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CHANGE DYNAMICS WITHIN PROJECT MANAGEMENT: AN ASSESSMENT TOOL

by

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Submitted in partial fulfilment of the requirements for the degree
Ph.D in ORGANIZATIONAL BEHAVIOUR

in the

DEPARTMENT OF HUMAN RESOURCES MANAGEMENT

in the

FACULTY OF ECONOMIC AND MANAGEMENT SCIENCES

at the

UNIVERSITY OF PRETORIA

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PRETORIA July 2007

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DECLARATIONS

I, Riana (A.B.) Smith, declare that the thesis "*Assessing change dynamics in project management: an assessment tool",* which I hereby submit for the degree Ph.D Organisational Behaviour at the University of Pretoria, is my own work and has not previously been submitted by me for a degree at this or any other tertiary institution.

I, Riana (A.B.) Smith, declare that the thesis has been edited by Mrs Idette Noomé, Ms Nikola Haupt and Ms Dina-Marie Steyn from the Department of English at the University of Pretoria.

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ADRIANA BEATRICE SMITH DATE

ACKNOWLEDGEMENTS

I wish to express my sincere and heartfelt appreciation to:

- my Creator;
- my supervisor, Dr Yvonne du Plessis, for her inspiration and guidance;
- my husband, Dave Smith, for his unconditional support;
- my family for their support and encouragement;
- Ms Rina Owen and Mr Sollie Millard for their assistance with the statistical analysis;

  and
- Mrs Idette Noomé, Ms Nikola Haupt and Ms Dina-Marie Steyn for editing the dissertation.

ABSTRACT

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DEGREE: Ph.D (Organisational Behaviour)

Today, organisations are increasingly using a variety of project management methodologies to effect organisational change. However, appropriate and thorough management of organisational change within the project environment is not inherent in the mechanistic nature of traditional project management, which focuses on the creation of a temporary organisation around a unique organisational issue, with the primary emphasis on the achievement of project milestones, cost and quality parameters. Usually, a change management imperative is not included in the project management methodology and it is therefore neglected, which has a negative impact on the outcome and/or longevity of the project.

It was therefore important to identify what the elements of change dynamics in the project management domain are across each project phase in order to assist project managers and teams to manage change dynamics consciously and diligently during the life cycle of the project.

The research problem and objectives of the study were informed by a comprehensive literature study, which revealed a need for the development of an assessment tool containing the elements of change dynamics across the four stages of the project life cycle.

Triangulation was used to ensure the integrity of the study. This included defining change management elements within the project management domain on the basis of a comprehensive literature study, administering the Delphi technique and applying Lawshe's content validity methodology. The DeVellis scale development methodology was then applied to the resulting draft assessment tool for the next phase of the research project.

The second phase of testing of the diagnostic tool exposed the 'change management measurement tool' to the views and opinions of two target population groups, namely some South African and some international project managers with various experience levels from different economic sectors.

Various iterations of exploratory factor analysis indicated the primary factors for each of the four phases of the project life cycle whilst identifying the most important change management elements to be retained in the final assessment tool. Item-scale and reliability analysis, together with Tucker's phi results, confirmed the reliability, internal consistency and structure of the assessment tool, which is comprised of 103 items. Highly intercorrelated items in each of the four project life cycle sections of the assessment tool, namely the conception/initiation, planning, implementation and post-implementation phases were indicated by Cronbach alpha coefficients of 0.937, 0.974, 0.931 and 0.875 respectively.

The results of this study contribute to the application of organisational behaviour techniques in the field of project management because the study provides an assessment tool to measure change dynamics during a project's life cycle. The aim of this study, to contribute to the body of knowledge by developing an assessment tool to link the existing theories of change management/change dynamics to the constructs and dimensions of project management and, more specifically, to the four stages of a project life cycle, has been achieved. The assessment tool that was developed in the course of this study can serve as both a diagnostic tool and a checklist which project managers can use to ensure that sufficient focus is placed on the change management imperative as part of the necessary project management methodology during a project's life cycle.

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CHAPTER 1: INTRODUCTION AND CONTEXT

1.1 BACKGROUND

Progressive globalisation and the associated challenges of global competition, the daunting pace at which the information and telecommunication technologies are developing, the breaking down of trade and investment barriers and the emergence of the knowledge worker (Hill, 2003:4) call, among other things, for organisations to develop the capability to operate across time zones, geographical areas, and functional and organisational silos. Organisations confronted with these challenges are increasingly adopting formal **project management** methodologies to develop their capabilities to implement strategy and achieve their objectives successfully (Rosenstock *et al*., cited in Pennypacker & Grant, 2003:5).

As early as the 1970s, Bennis (quoted by Willemon & Gemmill, 1971:315) asserted that the organisations of the future would be "adaptive, rapidly changing **temporary systems** (my emphasis), organized around problems …. Organizational charts will consist of **project groups** (my emphasis) rather than stratified functional groups." Partington (1996:13) makes a similar statement, indicating that managers are increasingly being urged to "transform their organizations from bureaucratic, hierarchical 'mechanistic' structures to flatter, more flexible 'organic' forms based around **project** (my emphasis) teams" to enable organisations to keep up the required pace of technological and administrative innovation. Cadieux (cited in Hebert, 2002:3) maintains that increased competition, the need for specific information, reduced product life cycles and the technological revolution is forcing companies to **change** more rapidly.

In the South African context, concerns surrounding rapid change are also pertinent. Most organisations are joining the effort to become and/or remain globally competitive in the wake of major political, economic and market reform since 1994. This environment requires a proactive strategy from South African business to ensure that its skills, managerial methodologies and work practices are reconfigured in such a way that these companies are positioned to enter, survive and thrive in the new economy. Steyn (2001:38) expresses a similar view. He points out that the accelerated information flow, volatility in the internal business environment and the external environment, changes in economic outlook, socio-cultural issues, politics, the ecology and, finally, technologies have an impact on the way modern organisations are managed and that they require organisations to re-assess and re-engineer their systems and business

processes. According to Steyn (2001), the "integrative implementation link between corporate strategy, business strategy and operations strategy is the management of organisations through projects and programmes".

Project management as a management configuration and catalyst to effect **change** or Business Process Reengineering (BPR) has certainly gained international popularity as a mechanism to ensure that organisations are equipped to react swiftly and effectively to change. According to Hebert (2002:2), project management is considered the fastest-growing professional discipline in North America.

The use of project management methodology is also spreading from its traditional applications (mainly in sectors such as construction and defence) to include organisational change initiatives, such as implementing flatter structures, new information and communication strategies, customer focus and quality initiatives (Partington, 1996:14). The methodology of project management and its temporary matrix configuration makes it an attractive way of dealing with once-off organisational matters which require action. Organisations are increasingly adopting and applying project management methodology as an enabler to implement strategy in diverse business areas such as research and development, new product development, construction, software and hardware development, etc.

However, many projects still fall short of the originally stated intentions and objectives. Kearney and the Economist Intelligence Unit (cited in Boddy & Macbeth, 2000:297) found a high failure rate when European companies adopted Total Quality Management (TQM) systems. Hougham, Boddy and Gunson (cited in Boddy & Macbeth, 2000:297) show how information technology projects can take longer and cost more than originally planned. Wastell, White and Kawalek (1994:230) conclude that "BPR initiatives have typically achieved much less than promised", whilst Burnes (1996:172) observes that "even well established change initiatives, for which a great deal of information, advice and assistance is available, are no guarantee of success".

The complexity of the management of change dynamics within the project context is further exacerbated by rapid technological developments, the expectation of substantial competitive advantages, projects using advanced systems and processes, the unique organisational setting of each attempt at change and the systemic nature of organisations. Given the systemic nature of organisations, "any one project is likely to be part of a wider cluster of changes which will have unpredicted links to each other" (Boddy & Macbeth, 2000:297). The success of a project

also depends predominantly on the way in which the change dynamics are managed by people, the process of implementation, as well as the content or substance of the change (Boddy & Macbeth, 2000:298).

More often than not, the management of **change dynamics** which is so imperative in the context of the project management methodology is either overlooked, neglected or expedited to such an extent that the effort and eventual project outcomes are rendered unsustainable or even worthless. Boddy and Macbeth (2000:298) argue that, although the application of project management techniques can assist in the management of organisational change projects, the methodology will not in itself cope with situations where there are different views of what should be done, where there is conflict of interest, etc. These authors add that even participative or consultative techniques are not sufficient if the change threatens the *status quo* and thus established practices. According to these authors, the difference between successful and unsuccessful projects lies, to a large extent, in the way in which the change is managed.

Grover, Jeong, Kettinger and Teng (1995:121), in researching 105 organisations to establish problem areas surrounding Business Process Reengineering implementation, found that 31.8 percent of the respondents considered that the "need for managing change is not recognized" to be the first item ranked in terms of severity. In fact, six out the first ten most severe implementation problems concern the management of change dynamics. This clearly indicates that respondents regarded change management issues in conducting reengineering projects in a very serious light. The problems related to the management of change dynamics included communicating the rationale for change to employees, addressing the politics around the change initiative and ensuring commitment to new values. These findings confirm the fundamental nature of reengineering, which entails multidimensional organisational changes involving roles and responsibilities, performance/incentive measures, shared values (culture), organisational structure and skills requirements (Grover *et al*, 1995:121).

Grover *et al*. (1995) conclude that change management dynamics occupy centre stage in Business Process Reengineering implementation and that the inability to manage organisational change in reengineering is most likely to lead to project failure. Buchanan and Boddy (in Partington, 1996:19) express a similar argument, arguing that the failure of change programmes is associated more often with poor management of "human factors" than with technical problems. Change is, at best, "complex and not easily accomplished, involving the manipulation of interactive relationships among such organisational subcomponents as management, people, structure, technology and rewards" (Grover *et al.,* 1995:109).

The findings of a study done by the University of Bristol regarding Business Process Reengineering in the United Kingdom financial services industry (McElroy, 1996:328) were similar; and that study listed the communication of a clear vision, staff participation, the creation of process ownership, the instilling of a Business Process Re-engineering culture and staff organisation as matters related to change management critical for project success.

1.2 RATIONALE FOR THE RESEARCH PROJECT

The studies cited above make it abundantly clear that inadequate attention is paid to the human dimension of change management and corporate culture because of an overriding focus on the technical aspects of projects. Hastings (cited in Turner, Grude & Thurloway, 1996:148) points out the popularity of project management and suggests that few organisations seem to get real performance from project teams due to their focus on "hard" management issues (such as cost, quality and goal achievement on time) without adequate appreciation of the "soft" issues (such as motivation, culture and change management aspects). Knutson (1993:2) also asserts that "in the middle of all the specifications and activity, there is no one who can explain what the change is, or how it will benefit the organisation". She adds that "the harsh reality of managing change is that after a project is completed, people either do their jobs in a new way, or they carry on as usual" and "managers seem to find it difficult to take sufficient time to explore and fully understand an organisational change".

It is indeed a daunting task to alter the organisational *status quo* in order to introduce new practices, systems, structures and values within an organisation by means of a project. It is therefore essential that adequate attention is given to sound change management principles and processes within the context of project management to ensure the success and sustainability of the change that is supposed to happen. A project is, in essence, a change intervention in that it is a once-off, unique intervention with the objective of changing a system, process or organisational structure. Gray and Larson (2000:473) express this notion as follows: "[The] project-driven organisation will recognize the project manager as an agent of change." This claim emphasises that the evolving role of the project manager also includes being astute in the management of change dynamics.

