the preceding section of hypotheses tests, aligning it by region to the 3-part habit routine. At first glance, the hypotheses are not consistently successful within the geographical areas. The results discussion delves into the detail before drawing any conclusions.

6 Discussion of results

As a premise to start the discussion of the various results from the hypotheses tested, Table 29 is populated with both the expected results from the study, and the achieved results from the hypotheses. Table 29 highlights the design across the four geographical areas that deal with reliability and validity.

Table 29: Expected changes vs. achieved results across 3-part habit routine

Habit component (Testing instrument) [Hypothesis]	**Survey group (msg?)**	**Cue (FFMQ) [H1]**	**Routine (LSS) [H2]**	**Reward (JSS) [H3]**	**Cue (FFMQ) [H1]**	**Routine (LSS) [H2]**	**Reward (JSS) [H3]**
Regions		Western Cape			Gauteng		
Experimental groups		Atlantic Seaboard			Johannesburg		
PDCA Messaging (Main)	Post(1) > Post(0)	Pass● / Fail■	Pass / Fail	Pass / **Pass**	Pass / **Pass**	Pass / Fail	Pass / Fail
20-day time horizon *(D1)*	Post(1) > Pre(0)	Pass / Fail	Pass / **Pass**	Pass / Fail	Pass / Fail	Pass / Fail	Pass / Fail
PDCA NO Messaging (0) *(D2)*	Post(0) > Pre(0)	Fail / Fail	Pass / Fail	Fail / Fail	Fail / Fail	Pass / **Pass**	Fail / Fail
Control groups		Winelands			Randburg		
NO Change *(D3)*	Post(0) > Pre(0)	Fail / Fail	Fail / Fail	Fail / **Pass**	Fail / **Pass**	Fail / **Pass**	Fail / Fail

● Expected results indicated in top left triangle of small block (The same applies for all other small squares). ■ Bottom right triangle of small square indicates actual results from hypotheses tested (The same applies for other small blocks)

6.1 Cue component discussion

6.1.1 Main hypothesis

The main hypothesis (section 3.1.1), tested whether contextual cues relating to the intended change initiative increase the mindfulness test score over a predetermined time horizon using the tested FFMQ (Appendix 9.5). Results across the two regions, Western Cape and Gauteng are different (Table 29).

- Atlantic Seaboard Fail
- Johannesburg Pass

Factors to consider include (1) reliability, (2) content and context issues (section 6.1.2.3), and (3) validity of messaging.

In isolation, this indicates the results are not replicable; however, dimension 3's results for the particular hypotheses across the two regions are the same, which (is explained in more detail in section 6.1.2) indicates an inherent shift or internal environmental change within the specific region.

The same message content, delivered at similar times produced the expected result. As previously stated, the contextual cues delivery was consistent to the randomly selected participants; however, the daily operational conditions influenced actual delivery. Across the geographical areas, a 75% execution rate was achieved; ten contextual cues across the two geographical areas were not sent out. This as indicated in the study by Lally et al. (2010) does not have a significant impact on the habit formation process.

Messaging positioned as an additional operational mechanism to communicate a basic change requirement (Armenakis & Bedeian, 1999) explains the reasoning to do so, but does not explain the content to ensure the message actually achieves what is intended (Saunders & Lewis,

2012). Ziber (2007) suggests a well-formulated message will elicit new behaviours; however, in the context of the study this is untested. A well-formulated message is undefined and inferred. The impact language has on the effectiveness is broadly recognised (Amis & Aïssaoui, 2013). Testing the effectiveness of the contextual cues presents itself as an opportunity.

Simplistically the same change content, change process and change context produced the desired results in the Johannesburg area. The result for the hypothesis in the Johannesburg region, suggests that communication as a standard requirement for an LSS PDCA initiative combined with daily messaging has improved the mindfulness measure of participants. However, this statement is not supported when one considers the results of the internal environmental measure.

The potential obstacle as highlighted by Holt and Vardaman, is that an attitude change has not occurred.

6.1.2 Dimension hypotheses

6.1.2.1 Dimension 1

The first dimension hypotheses results replicated over the two regions, yet did not achieve the positive outcomes that were the aim of the study. The expectation that the messaging would have an impact over the 20-day period did not materialise.

- Atlantic Seaboard Fail
- Johannesburg Fail

Two factors to consider include (1) time horizon of measure and, (2) validity of messaging.

The time horizon choice reflected in the research methodology relates to automaticity in the context of habits (Lally et al., 2011). Potentially

the time horizon is not appropriate to achieve a change in the mindfulness measure over a period of 20 days.

The same arguments apply, as discussed in section 6.1.1 relating to messaging validity.

6.1.2.2 Dimension 2

The second dimension to establish the variation on the mindfulness score without contextual cues is as expected. No improvement on the FFMQ score reflected in the hypotheses tested, and replicated across the regions. Therefore, the mindfulness score has not improved for the participants involved in the change initiative.

- Atlantic Seaboard Fail
- Johannesburg Fail

The communication to operationalise the actions required to make the changes to the organisational routine, have had no impact on the mindfulness score of participants. This is the expected result, when deploying the systematic LSS: PDCA methodology no specific content requirements deal with mindfulness.

6.1.2.3 Dimension 3

The third dimension test results gauge the climate of the internal environment; the status quo under normal operating conditions. No change initiative implemented, therefore no participants received any communication about the intent of the change or potential benefits of the programme, and yet the results from the Gauteng region indicate a change (Table 29).

- Winelands Fail
- Randburg Pass

Although the research methodology did not mitigate for additional antecedents (Appendix 9.2) highlighted in the context theme as outlined by Choi (2011), conventional wisdom about the organisation brings forward a few factors that could contribute to the justification for the different results.

The zero-harm objective is a strategic project to improve safety, but more importantly accidents in the workplace. This continued focus requires communication through formal and informal channels. The strategic priority aligns with daily operations through incentive schemes that influence individuals. The assessment tool and surveys all included introductory paragraphs requesting participants to answer the questions in the context of safety.

6.1.3 Summary

Some results are unexpected. A closer look at why this occurred means considering the two regions alongside the content, context and process issues as well as the individual level construct. The antecedents for readiness to change on the individual level construct include change self-efficacy, perceived personal competence, job satisfaction, and organisational commitment (Appendix 9.4).

The research methodology did not mitigate for the antecedents mentioned above, with exception to job satisfaction. The impact of not considering all context and content in the planning phase, (Armenakis & Bedeian, 1999) is inferred as one of the contributing factors to not achieving the desired outcome. The rationale to implement change programmes as cost effectively as possible, whilst driving towards the desired outcomes, is potentially the reason for the general low success rate quoted in literature.

Empirical evidence from this study suggests no consistent result to improve the mindfulness score within the predetermined time horizon of 20 days. Contextual cue do not have an impact on the mindfulness score, within the context of the 20-day time horizon.

6.2 Routine component discussion

6.2.1 Main hypothesis

The main hypothesis (section 3.2) tested the results of a LSS PDCA systematic change initiative to determine if an improvement is achievable when the messaging component is combined with the deployment efforts. The outcomes across the two regions are the same and failed to produce results that suggested daily messaging enhance the normal change success rate.

- Atlantic Seaboard Fail
- Johannesburg Fail

Behaviour changes are not easily achieved (Rafferty & Simons, 2006). This result indicates the 20-day time horizon is not adequate to establish automaticity.

6.2.2 Dimension hypotheses

6.2.2.1 Dimension 1

The first dimension testing the change in violations prior to the deployment of the change initiative, to the post measurement with messaging, over the 20-day time horizon produced different results. Extracted from Table 29 the results highlighted below.