It is clear from the above that there is a paradox, in that, even though a project (a once-off intervention) is a change intervention in itself, often it is the lack of the management of the change management principles and the process itself that affects the success of the project

and/or the sustainability of the implemented changes. A lack of proper management of a change process within the project management domain could be a result of the tight deadlines often associated with projects, a potential lack of knowledge around change management, a disregard for the importance of proper change management, etc., or of a combination of these factors.

It is therefore imperative that the quest and search continues for the factors that are the differentiators between successful and unsuccessful projects, such as the management, measurement and implementation of appropriate change dynamics, in order to assist project managers/participants in running projects successfully.

From the above it is evident that the management of change dynamics plays a significant role in project management and the successful completion of projects. Managing the change process throughout a project's life cycle should be understood, planned for, implemented and measured by the project manager, supported by organisational systems and processes for enhanced project success.

1.3 DEFINING THE RESEARCH AND ITS SIGNIFICANCE

The very nature of project management (that is, the rigorous and structured management of the project performance framework, timelines, deliverables, quality criteria, costs and the temporary nature of the project configuration) does not always allow sufficient **focus** or **time** in the process to apply sound change management philosophy, principles and methodology to manage and entrench the change effected by the project.

This is compounded by the fact that project managers are often selected on the basis of their technical expertise, such as product or process development, while they may have only limited or no change management expertise and/or no or limited appreciation for the value that sound change management can add to the success of the project outcome. When change management activities are not built into the work breakdown structure (WBS), and therefore do not appear in the critical path of a project, it is likely that these activities will be considered non-essential and non-critical components that detract from the performance of the project. This inevitably affects the sustainability and longevity of the change brought about by the intervention of any project team negatively. In addition to being proficient in "hard" project management skills such as contracting, finance, costing, scheduling and controlling, measuring performance, quality and risk management, project managers/participants should also be adept at "soft" skills

such as negotiating, managing change, being politically astute, and understanding the needs and wishes of the people with whom they deal (Frame, 2002:10).

1.4 RESEARCH PROBLEMS

It is therefore necessary that more research be done based on the following research problems:

- What constitutes **change dynamics** in the **project management** domain?
- How can these change dynamics be assessed as critical success factors within the context of project management?
- How can change dynamics be managed more pro-actively during the project life cycle, using the elements within the assessment instrument as a mechanism to identify and manage change dynamics appropriately?

1.5 SCOPE OF THE STUDY

The focus of this study therefore revolves around the appropriate management of change dynamics within projects as an issue of central concern to academics, managers, stakeholders and project practitioners. The scope of the study includes the development of an assessment tool to measure change dynamics in the context of project management as change dynamics applies in a South African and international domain. This assessment tool can be applied as a measurement instrument, and it can also serve as a diagnostic tool to assist project managers and their organisations to become aware of different change dynamics within the respective life cycle phases of a project so that these can be addressed and managed pro-actively and continuously through the project life cycle as part of the application of project methodology.

This research focuses on change and project management from an integrated and holistic perspective. It does not focus on individual aspects within the two disciplines.

1.6 RESEARCH QUESTIONS

The current pace of change has necessitated that, in order to be flexible enough to deal with this imperative, organisations adopt project management as a method to achieve organisational objectives. Mirvis and Macy (cited in Seashore, Lawler & Camman, 1983:501) elaborate on the complexity of measuring change as follows: “The intrusion of intangibles into the cost-benefit equation considerably ‘enriches’ the assessor’s job, but it does not remove the obligation to

'cost out' programs." It is therefore important to measure the way change dynamics is managed as a critical success factor in the project management context.

Based on their empirical research on reengineering efforts in 105 organisations, Grover *et al.* (1995:110) assert that change management in Business Process Reengineering is of central importance in the success of the implementation of Business Process Reengineering. They also claim that their findings suggest that reengineering project implementation is complex and that, in order for a change programme to succeed, it is essential that change dynamics be managed and that balanced attention be paid to all the identified factors, such as management support, technological competence, project management, etc.

The following specific research questions were addressed in this study (informed by the above brief review of the relevant literature):

- What constitutes **change dynamics** and how does it apply in the context of **project management?**
- Is there a need for an **assessment tool** to measure change dynamics in project management?
- What process should be followed in developing an assessment tool to assess change dynamics in the context of project management?
- What would ultimately constitute a **change dynamics assessment tool** that could be pro-actively used by **project managers** to **manage change** and its unique dynamics during projects and/or measure how effectively change dynamics is managed to ensure project success?

1.7 RESEARCH OBJECTIVES

The objectives of this study support the research questions. They are the following:

- **Primary objective**: To develop an assessment tool that measures change dynamics in the context of project management in South Africa and some selected internationally-based destinations.
- **Secondary objectives**:

  The following secondary objectives were pursued to establish the content of an assessment tool to measure change dynamics in project management:

- to establish what constitutes change dynamics in the project management domain;
- to develop a framework of change dynamics applicable in the project management domain; and
- to determine which process should be used in developing a change dynamics assessment tool.

The contribution of a change management assessment tool in the project management field is that it will assist project managers/participants in assessing their organisational capability and will empower them to apply sound change management principles, so as to manage change dynamics in the project management context and domain. The assessment tool can also serve the dual purpose of being used, first, as an assessment tool to assess the status of change management within the project management context and/or, second, as a developmental/diagnostic tool to assist organisations using some project management methodology to enhance its change management capability.

1.8 OUTLINE OF THE THESIS

Chapter 1 serves as an introduction to set out some background to the study, the problem statement, context, scope, research questions and objectives of the study.

This is followed in Chapter 2 by a comprehensive literature study of the relevant theory related to the research issue. The literature study covers definitions of key concepts relevant to the study, such as project management and change management/dynamics, as well as a thorough assessment of literature on project management, change management/dynamics and the development of an assessment tool.

Chapter 3 presents the methodological approach followed.

Chapter 4 contains the research methodology applied with the results of the respective statistical applications.

Chapter 5 contains the recommended assessment tool for change management in project management, an assessment of the limitations of the study, as well as recommendations for future research.

1.9 SUMMARY AND CONCLUDING REMARKS

The project management domain is increasingly used to effect organisational change in accordance with an organisation's strategy, in addition to its more traditional applications in the military and construction environment. The methodology lends itself to establishing multi-functional project teams to resolve unique organisational issues, ranging from telecommunication, finance and design to manufacturing and even human resources. This requires project managers to understand, in addition to the technical aspects of the project, more complex, interdependent and fluid factors, in order to be genuinely effective, including the management of change dynamics as an integral part of the project scope. Neglecting to do this will affect the success of the project. It is therefore important that research be conducted to ascertain what constitutes change management within projects, and to design an assessment tool to measure the change achieved.

The outcome of this study should contribute to the body of knowledge of both project management and organisational behaviour focusing on change management.

CHAPTER 2: LITERATURE STUDY

2.1 INTRODUCTION

The purpose of Chapter 2 is to ascertain the theory relevant to the research questions and objectives, and to reflect on this theory. The chapter covers and elaborates on the relevance of the research issues and research questions and also examines contemporary theories on change management and dynamics, project management, change dynamics within project management and literature concerning the development of an assessment tool to measure the effects of the identified constructs on change dynamics.

This study is by nature multi-disciplinary, in that it covers the fields of organisational behaviour (focusing on change management and change dynamics), project management and instrument development. The literature reviewed with regard to these areas informed both the formulation of the research problem and the selection of the research objectives.

2.2 DEFINITIONS

Definitions relevant to this study are provided below to enable the reader to understand the literature in its context better.

2.2.1 Project management

According to Hamilton (1997:69), a project can be defined as “any series of activities and tasks that together achieve predetermined deliverables in accordance with a quality definition, have defined start and end dates, intermediate milestones, funding limits, and utilise resources such as equipment, materials, people, etc”. According to Nicholas (2001:4), Gray and Larson (2000:4), Pinto and Prescott (1988:6) a project tends to have has specific characteristics which warrant its classification as a project. According to these authors, a project has a single, definable purpose and result, and that purpose and result are usually specified in terms of cost, schedule and performance requirements. Every project is unique, is temporary, cuts across organisational lines, involves unfamiliarity and is a process with distinct phases which are usually referred to as the project life cycle.

According to Nicholas (2001: 22) project management (when one applies the principles of the classical, behavioural and systems viewpoints) consists of the following characteristics:

- a single person, the project manager, heads the project organisation and operates independently from the normal chain-of-command, while the organisation reflects the cross-functional, goal-oriented, temporary nature of the project;
- the project manager creates the focal point that ensures synergy toward the project objective;
- the actual work might be performed by cross-functional teams from within or outside the organisation;
- the project manager is responsible for integrating the activities of people from different functional areas working on the project;
- the project manager liaises and negotiates with functional managers for support; functional managers are responsible for individual work tasks and personnel within the project, while the project manager integrates and oversees the completion of activities;
- the project focuses on delivering a product or service at a certain time, at a certain cost and with certain technical requirements;
- a project might have both a vertical and a functional chain of command and people might report to both a project and a functional manager;
- decision-making, accountability, outcomes and rewards are shared among the members of the project team;
- the project organisation is temporary and is disbanded upon completion of the project;
- projects can originate from within or outside the organisation; and
- project management sets into motion other support functions such as personnel evaluation, accounting, procurement and information systems.

According to Hamilton (1997:111), project management is the application of knowledge, skills, tools and techniques in order to meet or exceed the requirements of the intended project sponsor or owner.

Implicit in the definitions given above is the necessity to manage and/or facilitate organisational change management processes appropriately, because of the fact that projects by their very nature are intended to effect and implement significant changes by means of a once-off project intervention. Each project is new, involves various degrees of unfamiliarity, and cuts across organisational functional lines, necessitating proper change management. Due to these

characteristics, each project is, in essence, a change intervention; and sufficient emphasis should therefore be placed on the management of change dynamics within the realm of a specific project(s).

2.2.2 Project success

According to Pinto and Slevin (cited in Gray and Larson, 2000:104), project success is a concept which "has remained ambiguously defined both in the project management literature and, indeed, often within the psyches of project managers". Usually, project objectives focus on cost, quality and timelines and exclude personal objectives and/or the feelings of the people involved. Measuring success by comparing specifications with outcomes is often grossly simplistic, especially since variables and criteria such as the project's budget, schedule or technical specifications are often very subjective (Gray and Larson, 2000:104).

Atkinson (1999:341) offers a more inclusive and balanced view of project success, as set out in Table 2.1.

Table 2.1: Square route to understanding success criteria

Iron triangle	The information system	Benefits (organisation)	Benefits (stakeholder community)
• Cost	• Maintainability	• Improved efficiency	• Satisfied users
• Quality	• Reliability	• Improved effectiveness	• Social and environmental impact
• Time	• Validity	• Increased profits	• Personal development
	• Information-quality use	• Strategic goals	• Professional learning
		• Organisational-learning	• Contractors profits
		• Reduced waste	• Capital suppliers
			• Content project team
			• Economic impact on surrounding community

Source: Adapted from Atkinson (1999:341)

For the purposes of this study, project success is broadly defined as an indication of how successfully the budget, schedule, specifications, quality criteria, management and sustainability of the change, and consultation with relevant stakeholders have been adhered to.

2.2.3 Change

Cummings and Worley (2001:3) refer to change as the effective implementation of planned change through a sequence of activities, processes and leadership that produces organisational improvements to enhance economic potential and the creation of competitive advantage.