- Atlantic Seaboard Pass
- Johannesburg Fail

The two geographical areas results are not replicable; however, in isolation the favourable result in the Atlantic Seaboard is interesting. Kotter's (1996) 8-step process highlights the benefit of achieving short-term wins (Duhigg, 2012), although not linked to a specific time horizon; this in terms of the specific change initiative is a short-term win. The objective to improve the infringement logged as violations requires new behaviours from the participants.

Although this is a longitudinal study, recognised as a pre-requisite for change initiatives (Armenakis & Bedeian, 1999), the 20-day time horizon choice seems to be questionable. On the one hand, the LSS PDCA methodology advocates a longer period to ensure the process is in statistical control before deploying on a large scale, and on the other studies indicate as little as seven days is appropriate to measure automaticity (Lally et al., 2010).

6.2.2.2 Dimension 2

Dimension two, testing the impact of not applying the change initiative in combination with messaging, highlights different results across the geographical regions. The adopted technical change methodology applied within the organisation is expected to render positive results.

- Atlantic Seaboard Fail
- Johannesburg Pass

In isolation, this indicates the results are not replicable; however, dimension three's results for the particular hypotheses across the two regions are the same, which (is explained in more detail below)

indicates an inherent shift or internal environmental change within the specific region.

The most significant contributor to the failure of the change initiative is highlighted in the incentive programme linked to this organisational routine (Shin et al., 2012), or more specifically on the individual level, the habit. The incentive works counter productively toward the habit that needs to be changed. The incentive reinforces the existing behaviour. Behavioural changes will not take place if the incentive scheme is not amended to encourage the desired outcome of the change initiative (Aiken & Keller, 2009; Armenakis & Bedeian, 1999).

6.2.2.3 Dimension 3

The third dimension test results gauge the status or climate of the internal environment; the status quo under normal operating conditions. No change initiative was implemented, therefore no participants received any communication about the intent of the change or potential benefits of the programme, and yet the results from the Gauteng region indicate a change (Table 29).

- Winelands Fail
- Randburg Pass

Although the research methodology did not mitigate for additional antecedents (Appendix 9.3) highlighted in the process theme as outlined by Choi (2011), conventional wisdom about the organisation brings forward a few factors that could contribute to the justification for the different results.

As for many organisations operating in the 21st century, change and change programmes are necessary to retain their economic viability. These programmes run for an extended period, and put the

organisation in a “climate of constant change” (Armenakis & Bedeian, 1999, p. 309). High employee stress levels influence the success of change programmes (Shin et al., 2012). An additional process theme highlighted by both Choi (2011) and Armenakis and Bedeian (1999) is the history of change programmes. The organisation’s record of accomplishment, and by similar account for other organisations (Amis & Aïssaoui, 2013; Vakola, 2013; Shin et al., 2012; Beer & Nohria, 2000; Kotter, 1996), mirrors the broader literature of low success rates.

6.2.3 Summary

Empirically, the objective to prove contextual cues combined with communication about the change initiative to participants, has the ability to foster new routines and/or behaviours in participants is evident.

6.3 Reward component discussion

6.3.1 Main hypothesis

The expected result for the main hypothesis (section 3.3) is to have improved the job satisfaction score over the 20-day time horizon. The LSS PDCA initiative included communication about the intent, objectives, and actions needed to improve the business metric. Continued daily contextual cues sent to participants, create a daily awareness or mindfulness of the change initiative, and therefore by implication have an intrinsic impact on job satisfaction. Results across the two regions Gauteng and the Western Cape are different (Table 29).

- Atlantic Seaboard: Pass
- Johannesburg Fail

In isolation, this indicates the results are not replicable; however, dimension 3's results for the particular hypothesis across the two regions are the same, which indicates an inherent shift or environmental change within the Western Cape region.

The study handles job satisfaction as an intrinsic measure of the efforts applied to the mindfulness of participants, so it is appropriate to look at the relationships between the two antecedents highlighted within the study.

Table 30:Hypothesis test results for cue vs. reward

Habit part (Testing instrument) [Hypothesis]	**Cue (FFMQ) [H1]**	**Reward (JSS) [H3]**	**Cue (FFMQ) [H1]**	**Reward (JSS) [H3]**
Regions	Western Cape		Gauteng	
Experimental groups	Atlantic Seaboard		Johannesburg	
PDCA Messaging (Main)	Fail	**Pass**	**Pass**	Fail
20-day time horizon *(Dimension 1)*	Fail	Fail	Fail	Fail
PDCA NO Messaging *(Dimension 2)*	Fail	Fail	Fail	Fail
Control groups	Winelands		Randburg	
NO Change *(Dimension3)*	Fail	**Pass**	**Pass**	Fail

In most instances, the results achieved for the mindfulness hypotheses correlate with the subsequent job satisfaction hypotheses results. The most important main hypothesis fails; increasing the mindfulness measure (with messaging) of participants, leads to an increase in the job satisfaction score. Underpinning the results however, is the results for dimension 3, the status quo of the operating environment shifted.

6.3.2 Dimension hypotheses

6.3.2.1 Dimension 1

The expected result that an improvement is achievable in the job satisfaction score is not evident. The results are however correlated to the results for mindfulness.

- Atlantic Seaboard: Fail
- Johannesburg Fail

6.3.2.2 Dimension 2

The expected result that no improvement is achievable in the job satisfaction score is evident. The standard deployment of the LSS PDCA across the two geographical areas is the same.

- Atlantic Seaboard: Fail
- Johannesburg Fail

As expected as the results are, this is the missed opportunity for change practitioners and organisations that want to improve the success rate of change initiatives. Pairing technical change methodologies with affective and behavioural factors will improve success ratios (Armenakis & Bedeian, 1999).

6.3.2.3 Dimension 3

The third dimension test results gauge the status or climate of the internal environment; the status quo under normal operating conditions. No change initiative implemented, therefore no participants received any communication about the intent of the change or potential benefits of the programme, and yet the results from the Western Cape geographical region indicate a change (Table 29).

- Winelands Pass
- Randburg Fail

Although the research methodology did not mitigate for additional antecedents (Appendix 9.2) highlighted in the context theme as outlined by Choi (2011), conventional wisdom about the organisation and external environment brings forward a few factors that could contribute to the justification for the different results.

South Africa has made international news about the extent to which workers are striking about compensation. The job satisfaction survey measures various facets, which include pay, fringe benefits and contingent rewards. This external factor could definitely have had an impact on the results.

6.3.3 Summary

Empirically, the main objective to prove contextual cues combined with communication about the change initiative to participants, has not lead to a subsequent increase in the job satisfaction score.

6.4 Research limitations

One of the first risks associated with the study in the context of implementing it in a South African services organisation, was the language used in the assessment tools to determine the mindfulness and job satisfaction scores. The small pilot study with volunteers that represented the participants did not provide feedback necessitating any changes to the standard assessment format (Appendix 9.5 and 9.6). The internal consistency of the questions across the facets required a systematic process (discussed in Chapter 5) to achieve acceptable Cronbach alpha scores.

Time constraints weighed heavily on the decision to run the study for a 20-day time horizon. Although the literature on automaticity highlights measures taken seven days apart (Lally et al., 2010) this is very short time horizon. Conventionally the full DMAIC deployment of LSS runs for 12 months, with incremental change evident over the period.

The message content is untested for aligning with the definition of “well-formulated” (Armenakis & Bedeian, 1999, p. 302) and would benefit with a feedback communication mechanism to ensure the participants read the content.

Automating the delivery of the contextual cues to coincide with the intended time of day (Wood et al., 2005) will mitigate the uncertainty as to whether the operational constraints resulting in non-delivery had an impact on the outcome of the study.

The decision to use the LSS PDCA approach to implement the organisation routine change was based on convenience. The chosen organisation utilise the change methodology in the course of normal business. This did negate the requirement to teach people how to implement a change programme that required an organisational routine change.