According to Grundy (1993:19), strategic change is the "reshaping of strategy, structure and culture of an organisation over time, by internal design, by external forces or by simple drift". Felkins, Chakiris and Chakiris (1993:4) state that "while the dynamics of change can be elusive, the basic components and rules of change are an integral part of the system itself". They characterise change as a "crystallization" of new actions and possibilities based on "reconceptualized" patterns of organisation. They also identify the following characteristics of change:

- organisational change involves contradictions;
- organisational change is a continuous process;
- organisational change is interpreted through the perceptions and interactions of people; and
- organisational change can be facilitated through collaborative inquiry and teamwork.

For the purposes of this study, the terms Business Process Reengineering and/or change intervention(s) are used interchangeably. The terms are used to refer to a major organisational change intervention which is project managed as a once-off intervention to enhance performance. This might result in a change of the entity's strategy and/or structure and/or business processes and/or culture.

2.2.4 Measurement of change dynamics

"Measuring elusive, intangible phenomena derived from multiple, evolving theories poses a clear challenge to social science researchers. Therefore, it is especially important to be mindful of measurement procedures and to recognize fully their strengths and shortcomings" (DeVellis, 1991:7).

As the above quote suggests, the measurement of organisational change management and its related dynamics, mostly an intangible phenomenon based on social theory, is therefore complex in the sense that the measurement of organisational change management consists of variables which are of interest "to social and behavioural scientists [and] which are not directly observable, [and] of which beliefs, motivational states, expectancies, needs, emotions, and social role perceptions are but a few examples" (DeVellis, 1991:7). Furthermore, change is systemic. The different parts of systems are by definition interdependent, which adds to the complexity of the measurement process. Any part that is therefore examined in isolation may provide a limited or distorted picture of its function, determinants or consequences (Seashore *et al.*, 1983:25).

Care was taken in this study to ensure that, as far as possible, all aspects of change management processes and dynamics were taken into account in the development of an assessment tool throughout the project life cycle, that is from project conception/initiation through to the post-project implementation phase, by means of a thorough literature study and the subsequent iterative administration of the Delphi technique and Lawshe's content validity methodology, and the application of DeVellis's scale development process.

2.2.5 Assessment instrument

According to Mouton (2001:100), a measuring instrument refers to such instruments as questionnaires, observations schedules, interviewing schedules and psychological tests. DeVellis (1991:8) is more specific. He defines measurements scales as "collections of items intended to reveal levels of theoretical variables, not readily observable by direct means", in other words he uses the classical measurement model which "assumes that individual items are comparable indicators of the underlying construct".

For the purposes of this study, the term "assessment instrument" refers to a structured questionnaire that measures the management of change dynamics across the life-cycle of a project or projects and/or an instrument or tool which can be used pro-actively as a check-list to ensure that adequate attention is given to the management of change dynamics across the project life cycle.

2.3 THEORY ON MODELS ON CHANGE MANAGEMENT AND CHANGE DYNAMICS

2.3.1 Introduction

There are a myriad theories and models on organisational change and change dynamics. The main focus of this chapter is more contemporary theories and models of change. This focus contextualises the research questions set out in Chapter 1. These theories are used later in the study to evaluate the research outcome, namely the design of the content of an assessment tool to measure change management in the context of project management.

2.3.1.1 Reasons and process of organisational change

According to Grundy (1993:24), triggers of change "are the factors which may conspire to initiate change both internally and externally regardless of whether these are seen as needs, opportunities or threats". The need for change within organisations may thus originate from both within and outside the organisation. Greenberg and Baron (1993:624) describe organisational change with some examples, as set out in Table 2.2.

Table 2.2: Examples of organisational change

	Planned change	Unplanned change
Internal change	• Changes in products or services • Changes in administrative systems	• Changing employee demographics • Performance gaps
External change	• Introduction of new technologies • Advances in information processing and communication	• Government regulations • External competition

Source: Greenberg & Baron (1993:624)

2.3.1.2 Varieties of change

According to Grundy (1993:24), it is possible to single out a number of characteristic types of change. **Incremental change** is experienced when business environments evolve slowly in a systematic and predictable way. **Bumpy, incremental change** is characterised by periods of relative tranquillity, punctuated by acceleration in the pace of the change which is then described as 'overload'. **Discontinuous change** is change which is marked by rapid shifts in

strategy, structure, culture, or all three. Lynch (cited in Steyn, 2001:38) refers to **prescriptive change** which is caused by a top-down formal strategic approach resulting from analysis and planning, or **emergent change** which is caused by unplanned events in either the external or internal environment of the organisation.

Felkins *et al*. (1993:6) describe change as either **directed** (that is, change effected through a definite plan and guiding project teams) **or non-directed** (that is, change effected through pre-programmed decisions and routine policies that are interpreted daily by organisational members in relation to their jobs, structures and processes)**.**

Figure 2.1 illustrates how these two types of change should be aligned on a continuum to ensure maximum benefit realisation.

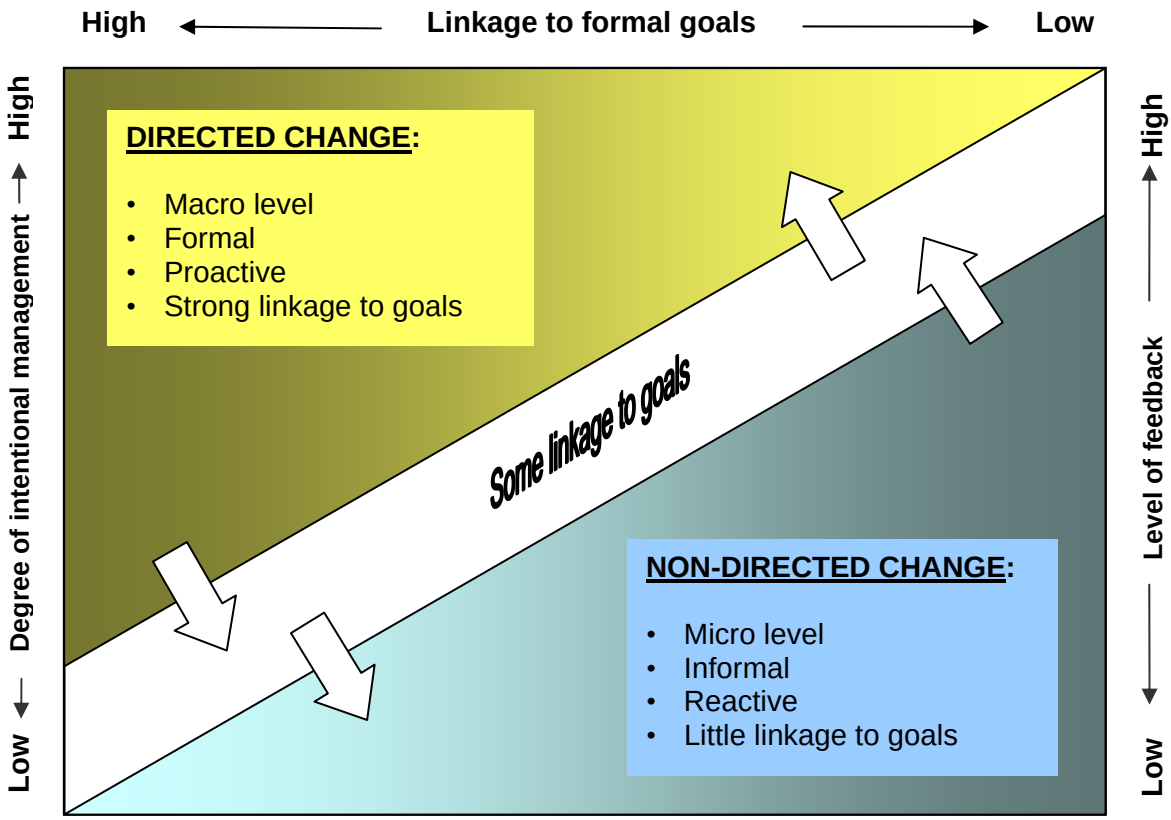


Figure 2.1: Directed and non-directed change
Source: Felkins *et al*. (1993:6)

For the purposes of this study, change is referred to as any change intervention, irrespective of its origin, which is managed by applying project management methodology to bring about the required organisational change.

2.3.1.3 Contemporary theory and models on change management and change dynamics

According to Kotter (2002:3), large-scale organisational change efforts can only be successful if the following eight steps are handled well:

- **Step 1: Increase urgency**

  The first challenge when embarking on a project involving organisational change is creating the necessary sense of urgency among a critical mass of people in the organisation. Sets of behaviour or attitudes such as complacency, immobilisation, deviance and pessimism are typical when actions to achieve necessary change are launched. If such behaviour or attitudes are not addressed appropriately and timeously, they can stifle the effort.

- **Step 2: Building the guiding team**

  When sufficient urgency is created, successful change agents establish a guiding team with the necessary credibility, skills, networks, reputations and formal authority to provide change leadership. This team should function on the basis of trust and emotional commitment, collective effort and simple governance structures with strong task forces.

- **Step 3: Getting the vision right**

  The guiding team then provides unambiguous, simple and inspiring visions and related strategies. Focusing on detailed plans and budgets only (although these are necessary) is insufficient - a clear, sensible vision is the first requirement.

- **Step 4: Communication for buy-in**

  The next step should entail comprehensive communication of the vision and the strategies through various communication channels to various levels and target audiences. The overarching objectives are to ensure awareness and understanding, to develop a gut-level commitment and to liberate more energy from a critical mass of people. Repetition of messages, leading by example and the use of symbols are very effective.

- **Step 5: Empowering action**

  Empowerment should be the next area of emphasis – key obstacles that could prevent people from acting on the vision need to be removed. Change leaders address the problems created by managers who disempower employees with inadequate information and systems, and who create self-confidence barriers within people's minds.

- **Step 6: Creation of short-term wins**

  During this phase, potential short-term wins are identified and acted upon to provide the necessary credibility, resources and momentum to the change effort. Successes should be demonstrated early in the process to ensure the necessary buy-in.

- **Step 7: Sustaining the effort**

  Change leaders should be resilient and not let up. Momentum should be retained by quick wins and the consolidation of early changes until the new vision becomes a reality.

- **Step 8: Making change stick**

  The new behaviours are reinforced despite potential resistance.

The abovementioned elements, such as the development of a strategy, business case, short terms wins, and so forth, are all considered essential steps within a successful change initiative. However, a golden thread woven through all eight stages is recognising how important it is for change leaders to be sensitive to any **emotions** that undermine change and that they should find ways to reduce these negative feelings. These change agents also need to be sensitive to the emotions that facilitate change, and they should find ways to enhance and reinforce those constructive feelings.

Kotter (2002:181) has summarised his theory that people do not change because they are given the results of an **analysis** that is supposed to shift their **thinking**, but because they are **shown** a truth that influences their **feelings**. This is illustrated in Table 2.3 overleaf.

Table 2.3: Kotter's model of change

See, Feel, Change
See Identify a problem, or a solution to a problem, in one stage of a change process, and then help people visualize this in a way that enables a helpful change in behaviour. Show people in a way that is as concrete as possible – touchable, feelable, seeable, especially the latter. Show the problem or solution in an emotionally engaging, dramatic, vivid, and compelling way. Use live presentations, physical environment, visible results, new demands placed on people and old demands taken away. Give the show an afterburner via physical symbols that people see each day, stories that are told and retold, or ongoing role modelling.
Feel The dramatic, vivid visualizations catch people's attention, reducing emotions that undermine a sensible change – feelings of anger, complacency, false pride, pessimism, confusion, panic, [or] cynicism. "Seeing" increases emotions that facilitate a needed change regarding some valid idea – feelings of passion, faith, trust, pride, urgency, hope (and fear, if quickly converted into any of the others).
Change Different feelings – a change of heart – transform behaviour. The new behaviour helps groups and organisations effectively move through the eight steps and leap into a prosperous future.

Source: Kotter (2002:181)

A large amount of research has been conducted around the planned change approach as subscribed to by Lewin (cited in Cummings & Worley, 2001:22). Lewin's three sequential phases of change, namely unfreezing, moving and refreezing, are universally recognised. The first phase, unfreezing, prepares the climate for change in that it creates discomfort with the *status quo*. The moving phase involves evaluation and analysis, the design of a new dispensation and the implementation thereof. The refreezing phase institutionalises the change by reinforcing the new equilibrium of the organisation at a different level through various mechanisms, for instance, performance management, training, entrenching of organisational values, etc. Other studies build on Lewin's model by extending it to include more stages which make provision for feedback, re-diagnosis, and so on (Kolb & Frohman in Grover *et al.*, 1995:113).

Pierce and Delbecq (cited in Grover *et al.,* 1995:113) refer to innovation process literature which describes change as consisting of three phases, namely initiation (scanning organisational problems/opportunities), adoption (investing resources to accommodate the implementation effort) and implementation (initiating activities around development, installation and maintenance). These three phases correlate to a large extent with the phases mentioned above.

Cummings and Worley (2002:22) compare Lewin's change model with the Action Research Model, as well as with the Contemporary Action Research Model which is illustrated in Figure 2.2 overleaf. Lewin's model is sequential, whereas the Action Research Model and Contemporary Action Research Model are cyclical and consist of an iterative cycle of research and action.

In their study, Grover *et al.* (1995:116) collated relevant literature on problems related to the Business Process Reengineering of major change (including product innovation, process- and technology-based changes, etc.) within organisations. According to these researchers, implementation revolves around activities pertaining to the initiation, adoption and institutionalisation of business process change.

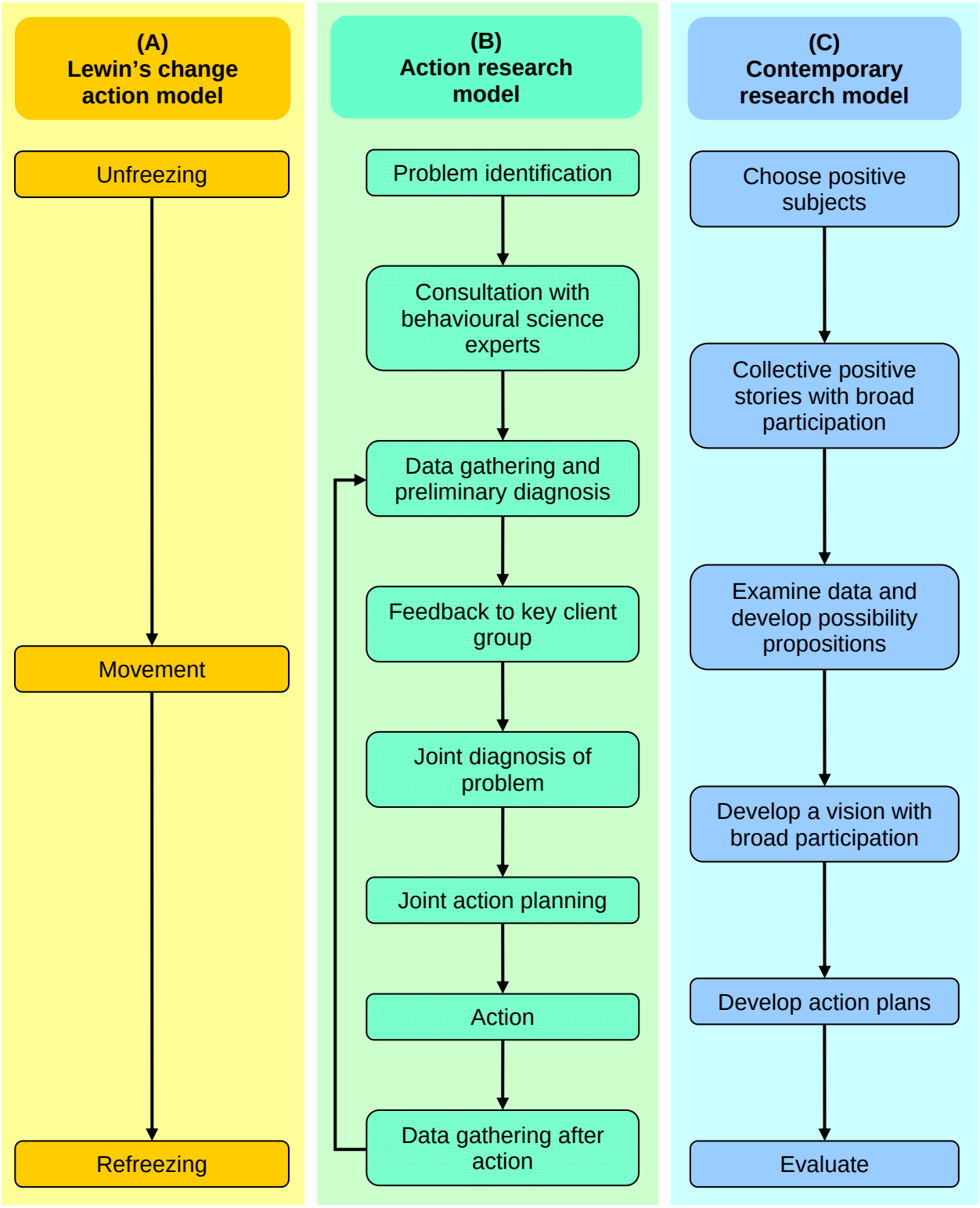


Figure 2.2: Comparison of planned change models
Source: Cummings & Worley (2001:24)

Initiation efforts include establishing a vision, aligning Business Process Reengineering efforts with the organisation's strategy, identifying reengineering opportunities, enabling IT systems, etc.

Adoption revolves around commitment and communication. It may therefore involve senior management's commitment to new values, mustering the required resources, and communication between management and employees with regard to the need for, scope of and commitment required for the project. This phase requires careful preparation in anticipation of organisation-wide radical change.

Institutionalisation includes designing, installing and evaluating new business processes, structures and systems.

In addition to the above, Cummings and Worley (2001:155) focused on several aspects that are critical for successful change management, as set out in Figure 2.3.

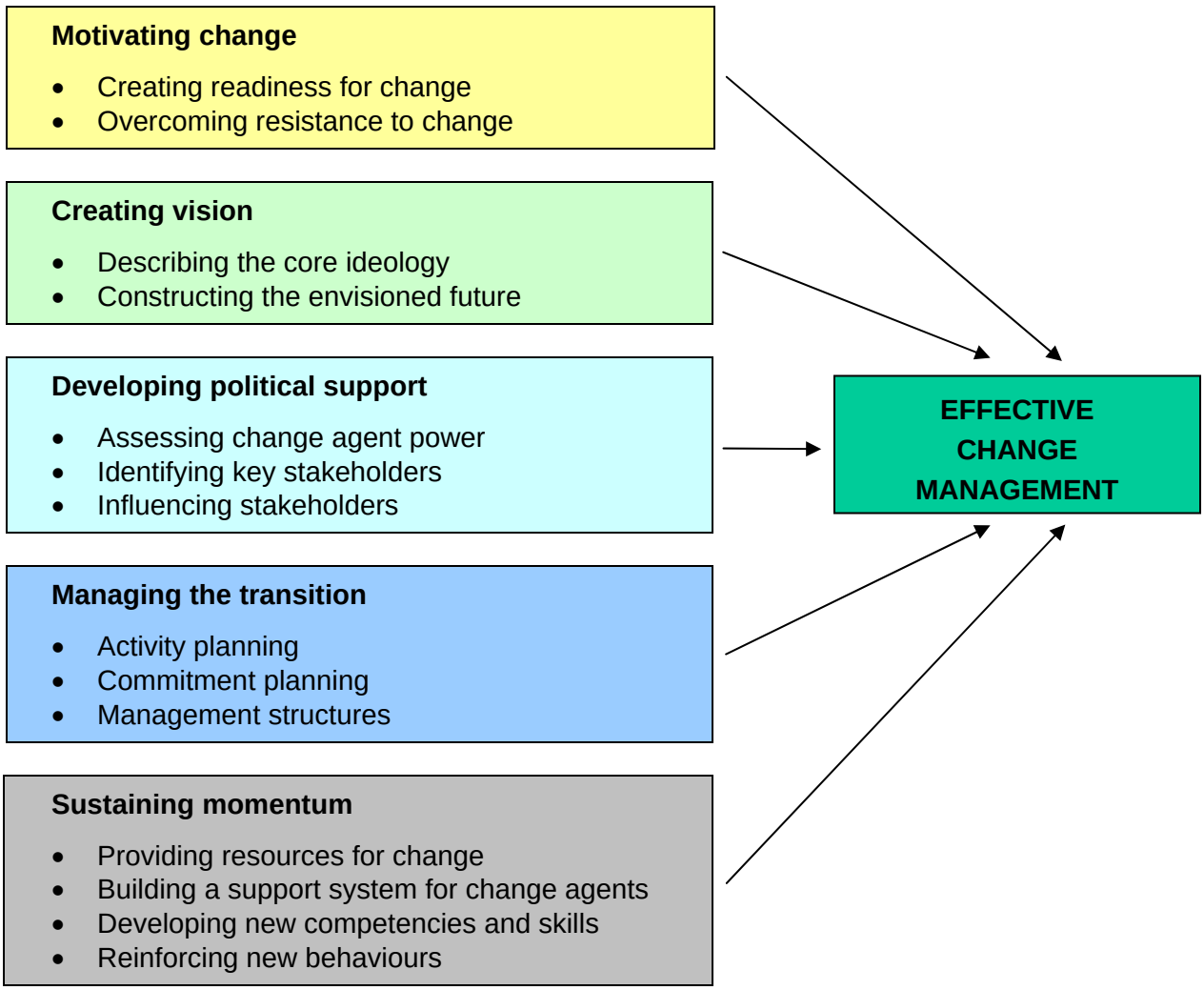


Figure 2.3: Activities contributing to effective change management

Source: Cummings & Worley (2001:155)

Lanning (2001) further summarises different phase models representing a variety of schools of thought over time, as classified under the Bullock and Batten (1985) model as modified by Salminen (cited in Lanning, 2001:14) which is shown in Table 2.4 overleaf.