The organisation has just been through an 18-month organisational transformation that is still not finalised. Workplace demands impact employee stress levels (Shin et al., 2012), particularly in a climate of constant change.

7 Consolidation

Notwithstanding the research limitations, the contribution of this study to the body of evidence has highlighted the benefit of recognising that the 3-part habit routine has merit to enhance intended change initiative outcomes.

7.1 Conclusion

Drawing on the consolidation of the hypotheses, Table 31 highlights success within the context of intended organisational change. The aim to amend embedded routines and/or automatic behaviours by providing contextual cues at a specific time of day is evident.

Table 31: Concluding results of the 3-Part habit routine components

Habit component [Hypothesis]	**Cue [H1]**	**Routine [H2]**	**Reward [H3]**	**Cue [H1]**	**Routine [H2]**	**Reward [H3]**
Regions	**Western Cape**			**Gauteng**		
Experimental groups	**Atlantic Seaboard**			**Johannesburg**		
PDCA Messaging (Main)	Pass● / Fail■	Pass / Fail	Pass / Pass	Pass / Pass	Pass / Fail	Pass / Fail
20-day time horizon *(Dimension 1)*	Pass / Fail	Pass / Pass	Pass / Fail	Pass / Fail	Pass / Fail	Pass / Fail
PDCA NO Messaging (0) *(Dimension 2)*	Fail / Fail	Pass / Fail	Fail / Fail	Fail / Fail	Pass / Pass	Fail / Fail
Control groups	**Winelands**			**Randburg**		
NO Change *(Dimension3)*	Fail / Fail	Fail / Fail	Fail / Pass	Fail / Pass	Fail / Pass	Fail / Fail

● *Expected results indicated in top left triangle of small block (The same applies for all other small squares).*
■ *Bottom right triangle of small square indicates actual results from hypotheses tested (The same applies for other small blocks)*

Although empirically the study does not provide evidence that the change communication paired with contextual cues improve the mindfulness measure of participants, the findings suggest context, content and process issues have a significant impact on the success rate of organisational

change programmes. Not considering these within the context of the intended change programme, will lead to a less than expected result and/or potentially different results as evidenced in the standard LSS PDCA hypotheses outcomes.

Similarly, the job satisfaction scores have not improved because of an improvement in the mindfulness scores. This interaction or lack of an interaction is not empirically evident. The findings suggest context, content and process issues have an impact.

7.2 Ideas for future research

i. The future prospect of this study is the opportunity to replicate it within a more controlled environment, so that more of the potential content, context and process issues are alleviated.

ii. Replicating the study, but increasing the longitudinal time horizon to deal with the question of automaticity is an opportunity within the current organisation. The mechanisms used to complete the study are intact, which makes it replicable and scalable.

iii. Within the context of establishing a longitudinal time horizon that empirically proves automaticity of the organisational routine, replicating the outcome of said study by varying the organisational routine's complexity to determine the impact will contribute to the body of knowledge.

iv. Adding a simple unique identifier on the assessment tool responses, enabling paired t-tests will prove useful to measure the influence on the mindfulness and job satisfaction scores. Simply being able to correlate the three parts across the study will provide a more

granular view of the variables and the relationships, contributing to research toward the individual level construct.

v. Automating delivery of the contextual cue and including a feedback loop to ensure a read-receipt will enable a more robust indication if contextual cues have an impact on the mindfulness scores.

7.3 Practical implication for managers

As with any change programme, this study took considerable planning. Armenakis and Bedeian (1999) highlight the importance of considering context and content factors. Many of which are can be external and uncontrollable. Operating in the 21st century makes it not only necessary, but also imperative to have the ability to change. The reality is that an organisation has to weigh up the benefits of a proposed change programme with the foreseen cost of implementation, but it is noteworthy that without considering the context and content issues the success ratio can be lower than the expectations. The distinction between what to consider as important and what issues are potentially going to influence the change efforts, is still relatively undefined.

Not including considerations for affective and behavioural factors into intended change programmes will continue to influence the effectiveness of change agents, and practitioners.

The apparent success in the use of contextual cues assist practitioners in communicating the objectives and potential benefits of intended change programmes, which supports the efforts to engage and encourage individuals to support change programmes.

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9. Appendixes

9.1. TABLE I: Summary of literature review: Overview of change attitudinal constructs – Change content (Choi, 2011)

Theme	Attitudinal constructs	Readiness for change	Commitment to change	Openness to change	Cynicism about organisational change
Change content	**Communication/ Information sharing**		Sharing the vision, the progress, and likely consequences of the intended change (Shum et al.,2008)	Information sharing during change implementation (Wanberg & Banas, 2000); Perceived quality of received information about changes (Miller et al., 1994)	Information sharing during change implementation (Stanley et al., 2005); Perceived quality of received information about changes (Qian & Daniels, 2008)
	Extent of change		Extent of change in the work unit and on individuals' job (Fedor et al., 2006; Herold et al., 2007)		
	Favourableness of change outcome	***Affect (Rafferty et al. (2013);***	Favorableness of change on individuals' job and for the work unit members (Fedor et al., 2006); Distributive change justice (Bernerth et al., 2007); Improvements of the work environment (Devos et al., 2001)		Distributive change justice (Bernerth et al., 2007)
	Appropriateness of change		Congruence between a change initiative and an organization's vision (Parish et al., 2008); Change appropriateness (Neves, 2009)		

9.2. TABLE II: Summary of literature review: Overview of change attitudinal constructs – Change context (Choi, 2011)

Theme	Attitudinal constructs	Readiness for change	Commitment to change	Openness to change	Cynicism about organisational change
Change context	Organisational culture	Human relation (Clan) culture and open system (Adhocracy) culture (Jones et al., 2005); Perceived participation at work (Eby et al., 2000); Social relationships in the workplace (Hanpachern, Morgan, & Griego, 1998; Madsen et al., 2005); Trust in peers (Rafferty & Simons,2006	Human relation (Clan) culture (Shum et al., 2008) Information	Information environment (Ertürk, 2008; Miller et al., 1994)	Decision-making climate characterized by employee involvement in decision making (Brown & Cregan, 2008); Information sharing climate (Brown & Cregan, 2008); Perceived group cohesion (Cindy et al., 2007); Cynicism of colleagues (Qian & Daniels, 2008)
	Organisation-al capabilities to change	Organization's ability to accommodate changing situations (Eby et al., 2000; Jones et al., 2005); Flexible policies and procedures (Eby et al., 2000; McNabb & Sepic, 1995; Rafferty & Simons, 2006)	Cross-functional integration (Shum et al., 2008); Provision of the adequate technology/infrastructure to support change (Shum et al., 2008); Employees' satisfaction with HR practices (Conway & Monks, 2008)		
	Leadership	Trust in leaders (Rafferty & Simons, 2006)	Employee–manager relationship (Parish et al.,2008); Transformational leadership (Herold et al., 2008; Michaelis et al., 2010); Facilitative leadership (Shum et al., 2008); Leaders' change management practices (Herold et al., 2008); Role autonomy (Parish et al., 2008)	Trust in executive management (Devos et al., 2007; Ertürk, 2008)	Effective leadership practices (Wanous et al., 2000); Management cynicism (Stanley et al., 2005); Transformational leadership (Bommer et al., 2005; Cindy et al., 2007); Trust in leaders (Qian & Daniels, 2008)