Table 2.4: Summary of different change management model phases representing different schools of thought over time

Bullock & Batten, 1985	Lewin, 1951	Lippitt *et al*., 1958	Frohman *et al*., 1976	Ackerman, 1982	Burke, 1982	Beer *et al*., 1990a	McCalman & Paton, 1992	Burke, 1994	Walton, 1995	Kotter, 1995
▪ Exploration	▪ Unfreez-ing	▪ Developing need ▪ Establishing change relationship ▪ Diagnosing problems	▪ Scouting ▪ Entry	▪ Awareness of the need and opportunities for change ▪ Assessing the environment and organisation	▪ Entry ▪ Contracting	▪ Mobilising energy	▪ Problem / system specification ▪ Formulation of success criteria ▪ Identification of performance indicators	▪ Generating need	▪ Diagnosis	▪ Establishing a sense of urgency ▪ Forming a powerful guiding coalition
▪ Planning		▪ Examining alternative routes and goals ▪ Establishing intentions of action	▪ Data collection ▪ Data feedback ▪ Diagnosis ▪ Planning	▪ Designing the future state ▪ Defining what needs to be changed ▪ Planning and organising for implementation	▪ Diagnosis ▪ Feedback ▪ Planning	▪ Developing a task-aligned vision ▪ Fostering consensus, competence and cohesion	▪ Generation of options and solutions ▪ Selection of evaluation techniques and option editing ▪ Option evaluation	▪ Determining future state ▪ Addressing organisation power and political dynamics	▪ Clarifying and Coalition Building	▪ Creating a vision ▪ Communicat-ing the vision
▪ Action	▪ Moving	▪ Actual change efforts	▪ Action ▪ Evaluation	▪ Implementing new state ▪ Evaluation and fine-tuning	▪ Intervention ▪ Evaluation	▪ Spreading revitalisation	▪ Development of implementation strategies	▪ Disengaging from past ▪ Organising transition teams ▪ Involving people ▪ Using multiple levers ▪ Providing feedback ▪ Creating symbols and language	▪ Action ▪ Consolidat-ion and Refinement	▪ Empowering others to act on the vision ▪ Planning for and creating short term wins ▪ Consolidating improvements and producing still more change
▪ Integration	▪ Refreez-ing	▪ Stabilising change ▪ Terminating relationship		▪ Formalising the new state		▪ Consolidat-ing changes ▪ Continually monitoring and strategising	▪ Consolidation	▪ Utilising reward system ▪ Deploying guardians of the new way	▪ Sustaining	▪ Institutionalis-ing new approaches

Source: modified by Salminen (cited in Lanning, 2001:14)

It is abundantly clear from the abovementioned literature that a myriad models and theories around change management exist; and those organisations that want to survive in the current milieu need to harness their capacity to manage change. Pieters and Young (2000:3) argue (as set out in Figure 2.4) that synergy and balance should be created between the change and the external environment by managing for change by approaching change from a systems perspective, by continuous improvement on an organisation-wide basis and by continuous learning achieved by putting life/career-long learning support systems in place.

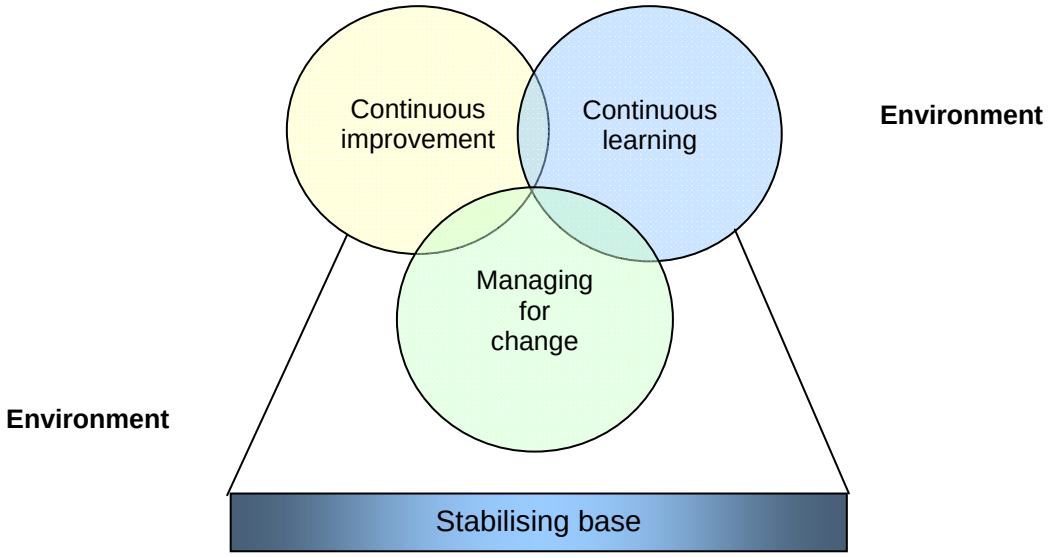


Figure 2.4: Synergy and balance between the change and the external environment
Source: Pieters and Young (1999:3)

In an attempt to manage change, managers worldwide are adopting various project management methodologies to effect change as a means to achieving strategic business objectives. Formerly hierarchical organisational structures are now often modified to include project and programme management as a way to enhance profit and competitive advantage by means of a more flexible and effective management configuration.

2.4 PROJECT MANAGEMENT THEORY AND MODELS

All organisations are faced with the imperative to adapt their strategies, structures and processes continuously to an ever-changing and dynamic environment to remain competitive. In recent years,

project management as a management methodology, has gained a remarkable reputation as a medium which facilitates the execution of strategy in order to enhance performance.

2.4.1 Development of project management

Hebert (2002:2) suggests that project management evolved in three stages, which can be grouped according to when the evolution took place, namely from the 1960s to 1970, the 1970s and after 1979.

- **The 1960s to 1970**

  This era was characterised by an abundance of resources and unprecedented economic growth, supported by optimism. Project management was not a well-known method at the time; it was not taught in management schools; and, when it was used at all, was usually driven by an individual who had only a vague idea of what the task at hand entailed.

- **The period between 1970 and 1979**

  During this era, most businesses undertook a few, mostly highly technical and specialised, projects on an annual basis, for example, the large space projects run by the National Aeronautics and Space Administration (NASA). The global economy was still strong, and product life cycles were relatively long.

  Taylorism, that is the transfer of control of the work process to management and enhancing productivity by means of a division of labour, combined with pyramidal management hierarchies, resulted in rigid structures faced by the need for and challenge of automation-driven production growth.

  Project management during this era was mostly outsourced, especially to engineering firms; and it was seen as a tool for controlling costs and schedules. Project managers, mostly engineers, focused on technical issues such as construction and infrastructure.

- **Evolution from 1979 onwards**

  The world-wide oil crisis of 1979 halted this period of growth. This crisis made businesses realise that they no longer had full control over raw material costs and therefore had to refocus on quality instead. This resulted in stronger global competition, which in turn led to a decline in product life cycles. Businesses had to devise new ways of conducting business as a strategic response to a constantly changing business environment.

This era saw the rapid development of sales and marketing services as new business solutions enabling responsiveness to customer needs. Matrix organisational structures were put in place to optimise resources; and projects were no longer only technical, but also dealt with improving organisational outputs and structures. The concept of total quality, which included human resources management, was embraced.

2.4.2 Current application

The current era of project management is characterised by the use of cutting-edge project management techniques that assist management to focus its resources more efficiently. Leeman (2002:1) asserts that "project management methodology bridges the gap between company strategy and individual projects, between setting goals and achieving those goals". According to the Project Management Institutes, Project Management Body of Knowledge (PMBOK, 2000), there are eight knowledge areas which should be managed across a project life cycle, namely

- **project integration management**, which includes ensuring alignment and synergy between key project elements;
- **project time management,** that is, managing all interdependencies to ensure project completion on time;
- **project cost management,** that is, activities to ensure project completion within the scope of the project budget;
- **project quality management,** that is, ensuring that the project meets all the specified quality criteria;
- **project human resources management,** that is, ensuring that human resources are optimally used;
- **project communication management,** that is, all activities related to the generation and distribution of information related to the project;
- **project risk management,** that is, ensuring that potential risks are mitigated with appropriate contingency planning; and
- **project procurement management,** that is, sourcing appropriate goods and services relevant to the project.

All of the above areas are important when managing projects. However, the management of change and change dynamics are largely excluded and the focus (apart from managing timelines, cost, quality, risk, procurement and communication) is only on limited human resources matters. This might explain the lack of adequate focus on the professional management of change within the project management domain.

Figure 2.5 depicts the difference between project management and normal day-to-day operations management.

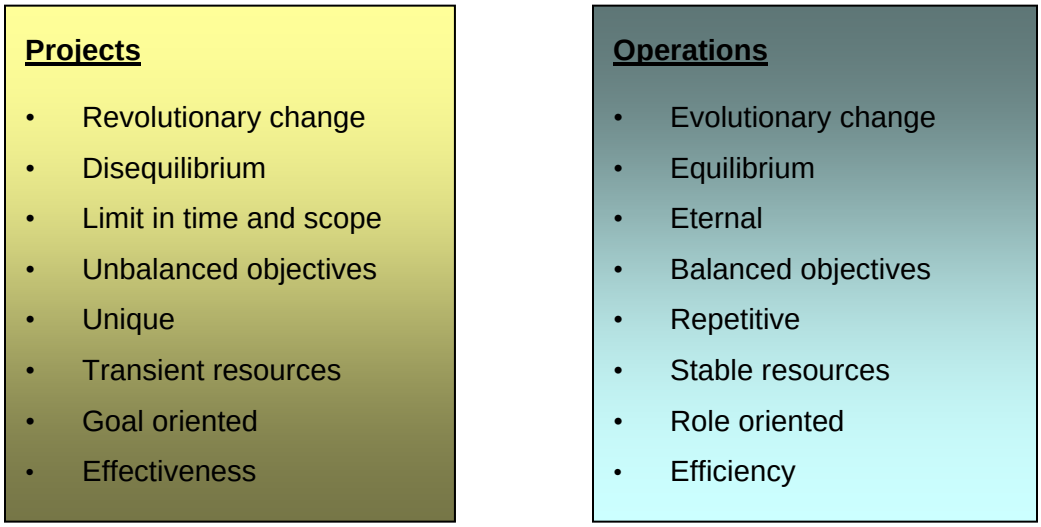


Figure 2.5: Difference between project management and normal operations management
Source: Hamilton (1997:65)

For the purposes of this study, the focus is on projects and related methodologies, as opposed to normal day-to-day operations.

Grundy and Brown (2002:3) have supplemented the approaches of more traditional project management with more strategic perspectives. They define **strategic project management** (SPM) as "the process of managing complex projects by combining business strategy and project management techniques in order to implement the business strategy and to deliver organizational breakthroughs". According to these authors, strategic project management contains five stages, namely:

- **Defining the project**, which involves
  - diagnosing key problems which give rise to the project;

- defining the project's scope and focus;
- clarifying key interdependencies;
- creating a vision for the project as well as key objectives; and
- identifying stakeholders.

- **Creating the project strategy, which involves**
  - exploring the internal and external environment of the project;
  - defining the key strategic objectives of the project;
  - examining strategic options for what to do and how to execute it;
  - assessment of the project's attractiveness and implementation difficulty; and
  - strategising around key stakeholders.
- **Detailed project planning, which requires**
  - analysing key activities and/or subprojects within the overall project strategy;
  - analysing the interdependencies and networking of the key activities, including critical paths;
  - appraising key uncertainties with contingency plans; and
  - appraising the project's value, financials and cost drivers.
- **Implementation and control, which means**
  - defining project milestones and responsibilities;
  - identifying key implementation difficulties and putting corrective measures in place; and
  - creating a preview of likely project dynamics.
- **Review and learning, which involves**
  - revisiting the project to assess the delivery, implementation and positioning of the project and other behavioural lessons; and
  - looking at lessons learnt on how the strategic project management process could be improved.

From the above it is clear that conventional project management is an integral part of strategic planning within organisations, which broadens its original scope from being mechanistic and rigid

(adhering strictly to the more technical aspects of project management) to allow for a certain level of fluidity and adaptability throughout the life cycle of the project. However, again, not much is said about the management of change dynamics within the project and organisational context.

Projects consist of various stages and/or phases within a project management life cycle. Table 2.5 (overleaf) depicts this.

Table 2.5: Summary of the project life cycles according to various authors

Morris, 1982	Adams & Barndt, 1983	Roman, 1986	Burke, 1995	Maylor, 1996	Turner, 1999	Kerzner, 1998
Feasibility: • Project formulation • Feasibility studies • Strategy design and appraisal	Conceptual: • Identify need • Establish goals • Estimate available resources • Sell the project • Make key personnel appointments	Conceptual: • Objectives • Activity forecasting • Review of objectives	• Conceptual		Germination: • Develop proposals • Gather information • Conduct feasibility • Estimate design	• Conceptual
Planning and Design: • Base design • Cost and schedule • Contract terms and conditions • Detailed planning	Planning: • Define organization • Define targets • Schedule • Define and allocate tasks and resources • Build project team	Formative: • Policy decisions • Planning		Planning: • Conceptualisation • Analysis • Proposal • Justification • Agreement	Growth: • Develop design • Estimate costs and returns • Assess viability • Obtain funding	• Planning • Definition and design
Production: • Manufacturing • Delivery • Civil works • Installation • Testing	Execution: • Perform the work	Operational: • Implementation • Control	• Execution	Doing: • Start-up • Execution • Completion • Hand-over	Maturity: • Do detail design • Baseline estimates • Do work • Control progress	• Implementation
Turnover and Start-up: • Final testing • Maintenance	Termination: • Transfer the product • Release the resources • Transfer of commitments • Terminate the project • Reward personnel	Termination: • Evaluation	• Operation	Checking: • Review Acting: • Feedback	Metamorphosis: • Finish work • Commission facility • Obtain benefit • Disband team • Review achievement	• Conversion

Source: Lanning (2001:20)

From Table 2.5 above, it is clear that projects consist of clearly defined phases across the life cycle of a project, are temporary, deal with unique once-off matters, have clear deliverables and time frames and are complex. For the **purposes of this study**, the abovementioned phases have been consolidated into the following **four phases**, which will subsequently be used as basis for this research study, namely

- the conceptual/initiation phase;
- the planning phase;
- the implementation phase; and
- the post-implementation phase.

2.5 RATIONALE FOR CHANGE MANAGEMENT IN THE CONTEXT OF PROJECT MANAGEMENT

2.5.1 Introduction

Felkins *et al*. (1993:23) claim that organisational leaders must find effective ways to deal with the profound changes that are redefining structures, redesigning work, changing relationships, transforming cultures, creating new roles for boards, managers, staff professionals, team members, and employees: "Leaders must take on more facilitative roles, as competencies in change management become critical to creating and sustaining effective organisations". Felkins *et al*. (1993:26) describe the changing roles of a manager in the chart in Figure 2.6.

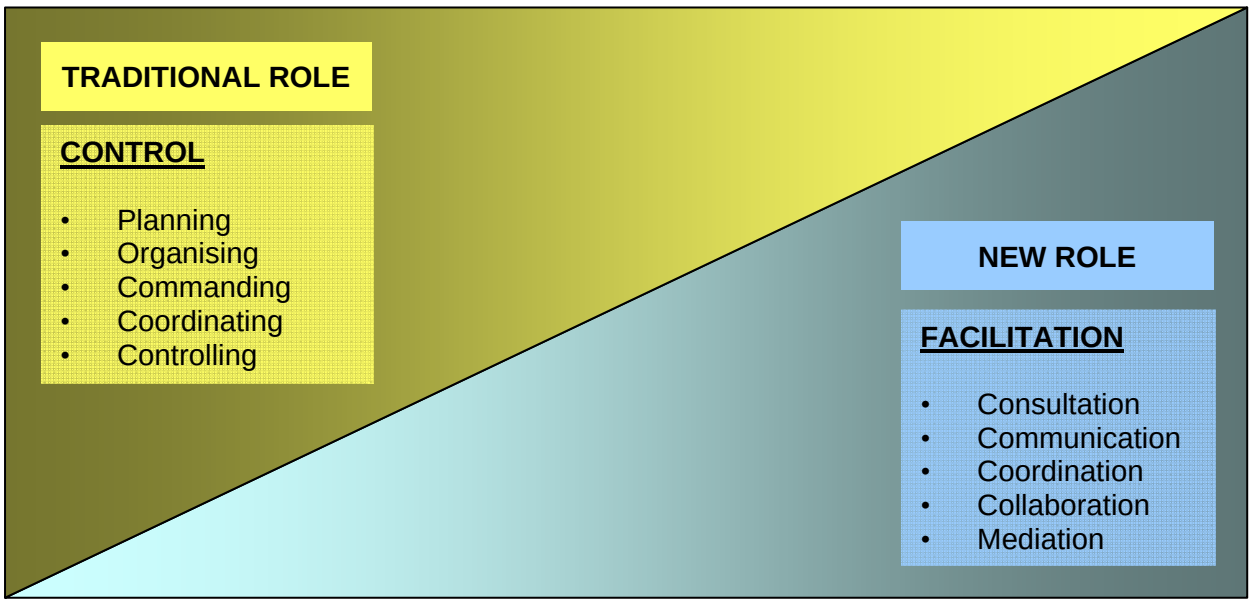


Figure 2.6: Changing roles of a manager

Source: Felkins *et al*. (1993:26)

It is clear from Figure 2.6 that the classic functions of the manager used to revolve around planning, organising, commanding, coordinating and controlling resources, whilst the new required managerial competencies revolve around conflict management, problem solving and resource development in a fluid environment. The old mechanistic role of the manager has therefore evolved into a more facilitatory role which requires the manager to achieve results by means of more collaborative processes.

However, the nature of project management (namely that it is a very structured process with strict deadlines and quality criteria, and that it requires rigorous management of costs) does not lend itself to the proper management of change dynamics, which requires sufficient time to mediate, collaborate and work with and through individuals to ensure buy-in for, participation in and the internalisation of the change that is being effected. This dilemma provides a project manager with a complex paradox which needs to be managed throughout the life cycle of the project.

2.5.2 Project failure

Many change projects fall short of the originally stated intentions and objectives, thus detracting from projects' success in terms of their outcomes, timeframes, quality and cost. Kaplan and Norton (cited in Lanning, 2001:1) refer to their study amongst management consultants which showed that fewer than 10% of clearly formulated strategies were successfully implemented. As many as 60% of South African participants in a study on project success have experienced at least one failed project in the twelve months preceding the survey, with an accompanying average failed project cost of R22 million (KPMG Survey, 2002:1). In the same KPMG survey reference is made, amongst other aspects, to the importance of people aspects which should be addressed through communication and change management initiatives.

Davenport (cited in Grover *et al.,* 1995:116) points researchers toward relevant research streams to enable them to understand Business Process Reengineering implementation issues and problems better. These streams include

- **implementation factors research**, which emphasises top-management support, technological sophistication and the involvement of constituents in the process;
- **implementation process research**, which delineates the boundaries of implementation components and emphasises the need for communication around change;

- **implementation politics research**, which deals with non-rational behaviour and the management of resistance to change;
- **management information system (MIS) planning research**, which focuses on top-down analysis, alignment of systems with corporate goals, the need for broad participation, commitment from top management, resource allocation, alignment with culture and the need for methodology;
- **innovation research**, which emphasises organisational structure, technological resources and positive managerial attitude toward change; and
- **organisational development and socio-technical approaches**, which emphasise the importance of optimising both the technical and human systems within the context of the culture and environment simultaneously.

From the above list it is clear that the failure of projects can often be attributed to a number of aspects, which include the technical aspects related to project management, but also, very importantly, issues related to change management and relevant change dynamics. If a project manager and/or team is not vigilant in integrating all aspects and managing them in a holistic manner (including change management), the project will not achieve its original project scope and objectives.

2.5.3 Change dynamics that affect project success

According to Hebert (2002:5), project managers must be flexible, must be able to work with ambiguity and must be able to manage change. Frame (2002:8) expresses a similar opinion, arguing that traditional project management emphasises the importance of basic skills such as scheduling, budgeting and allocating human and material resources. Frame (2002) adds that project managers should, in addition to being proficient in “hard” skills such as these, be adept at “soft” skills such as negotiating, managing change, being politically astute, and understanding the needs and desires of the people they deal with (including customers, peers, staff, and their own managers).

Two things make this a challenge: first, the nature of project management, which is a structured approach to achieve project timelines, quality standards and budget parameters; and, second, the fact that project managers might not enjoy the same authority as traditional functional managers. Project managers are frequently appointed on the basis of their technical expertise, and without a proper grounding in change management and/or they are rewarded on the basis

of the technical outcome of project deliverables, resulting in no focus or an insufficient focus on change management aspects.

A review of the literature on project management indicates that much emphasis is indeed placed on the mechanistic and technical nature of project management, which includes life cycle planning, quality measures, cycle time, cost, defects reductions, etc. Only a relatively small portion of the literature is dedicated to issues related to organisational behaviour and human resources issues such as leadership, training, resource allocation, project structures, etc. Even less is written about the management of change dynamics within the realm of project management to ensure that the benefits obtained from the project are indeed implemented and embedded within the organisation. Transformational issues such as organisational culture, managing resistance to change, sufficient communication, organisational politics, commitment, and so forth, are therefore seldom recognised or addressed, and their relationship with project success is often ignored or downplayed.

As was mentioned in Chapter 1, on the basis of empirical research on reengineering in 105 organisations, Grover *et al.* (1995:110) assert that, change management within Business Process Reengineering processes is of central importance in the success of the implementation of Business Process Reengineering.

Table 2.6 contains all the change management-related and management support aspects and their respective severity scores or weighting values (as percentages) indicated in the study by Grover *et al.* (1995:137).

Table 2.6: Severity scores of the change management and management support aspects

Rank	Score (in %)	Problem	Category
1	31.8	Need for managing change is not recognised	Change management (CM)
3	30.1	Rigid hierarchical structures in the organisation	CM
4	28.8	Line managers in the organisation unreceptive to innovation	CM
5	27.7	Failure to anticipate and plan for the organisational resistance to change	CM
7	23.3	Failure to consider politics of the business reengineering efforts	CM
10	23.0	Failure to build support from line managers	CM
12	22.1	Unreasonable expectations attributed to business re-engineering as a solution for all organisational	CM

		problems	
16	21.7	Managers' failure to support the new values and beliefs demanded by the redesigned process	Management support (MS)
18	20.6	Absence of management systems (e.g. incentive, training systems) to cultivate required values	CM
20	20.1	Difficulty in gaining cross-functional cooperation	CM
23	18.5	Senior management's failure to commit to new values	CM
24	18.2	Insufficient understanding about the goals of top management in relations to business reengineering	MS
26	16.8	Lack of appropriate employee compensation incentives in the new process	CM
29	16.3	Lack of senior management leadership for reengineering efforts	MS
29	16.3	Failure to communicate reasons for change to members of organisation	CM
33	16.9	Inadequate training for personnel affected by the redesigned process	CM
34	15.9	Necessary changes in human resource policies for business reengineering implementation were not made	CM
36	15.4	Top management's insufficient understanding about business reengineering	MS
36	15.4	Failure to consider existing organisational culture	CM
41	13.5	Lack of top management support in business reengineering efforts	MS
60	7.0	Not enough time to develop new skills for the redesigned process	CM

Source: Grover *et al*. (1995:137)

From Table 2.6 it is clear that change management aspects within the project domain are of critical importance and that they should be regarded as crucial to for the successful execution of projects.

Grover *et al.* (1995:126) conclude that "change management occupies the centre stage in business process reengineering implementation" and claim that "inability to manage organisational change in reengineering will most likely lead to project failure". Their study has shown that there is a critical relationship between change management and project success and that, in fact, there is a stronger correlation between change management and project success than between technological competence and project success. While Grover *et al*. considered technical competence important and complex, they found that it had the least impact on project success. Table 2.7 (overleaf) shows Lanning's (2001:24) summary of various authors' views on critical success factors in carrying out change in organisations.