9.3. TABLE III: Summary of literature review: Overview of change attitudinal constructs – Change process (Choi, 2011)

Theme	Attitudinal constructs	Readiness for change	Commitment to change	Openness to change	Cynicism about organisational change
Change process	History of change	Successful history of change (Devos et al., 2001)	Successful history of change (Devos et al., 2001)	Successful history of change (Devos et al., 2007)	Positive experience with previous change projects (Wanous et al., 2000)
	Participation and involvement in change	Participation in change projects (Devos et al.2001) and/or in training (Shum et al., 2008); Fairness of the change process (Fedor et al.,2006); Procedural justice of the change process (Bernerth et al., 2007; Foster, 2010); Interactional justice of the change process (Foster, 2010)	Participation in change projects (Devos et al. 2001) and/or in training (Shum et al., 2008); Fairness of the change process (Fedor et al.,2006); Procedural justice of the change process (Bernerth et al., 2007; Foster, 2010); Interactional justice of the change process (Foster, 2010)	Participation in decision process (Ertürk, 2008; Wanberg & Banas, 2000); Exposure to change (Axtell et al., 2002)	Participation in decision process (Wanous et al., 2000); Interactional justice of the change process (Bernerth et al., 2007; Cindy et al., 2007)

9.4. TABLE IV: Summary of literature review: Overview of change attitudinal constructs – Individual level construct

(Choi, 2011)

	Attitudinal constructs	Readiness for change	Commitment to change	Openness to change	Cynicism about organisational change
Individual level construct	**General attitudes in workplace**	Change self-efficacy (C. E. Cunningham et al., 2002; Kwahk & Lee, 2008; Rafferty & Simons, 2006); Perceived personal competence (Kwahk & Kim, 2008); **Job satisfaction (McNabb & Sepic, 1995);** Organizational commitment (Kwahk & Kim, 2008; Kwahk & Lee, 2008; Madsen et al., 2005)	Change self-efficacy (Herold et al., 2007); Job satisfaction (Devos et al., 2001); Job motivation (Parish et al., 2008)	Change self-efficacy (Wanberg & Banas, 2000)	
	Personality (states)	**Mindfulness (Holt & Vardaman, 2013)**	Locus of control (Chen & Wang, 2007)	Locus of control (Wanberg & Banas, 2000); Personal resilience (Wanberg & Banas, 2000); Need for achievement (Miller et al.,1994)	Active orientation (Brown & Cregan, 2008)

9.5 Mindfulness assessment tool (FFMQ)

(Baer, et al., 2008; Association for Behavioral and Cognitive Therapies, 2008)

Please rate each of the following statements using the scale provided. Write the number in the blank that best describes your own opinion of what is generally true for you.

1	2	3	4	5
never or very rarely true	rarely true	sometimes true	often true	very often or always true

1. When I'm walking, I deliberately notice the sensations of my body moving.
2. I'm good at finding words to describe my feelings.
3. I criticize myself for having irrational or inappropriate emotions.
4. I perceive my feelings and emotions without having to react to them.
5. When I do things, my mind wanders off and I'm easily distracted.
6. When I take a shower or bath, I stay alert to the sensations of water on my body.
7. I can easily put my beliefs, opinions, and expectations into words.
8. I don't pay attention to what I'm doing because I'm daydreaming, worrying, or otherwise distracted.
9. I watch my feelings without getting lost in them.
10. I tell myself I shouldn't be feeling the way I'm feeling.
11. I notice how foods and drinks affect my thoughts, bodily sensations, and emotions.
12. It's hard for me to find the words to describe what I'm thinking.
13. I am easily distracted.
14. I believe some of my thoughts are abnormal or bad and I shouldn't think that way.
15. I pay attention to sensations, such as the wind in my hair or sun on my face.
16. I have trouble thinking of the right words to express how I feel about things
17. I make judgments about whether my thoughts are good or bad.
18. I find it difficult to stay focused on what's happening in the present.

19. When I have distressing thoughts or images, I “step back” and am aware of the thought or image without getting taken over by it.
20. I pay attention to sounds, such as clocks ticking, birds chirping, or cars passing.
21. In difficult situations, I can pause without immediately reacting.
22. When I have a sensation in my body, it’s difficult for me to describe it because I can’t find the right words.
23. It seems I am “running on automatic” without much awareness of what I’m doing.
24. When I have distressing thoughts or images, I feel calm soon after.
25. I tell myself that I shouldn’t be thinking the way I’m thinking.
26. I notice the smells and aromas of things.
27. Even when I’m feeling terribly upset, I can find a way to put it into words.
28. I rush through activities without being really attentive to them.
29. When I have distressing thoughts or images I am able just to notice them without reacting.
30. I think some of my emotions are bad or inappropriate and I shouldn’t feel them.
31. I notice visual elements in art or nature, such as colors, shapes, textures, or patterns of light and shadow.
32. My natural tendency is to put my experiences into words.
33. When I have distressing thoughts or images, I just notice them and let them go.
34. I do jobs or tasks automatically without being aware of what I’m doing.
35. When I have distressing thoughts or images, I judge myself as good or bad, depending what the thought/image is about.
36. I pay attention to how my emotions affect my thoughts and behavior.
37. I can usually describe how I feel at the moment in considerable detail.
38. I find myself doing things without paying attention.
39. I disapprove of myself when I have irrational ideas.

9.6 Job satisfaction assessment tool (JSS)

(Spector P. E., 2012)

	JOB SATISFACTION SURVEY Paul E. Spector Department of Psychology University of South Florida Copyright Paul E. Spector 1994, All rights reserved.	
	PLEASE CIRCLE THE ONE NUMBER FOR EACH QUESTION THAT COMES CLOSEST TO REFLECTING YOUR OPINION ABOUT IT Copyright Paul E. Spector 1994, All rights reserved..	Disagree very much / Disagree moderately / Disagree slightly / Agree slightly / Agree moderately / Agree very much
1	I feel I am being paid a fair amount for the work I do.	1 2 3 4 5 6
2	There is really too little chance for promotion on my job.	1 2 3 4 5 6
3	My supervisor is quite competent in doing his/her job.	1 2 3 4 5 6
4	I am not satisfied with the benefits I receive.	1 2 3 4 5 6
5	When I do a good job, I receive the recognition for it that I should receive.	1 2 3 4 5 6
6	Many of our rules and procedures make doing a good job difficult.	1 2 3 4 5 6
7	I like the people I work with.	1 2 3 4 5 6
8	I sometimes feel my job is meaningless.	1 2 3 4 5 6
9	Communications seem good within this organization.	1 2 3 4 5 6
10	Raises are too few and far between.	1 2 3 4 5 6
11	Those who do well on the job stand a fair chance of being promoted.	1 2 3 4 5 6
12	My supervisor is unfair to me.	1 2 3 4 5 6
13	The benefits we receive are as good as most other organizations offer.	1 2 3 4 5 6
14	I do not feel that the work I do is appreciated.	1 2 3 4 5 6
15	My efforts to do a good job are seldom blocked by red tape.	1 2 3 4 5 6
16	I find I have to work harder at my job because of the incompetence of people I work with.	1 2 3 4 5 6
17	I like doing the things I do at work.	1 2 3 4 5 6
18	The goals of this organization are not clear to me.	1 2 3 4 5 6

	PLEASE CIRCLE THE ONE NUMBER FOR EACH QUESTION THAT COMES CLOSEST TO REFLECTING YOUR OPINION ABOUT IT. Copyright Paul E. Spector 1994, All rights reserved.	Disagree very mcuh / Disagree moderately / Disagree slightly / Agree slightly / Agree moderately / Agree very much
19	I feel unappreciated by the organization when I think about what they pay me.	1 2 3 4 5 6
20	People get ahead as fast here as they do in other places.	1 2 3 4 5 6
21	My supervisor shows too little interest in the feelings of subordinates.	1 2 3 4 5 6
22	The benefit package we have is equitable.	1 2 3 4 5 6
23	There are few rewards for those who work here.	1 2 3 4 5 6
24	I have too much to do at work.	1 2 3 4 5 6
25	I enjoy my coworkers.	1 2 3 4 5 6
26	I often feel that I do not know what is going on with the organization.	1 2 3 4 5 6
27	I feel a sense of pride in doing my job.	1 2 3 4 5 6
28	I feel satisfied with my chances for salary increases.	1 2 3 4 5 6
29	There are benefits we do not have which we should have.	1 2 3 4 5 6
30	I like my supervisor.	1 2 3 4 5 6
31	I have too much paperwork.	1 2 3 4 5 6
32	I don't feel my efforts are rewarded the way they should be.	1 2 3 4 5 6
33	I am satisfied with my chances for promotion.	1 2 3 4 5 6
34	There is too much bickering and fighting at work.	1 2 3 4 5 6
35	My job is enjoyable.	1 2 3 4 5 6
36	Work assignments are not fully explained.	1 2 3 4 5 6

Note: The JSS is a copyrighted scale. It can be used free of charge for noncommercial educational and research purposes, in return for the sharing of results. See the "Sharing of results" page above for instructions. The JSS is copyright © 1994, Paul E. Spector, All rights reserved. (Spector P. E., 2012)

9.7 Details of sms's communicated to participants of the experimental groups

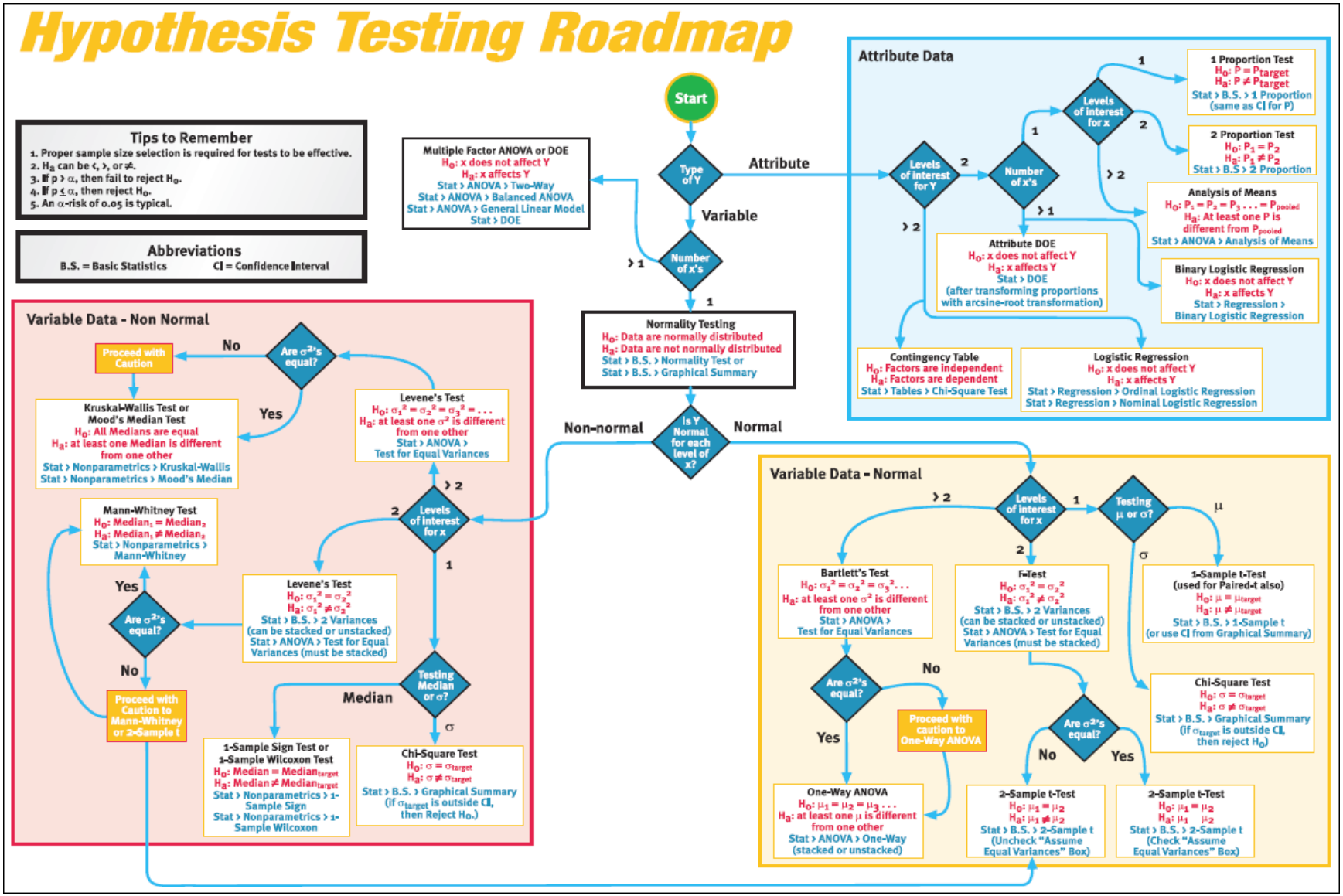
Day 1	Date	Friday, 23 August 2013
	Times delivered	18:26pm & 18:27pm
	Message	Health and safety awareness: Health and safety practices start with you. (Maine Department of Labor, 2013)
Day 2	Date	Saturday, 24 August 2013
	Time delivered	06:33am & 18:27pm
	Message	Health and safety awareness: Show your commitment to safety. Report any concerns to your manager. (Bongarde Media, 2013)
Day 3	Date	Sunday, 25 August 2013
	Times delivered	06:35 / 07:46am & 18:24 / 18:27pm
	Message	Health and safety awareness: Checking the tyres on your vehicle could save your life. (Tata Motors Limited, 2013)
Day 4	Date	Monday, 26 August 2013
	Times delivered	06:37am & 18:24pm
	Message	Health and safety awareness: Whatever you are doing, if you don't do it safely, you are not doing it right!
Day 5	Date	Tuesday, 27 August 2013
	Times delivered	06:39am & 18:52pm
	Message	Health and safety awareness: STAY ALERT – and stay alive

Day 6	Date	Wednesday, 28 August 2013
	Times delivered	06:26am & 19:24pm
	Message	Health and safety awareness: Practice safe work habits at all times
Day 7	Date	Thursday, 29 August 2013
	Times delivered	<am missed> & 18:36pm
	Message	Avoid using cellphones while driving a car. This could divert your attention from the road and cause an accident. (Galadari Motor Driving Centre, 2013)
Day 8	Date	Friday, 30 August 2013
	Times delivered	06:45am & 19:22pm
	Message	Health and safety awareness: When approaching a turn in the road, reduce your speed to ensure you stay on the road
Day 9	Date	Saturday, 31 August 2013
	Times delivered	06:57am & <pm missed>
	Message	Avoid using mobile phones while driving. This could divert your attention from the road and result in an accident. (Galadari Motor Driving Centre, 2013)
Day 10	Date	Sunday, 1 September 2013
	Times delivered	06:45am & 23:00pm
	Message	Health and safety awareness: Your seatbelt can save your life in an accident. Always remember to wear it. (Galadari Motor Driving Centre, 2013)

Day 11	Date	Monday, 2 September 2013
	Times delivered	07:20am & <pm missed>
	Message	Health and safety awareness: Maintain a safe distance from the vehicle in front of you. It helps avoiding a collision in case of sudden braking. (Tata Motors Limited, 2013)
Day 12	Date	Tuesday, 3 September 2013
	Times delivered	06:55am & pm
	Message	Health and safety awareness: Your seatbelt can save your life in an accident. Always remember to wear it. (Galadari Motor Driving Centre, 2013)
Day 13	Date	Wednesday, 4 September 2013
	Times delivered	06:37am & 18:38pm
	Message	Health and safety awareness: Maintain a safe distance from the vehicle in front of you. It helps avoiding a collision in case of sudden braking. (Galadari Motor Driving Centre, 2013)
Day 14	Date	Thursday, 5 September 2013
	Times delivered	07:29am & <pm missed>
	Message	Did you know: Checking your tyres, lights and indicators at the start of the shift are part of our safety procedures. (Crown, 2013)
Day 15	Date	Friday, 6 September 2013
	Times delivered	<am missed> & 19:17pm