Table 2.7: Summary of different authors' views on critical success factors in carrying out change in organisations

	Purposeful participation	Management support	Effective communication	Control and feedback	Supporting environment	Vision and clear goals	Purposeful planning	Clear need for change	Training	Key persons & organisation	Motivating people	Paying attention to culture	Risk management and dealing with resistance	Co-operation	Connection to strategy	Leadership
Lippit *et al*., 1958	✓	✓		✓	✓	✓	✓	✓	✓		✓		✓			
Ackerman & Corrigan, 1989	✓	✓	✓	✓	✓	✓	✓	✓		✓			✓			
Kleiner & Corrigan, 1989	✓		✓	✓		✓	✓					✓				
Carnall, 1990		✓		✓	✓		✓	✓	✓					✓	✓	
Mikkelson *et al*., 1991		✓	✓						✓							
Kaufman, 1992	✓	✓	✓		✓	✓	✓								✓	
Cummings & Worley, 1993		✓			✓	✓	✓		✓	✓	✓		✓			
Burke, 1994	✓	✓	✓	✓	✓	✓		✓		✓	✓	✓				
Eichelberger, 1994	✓		✓		✓	✓	✓	✓						✓	✓	
Kotter, 1996	✓	✓	✓	✓		✓		✓		✓		✓	✓			✓
Denton, 1996	✓	✓	✓	✓		✓			✓	✓	✓					
Goodstein & Burke, 1997	✓	✓		✓	✓		✓		✓					✓		
Rafii & Carr, 1997	✓		✓		✓			✓								
Moosbrucker & Loftin, 1998	✓	✓	✓													
Teng *et al*., 1998	✓			✓	✓				✓			✓				
Salminen, 2000	✓	✓	✓	✓		✓	✓	✓	✓		✓					✓
∑	**13**	**12**	**11**	**10**	**10**	**10**	**9**	**8**	**8**	**5**	**5**	**4**	**4**	**3**	**3**	**2**

Source: Lanning (2001:24)

Another study done by the University of Bristol concerning Business Process Reengineering in the United Kingdom financial services industry, discussed by McElroy (1996:328), lists the following factors set out in Table 2.8 as either important or absolutely critical for project success.

Table 2.8: Factors viewed as either important or absolutely critical for project success

Factors	%
Communicating a clear vision	100
Staff participation	100
Instilling process ownership	95
Process improvement teams with staff from all levels	90
Instilling a BPR culture	90
Organising staff around the process	90

Source: McElroy (1996:328)

In their study of 100 companies' managing change to implement collaborative working between organisations, Boddy and Macbeth (2000:298) took into account current theories of organisational change which provided some consistency in terms of the recommended practices for successful change projects and grouped these under broad headings such as project planning, structure and implementation:

- Project planning (setting clear goals; ensuring agreement with goals; and having senior management commitment);
- Project structure (creating structures to manage the change; ensuring adequate resources; having a powerful and respected champion; and appointing a capable project leader); and
- Project implementation (creating a project team with the right membership; preparing a detailed yet flexible project plan; consulting widely with those affected; and setting up adequate controls).

The aim of the study was to establish if there was any quantitative evidence about the recommended practices on how to introduce change to ensure successful project implementation. The recommended practices were drawn from a review of the change management literature. The study requested respondents to indicate which project management practices they had used during their project implementation and whether the project had been successful or not.

Analysis of the responses showed that companies which had been successful in their change initiative showed a statistically significant tendency to agree with the following statements:

- The people affected by the change within my organisation agreed with the goals;
- Management created a clear structure to manage the change;
- Senior management accurately estimated the amount of resources needed to implement the change; and
- A satisfactory system was developed to measure the progress of the change.

The above findings were consistent with the prescriptions on change management and much of the literature, which stressed the value of getting the necessary buy-in from those affected by the change effort. Unexpectedly however, successful companies tended to disagree with the project management practices expressed in the following statements:

- Care was taken to ask people with different perspectives for their views on the change; and
- There was a lot of exploring and experimenting with ideas.

Furthermore, it was observed that other commonly prescribed practices appeared to have had little effect on change initiative outcomes. The results of the study indicated that effective change does not always a) require the public support of senior management, b) have to be backed by a strong champion, or c) achieve success because the company has a detailed project plan in place. These results are contrary to what the change management literature would typically suggest and "show that while common prescriptions may help a project, they do not by themselves ensure success" (Boddy & Macbeth, 2000:298).

The above overview on project success and change management indicates that some research has already been done on determining the impact of and correlation between project success and change management. However, neither the change management and/or the project management literature nor documented practices offer a comprehensive, holistic and integrated approach to the management of change dynamics in project management. The literature tends to focus either on only change management or on only project management, but not on integrating and synergising the two concepts and the interface between the concepts. The aim of this study is therefore to contribute to the body of knowledge of both project management and organisational behaviour, by linking the existing theories of change management/dynamics with the constructs and dimensions of project management, and more specifically with the four stages of a project life cycle to develop an assessment tool to measure change.

2.6 ASSESSING CHANGE DYNAMICS

From the above section it is clear that there is a need for an integrated and scientific approach to the measurement of change dynamics within the realm of project management. The research approach used to assess change dynamics should be both qualitative and quantitative if it is to overcome possible deficiencies that can be attributed to one investigator or method (Babbie & Mouton, 2001:275).

2.6.1 Measurement of change dynamics

Miller (cited in Felkins *et al*., 1993:213) describes three patterns of research, namely basic, applied and evaluative research. **Basic**, or pure, research endeavours to seek new knowledge and is associated with traditional scientific investigation. **Applied** research is more pragmatic. It attempts to provide knowledge which can be used in direct action implementation and problem solving. **Evaluative** research provides an assessment of ongoing programmes and processes. The research done in this study fits best into the realm of applied research in that it will contribute to the practical application of change dynamics in a project management environment. Felkins *et al.* (1993:213) also comment that "collecting and analyzing data for change management includes determining the macro- and micro-units of change and measurement, reviewing statement of need, validating the need, and choosing methods of responding to the need".

Measurement in the social sciences is a much broader and more complex concept than in the physical sciences. According to DeVellis (1991:7), "measuring elusive, intangible phenomena derived from multiple, evolving theories poses a clear challenge to social science researchers. Therefore, it is especially important to be mindful of measurement procedures and to recognise fully their strengths and weaknesses".

The four major techniques for data collection are summarised in Table 2.9.

Table 2.9: A comparison of different methods of data collection

Method	Major advantages	Major potential problems
Questionnaires	1. Responses can be quantified and easily summarised 2. Easy to use with large	1. Non-empathy 2. Predetermined questions/missing issues 3. Over-interpretation of data

	samples 3. Relatively inexpensive 4. Can obtain large volume of date	4. Response bias
Interviews	1. Adaptive – allows data collection on a range of possible subjects 2. Source of "rich" data 3. Empathic 4. Process of interviewing can build rapport	1. Expense 2. Bias in interviewer responses 3. Coding and interpretation difficulties 4. Self-report bias
Observations	1. Collects data on behaviour, rather than reports of behaviour 2. Real time, not retrospective 3. Adaptive	1. Coding and interpretation difficulties 2. Sampling inconsistencies 3. Observer bias and questionable reliability 4. Expense
Unobtrusive measures	1. Non-reactive – no response bias 2. High face validity 3. Easily quantified	1. Access and retrieval difficulties 2. Validity concerns 3. Coding and interpretation difficulties

Source: Nadler (cited in Cummings & Worley, 2001:115)

As can be seen in Table 2.9, no single method or measurement tool can fully assess all the kinds of variables inherent in the organisational development or change process. For example, a questionnaire lends itself to self-report biases, such as the tendency of respondents to give socially desirable answers instead of honest opinions, according to Cummings and Worley (2001:114). The latter authors therefore recommend that more than one method be used to collect data, because of the biases inherent in any data-collection method.

Questionnaires are one of the most efficient ways available of collecting data, in that they typically contain fixed-response queries about organisational features and can be administered to large numbers of people simultaneously. Analysis can be done fairly quickly, using appropriate software, making possible quantitative comparison(s) and evaluation. The downside of using questionnaires includes, first, that responses are only related to questions covered in the instrument; second, that respondents cannot seek clarification; and, third, that they are impersonal and allow response biases (Cummings & Worley, 2001:115). According to Felkins *et al.* (1993:244), questionnaires are often developed by organisations to gather specific

information on a topic or issue related to change management and to provide descriptive and explanatory data. Felkins *et al.* also caution that it is crucial to decide what data is needed and to ensure that the questions provide the data that is required.

Duncan (cited in DeVellis, 1991:6) maintains that psychometrics has emerged as a methodological paradigm within the social sciences in its own right, and supports this argument with three examples of the impact of psychometrics: first, the widespread use of the psychometric definitions of reliability and validity; second, the popularity of factor analysis in social sciences research; and, third, the adoption of psychometric methods in developing scales measuring an array of variables far broader than those with which psychometrics was initially concerned.

Mouton (2001:103) cautions against the following errors in **instrument design**:

- no piloting or pre-testing is done;
- ambiguous or vague items are used (words are undefined, items are too vague, or too much is assumed about the respondents);
- double-barrelled questions are used (such questions combine two or more questions in one);
- item order effects arise (research has shown that the order or sequence of questions may affect response accuracy and response rates);
- fictitious constructs are measured/used;
- leading questions are asked;
- questions are phrased negatively or contain double negatives;
- poor and confusing layout of the questionnaire can lead to non-response or other errors;
- instruments may be too long;
- sensitive or threatening questions are asked; and/or
- mono-operational bias arises (constructs are measured using only a single item or question).

The information reviewed and assessed during the literature study informed the design of the assessment tool and caution was taken to avoid the potential problem areas mentioned above.

2.6.2 Development of an assessment instrument

The following steps were followed in the design of the envisaged assessment tool or instrument:

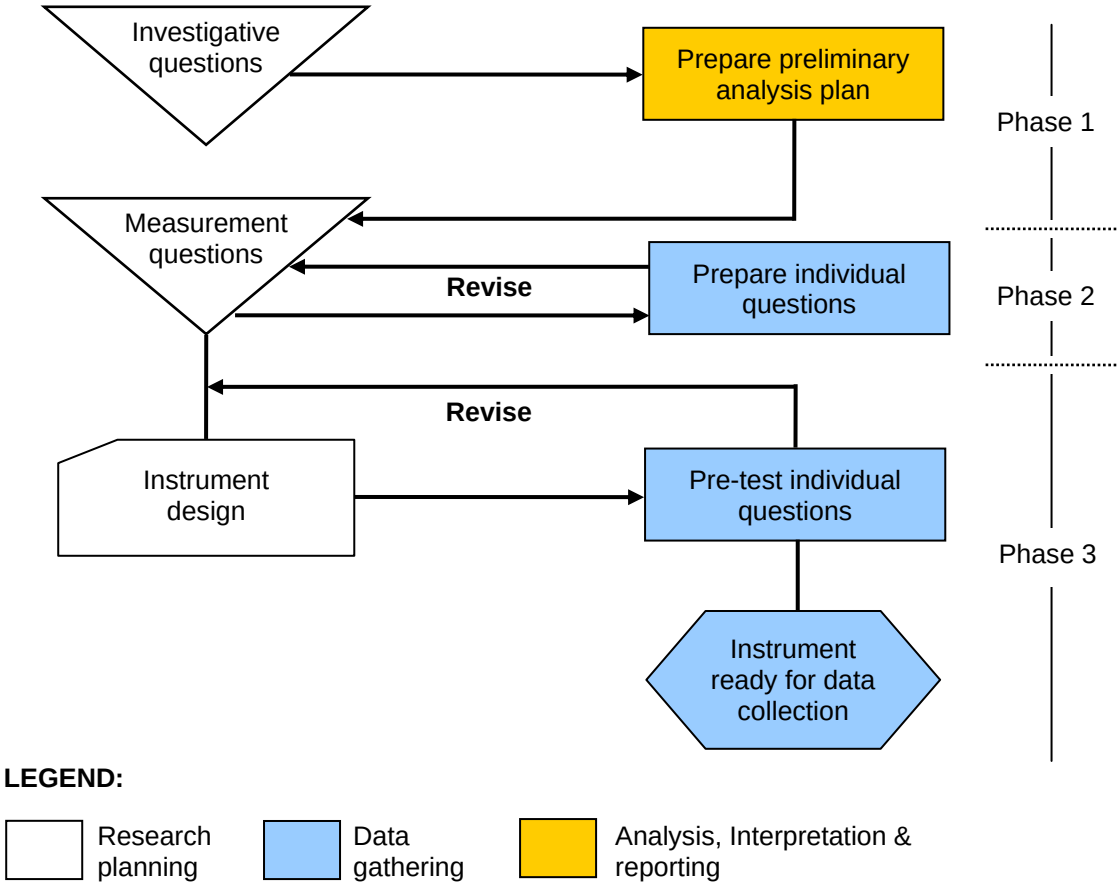


Figure 2.7: Flowchart for Instrument Design
Source: Cooper & Schindler (2003:329)