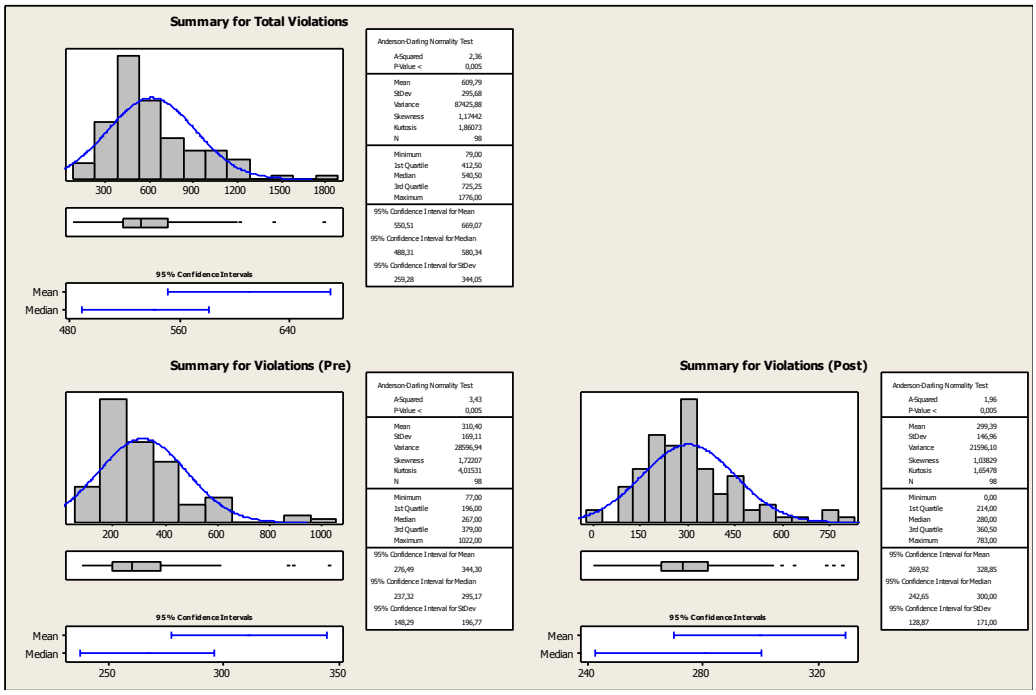
	Message	Health and safety awareness: If you have to reverse, reverse slowly, checking mirrors at all times. (Health and Safety Authority, 2013)
Day 16	Date	Saturday, 7 September 2013
	Times delivered	06:34am & 18:46pm
	Message	Health and safety awareness: Buckle Up and Stay Alive
Day 17	Date	Sunday, 8 September 2013
	Times delivered	07:44am & 18:33pm
	Message	Health and safety awareness: Whatever you are doing, if you don't do it safely, you are not doing it right!
Day 18	Date	Monday, 9 September 2013
	Times delivered	06:21am & 18:44pm
	Message	Health and safety awareness: Show your commitment to safety. Report any concerns to your manager (Bongarde Media, 2013)
Day 19	Date	Tuesday, 10 September 2013
	Times delivered	<am missed> & <pm missed>
	Message	Health and safety awareness: Health and safety practices start with you. (Maine Department of Labor, 2013)
Day 20	Date	Wednesday, 11 September 2013
	Times delivered	<am missed> & <pm missed>
	Message	Health and safety awareness: STAY ALERT – and stay alive

9.8 Hypothesis Testing Roadmap

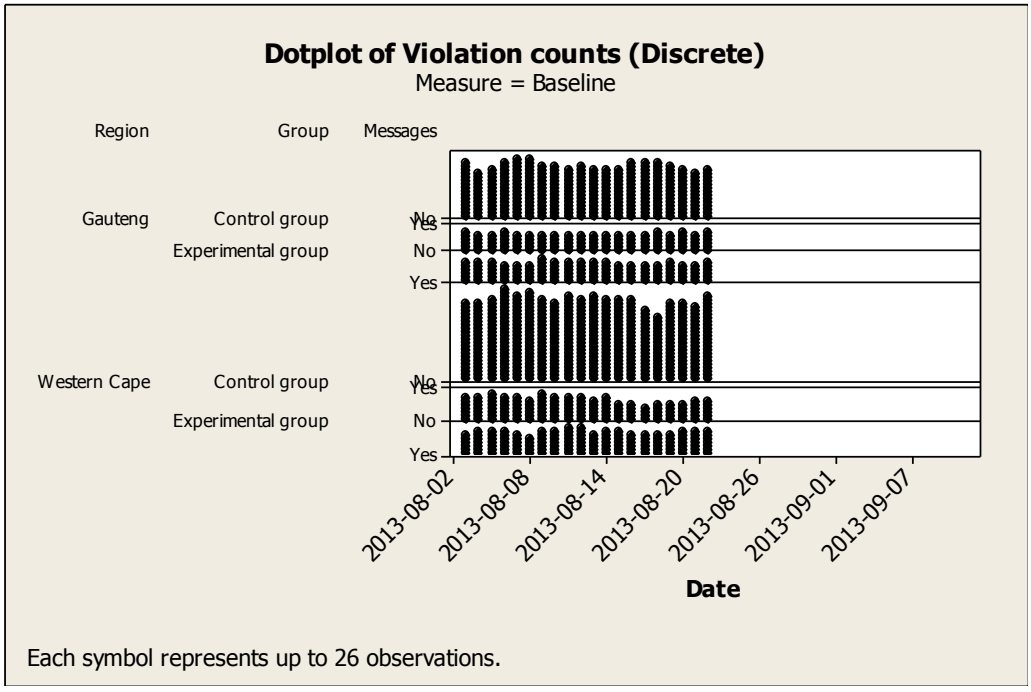


9.9 LSS PDCA Data Analysis detail

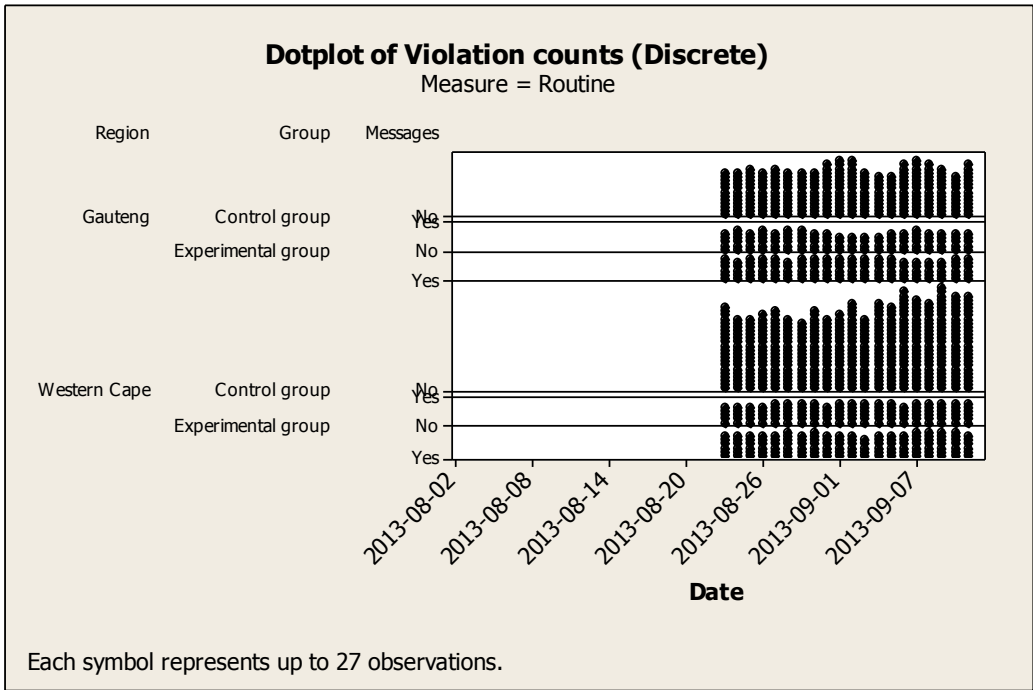
Violations (LSS) All response data (pre & post 20 day measures)



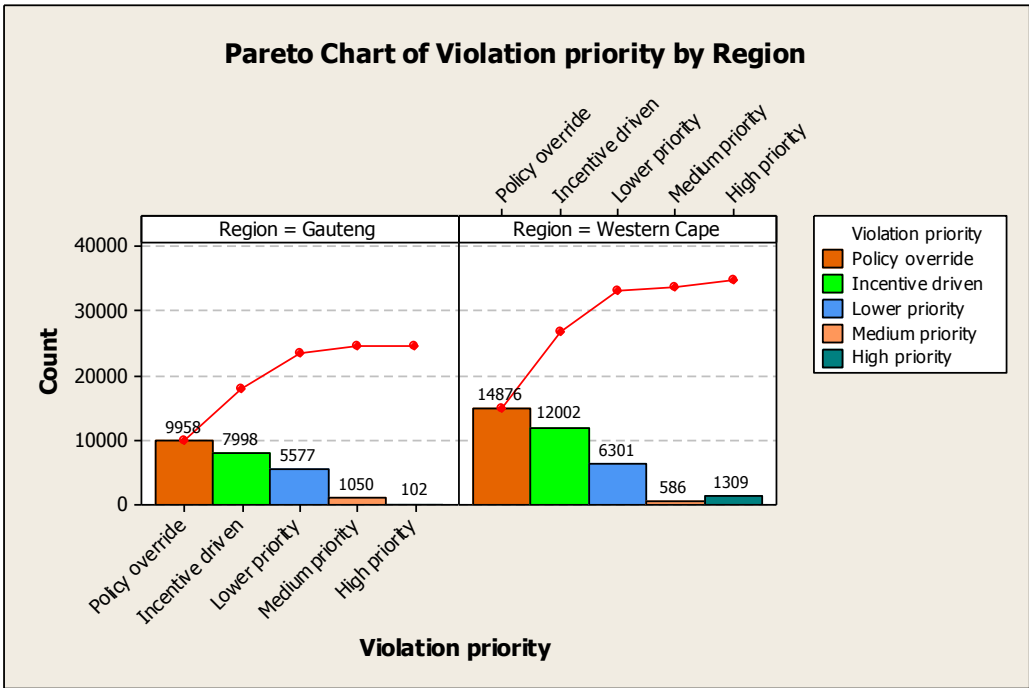
Violations (LSS) All response data discrete summary (baseline)



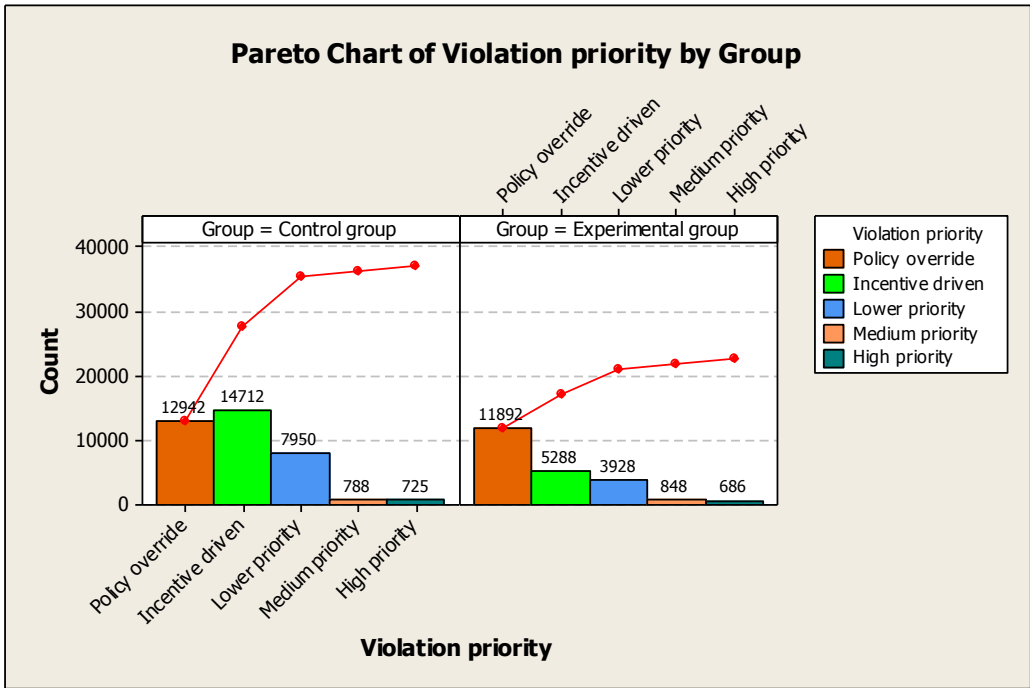
Violations (LSS) All response data discrete summary (routine)



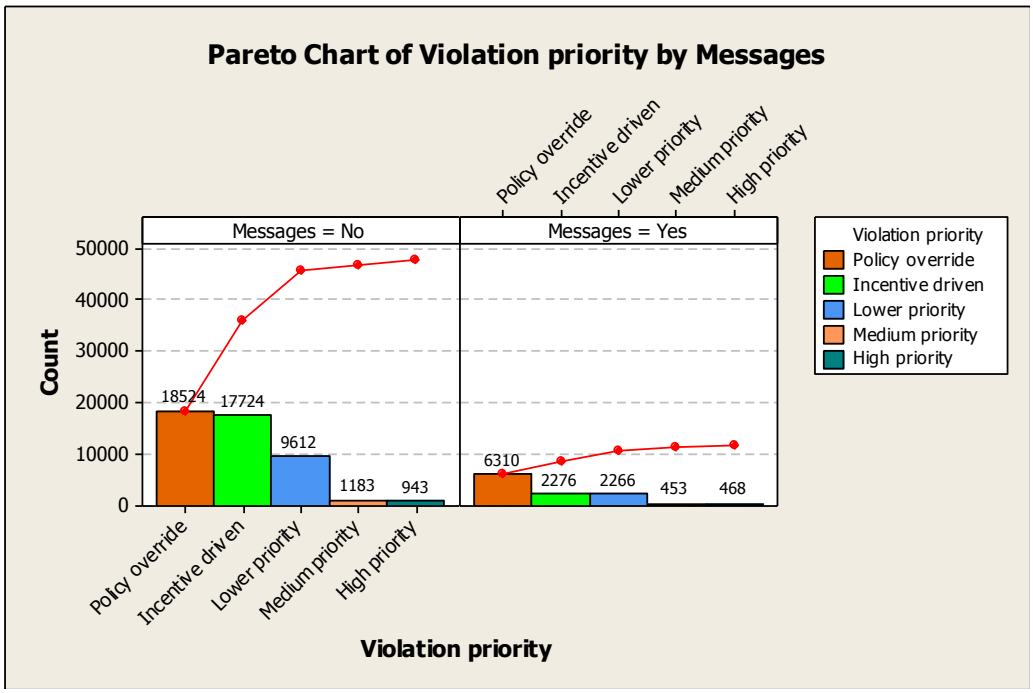
Violations (LSS): Geographical area (counts)



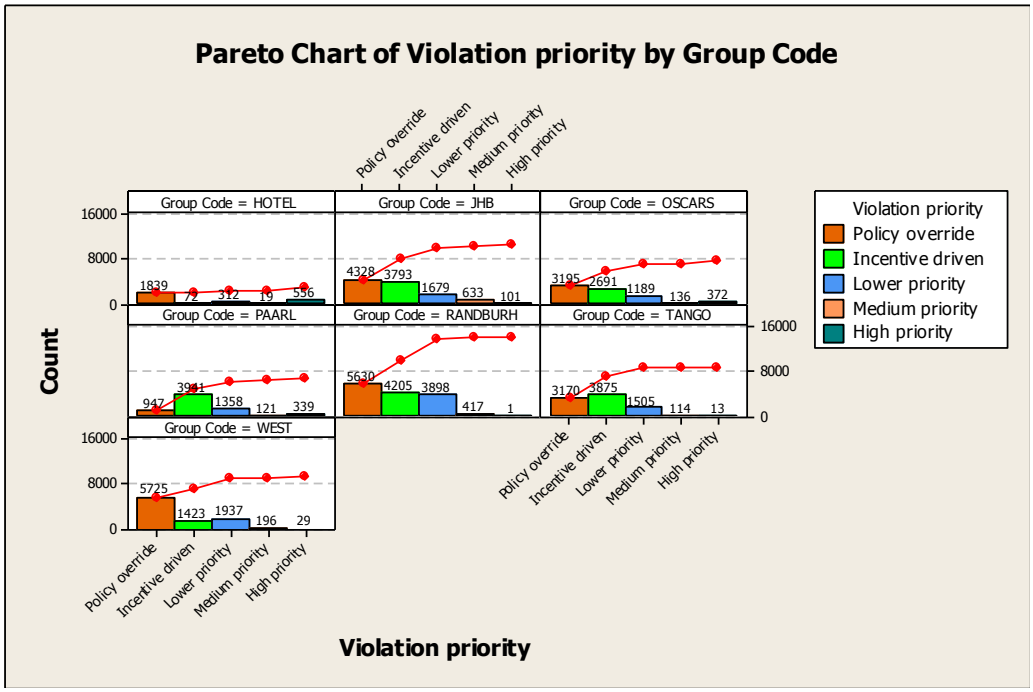
Violations (LSS): Group comparison (counts)



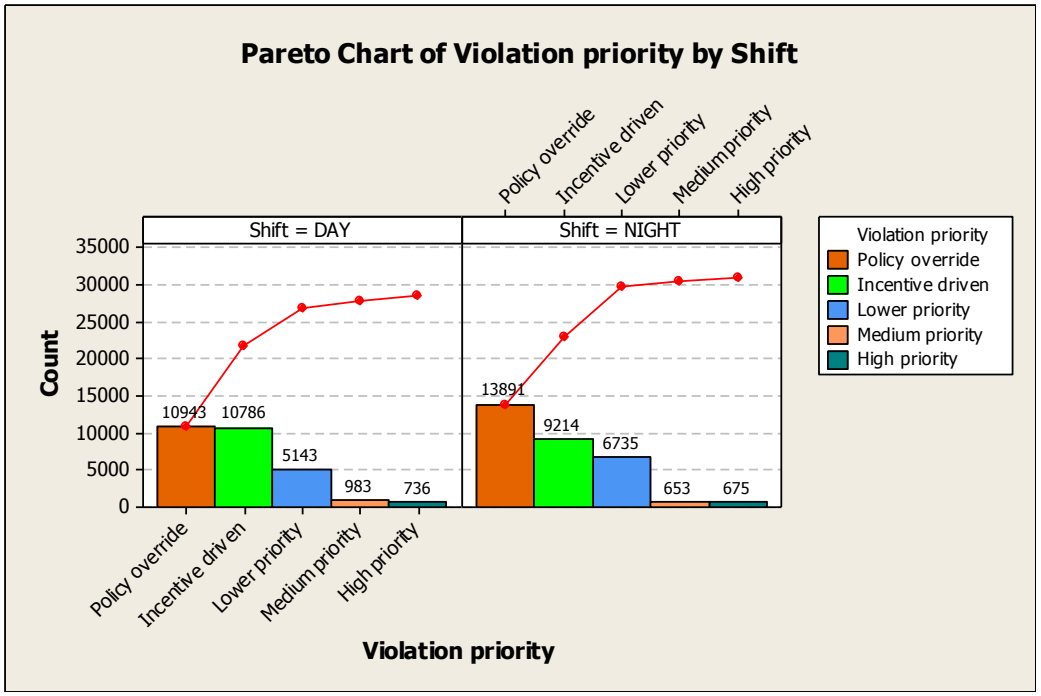
Violations (LSS): Message comparison (counts)



Violations (LSS): Geographical group (counts)

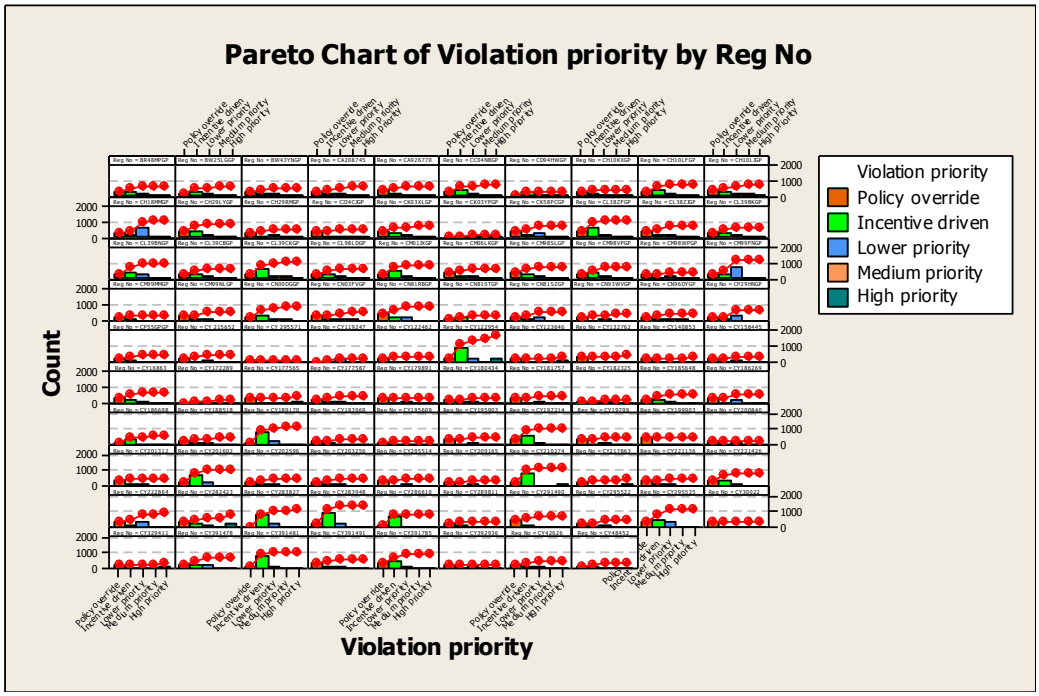


Violations (LSS): Shift comparison (counts)



Focus on infringements by shift, useful for supervision.

Violations (LSS) : By vehicle – 98 units (counts)



Contributes to individual level construct, addressing behaviours with individuals assigned to particular vehicle.

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