According to the diagram in Figure 2.7, the process of developing an instrument goes through the following levels (Cooper & Schindler, 2003:329):

- **management question** – the dilemma, stated in question form, that needs to be resolved;
- **research question(s)** – the fact-based translation of the question the researcher must answer to contribute to the solution of the management question;
- **investigative questions** – specific questions the researcher must answer to provide sufficient detail around the research question; and
- **measurement questions** – questions the respondents have to answer to resolve the management question.

Phase 1 of the assessment tool development consisted of a thorough literature review on the constructs relevant to the research questions to be asked in order to narrow down the potential number of constructs to be included in the eventual assessment instrument. This process was complemented by the application of the Delphi Technique.

The Delphi Technique can be defined as "a method for structuring a group communication process so that the process is effective in allowing a group of individuals, as a whole, to deal with a complex problem" (Linstone & Turoff, cited in Hanafin, 2004). It can also be described as a technique that can be used to arrive at a group position regarding an issue under investigation. The Delphi method consists of a series of repeated interrogations, usually by means of questionnaires, of a group of individuals whose opinions or judgments are of interest. After the initial interrogation of each individual, each subsequent interrogation is accompanied by information regarding the preceding round of replies, usually presented anonymously. After two or three rounds, the group position is determined by averaging (Principia Cybernetica Web, s.a.).

The methodology for developing a measurement instrument described in the guidelines by DeVellis (1991:51), as presented in Table 2.10, was found to be useful in developing the measurement instrument and was applied.

Table 2.10: Measurement instrument development methodology

Phase 1 **Determining what to measure**	**In this phase, clear and exact parameters of what is to be measured are established by** • using theory and becoming well-versed in theories related to the construct to be measured; • recognising the boundaries of the phenomenon; and • drawing up a theoretical model and/or framework at some level of conceptual formulation to guide the development of the scale, should no relevant theory exist. **The level of specificity versus generality is determined by** • determining a clear frame of reference of the level of specificity or generality at which a construct is to be measured. **Clarity about what to include in a measure is achieved by** • establishing whether the construct to be measured is distinct from other constructs to ensure that the measurement of the construct is in line with

	the objectives of the scale developer.
<u>Phase 2</u> **Generating an item pool**	**In this phase, items are chosen that are in line with the purpose of the scale, bearing in mind the following criteria:** • all items should reflect the construct of interest and the latent underlying variable; and • all items should reflect a construct and not merely a category: "models for scale development regard items as overt manifestations of a common latent variable that is their cause" DeVellis (1991:55). **Items are chosen bearing in mind the principles relating to redundancy:** • the focus is on over-inclusiveness – redundancy is more desirable in the initial item pool than in the final scale; and • although a final number of items for the inclusion in the pool cannot be prescribed, it will obviously be considerably higher than in the eventual scale; and that safeguards the scale developer against possible poor internal consistency. **Items are chosen bearing in mind the characteristics of good and bad items:** • exceptionally lengthy items should be avoided to reduce complexity and enhance clarity; • reading difficulty, including semantic and syntactic factors, should be assessed; • multiple negatives should be avoided to prevent confusion; and • double-barrelled questions, ambiguous pronoun references and misplaced modifiers should be avoided. **Positively and negatively worded items are considered:** • some items should be worded positively and some should be worded negatively to avoid affirmation, an acquiescence or agreement bias (that is, a tendency of a respondent to agree with items irrespective of their content).
<u>Phase 3</u> **Determining the format for measurement**	**In this phase, a decision is made on which scaling methodology to use** • for example, Thurstone or Guttman scaling. **Scales with equally weighted items are considered:** • it is preferable that scales should consist of items that are more or less parallel to allow the scale developer some latitude in constructing a measure which is optimally suited for its purpose. **The number of response categories is determined:** • a scale should discriminate between differences in the underlying attribute(s), otherwise its correlations with other measures will be

	restricted and its usefulness will be limited; • the wording or physical placement of response options should be done in such a way that the respondent is able to discriminate meaningfully; and • other issues for consideration include the investigator's ability and willingness to record a large number of values for each item and whether the number should be odd or even. **A choice is made between specific types of response format:** • specific types of response format, such as the Likert scale, the semantic differential scaling method, visual analoging and binary options should be considered. **It should be decided whether or not to use item time frames:** • a choice should be exercised in terms of whether or not a time frame is specified.
Phase 4 **Expert reviewing of the item pool**	**In this phase, subject matter experts should** • rate how relevant they think each item is to what the developer intends to measure; • evaluate the clarity and conciseness of items; and • point out ways of enhancing the phenomenon by identifying items that have not been included.
Phase 5 **Considering the inclusion of validation items**	In this phase, the construct validity of the final scale must be determined.
Phase 6 **Administering the items to a development sample**	**In this phase, the scale is administered on a suitably sized sample:** • Ghiselli in DeVellis (1991:78) suggest that 300 people are an adequate number.
Phase 7 **Evaluating the items**	**In this phase, item evaluation should be done, which should include the following:** • initial examination of individual items' performance by assessing reliability and correlation; and • considering reverse scoring, item-scale correlations, item means, item variances and coefficient alpha.
Phase 8 **Optimising scale length**	In this phase, the length of the scale should be optimised.

Source: Adapted from DeVellis (1991:51)

2.7 RECONSIDERING THE RESEARCH OBJECTIVES IN THE CONTEXT OF THE LITERATURE SURVEY

The literature survey covered in this chapter provides further context and scope for the study and provides answers to some of the research questions posed in Chapter 1, as summarised below.

- **Question 1: What constitutes change dynamics and how does it apply to the project management context?**

Question one above can be divided into two parts; first, "what constitutes change dynamics?" and second, "how do change dynamics apply in the project management context?" The discussion that follows deals with the second part of the question first.

The importance of the appropriate management of change dynamics in the domain of project management has been validated during the literature study. Previous works by Grover *et al.,* (1995:109), Hebert (2002:5), Lanning (2001:24), Boddy and Macbeth (2000:298), Mirvis and Macy (cited in Seashore *et al.,* 1983:501) and McElroy (1996:328) have been referenced in this regard and emphasised the importance of change management as a critical success factor for successful project implementation. It is essential that balanced attention be paid to all identified change management factors in addition to the traditional technical aspects of project management. The correlation between the appropriate management of change dynamics and successful project outcomes has been confirmed by the literature study and addresses the second part of the first question stated above.

The first part of the question ("what constitutes change dynamics?") has only partially been answered by the literature study. Some elements of change dynamics in project management have been identified, but this aspect needs to be explored more extensively by application of the relevant research methodologies to ensure a comprehensive description of all change dynamic components.

- **Question 2: Is there a need for an assessment tool to measure change dynamics in project management?**

It is evident from the literature study that organisations that give adequate attention to change dynamics during project management have a better success rate than those that do not. The various elements of change dynamics must therefore be included in the work breakdown structure of the project to ensure sustainable success. Without an appropriate assessment tool to guide project managers, the necessary change management elements may not be managed and measured on an ongoing basis, thus negatively impacting project objectives. The need for an assessment tool to measure change dynamics in project management has therefore also been validated by the literature study.

- **Question 3: What process should be followed in developing an assessment tool to assess change dynamics in the context of project management?**
- **Question 4: What could ultimately constitute a change dynamics assessment tool that can be used by project managers to manage change and its unique dynamics in projects?**

Questions 3 and 4 above could not be answered by the literature study and therefore need to be explored by means of the application of the chosen research methodology for this study:

2.8 SUMMARY AND CONCLUDING REMARKS

It is clear from the literature reviewed that there is an abundance of information concerning both change and project management theories and models. However, a comprehensive model on, first, what exactly constitutes change dynamics within the project management domain, and, second, how it can be measured, is does not exist, as any models that are available only cover some relevant aspects. The outcome of this study will contribute to a more integrated and holistic view on this matter.

CHAPTER 3: METHODOLOGICAL APPROACH

3.1 INTRODUCTION

Walsh (2001:1) argues that a research investigation involves the application of a particular way of thinking and the use of an identifiable range of particular skills and activities. The aim of this chapter is to describe the rationale for the application of the methodologies set out in Chapter 4.

According to Bechhofer (cited in Ali, 1998:3), "the research process is not a clear-cut sequence of procedures following a neat pattern but a messy interaction between the conceptual and empirical world, deduction and induction occurring at the same time". Pettigrew (cited in Ali, 1998:4) describes the research process as "characterised in the language of muddling through, incrementalism, and political process rather than as a rational, foresight, goal-directed activity". It is clear from these statements that research is often not a clear-cut process, neither when appropriate research questions have to be determined nor when an appropriate research methodology is to be chosen. Becker (cited in Ali, 1998:4) believes that "the finished monograph is the result of hundreds of decisions, large and small, made while the research is under way" and that "research is designed in the course of its execution". Despite these views, it is still important to ensure that researchers do their research in as controlled, rigorous and systematic a way as possible (Walsh, 2001:2).

According to Kumar (cited in Walsh, 2001:2), it is therefore important that research investigations should follow a process that

- is undertaken within a clear philosophical framework;
- uses procedures, methods and techniques that are evaluated for their validity and reliability; and
- is designed to be unbiased and objective.

According to Singleton, Straits, Straits and McAllister (1988:94), the following stages are relevant with regard to conducting social research:

- the selection and formulation of the research problem;
- the preparation of the research design;

- measurement;
- sampling;
- data collection;
- data processing; and
- data analysis and interpretation.

The application of these steps is discussed in Chapter 4.

3.1.1 Social science research

According to Singleton *et al.* (1988:7), scientific social research consists of two components, namely social and scientific components. First, the social component exists since the study involves people – how they act, think, feel and interact with one another. Second, it is scientific when the research is empirical (based on observation). On the basis of the nature of the research questions asked in this study, it is fair to argue that this study was conducted in the social science research field.

According to Neuman (1997:62), there are three different approaches to social sciences research, namely **positivism, interpretive social science** and **critical social science**.

Positivist social science is an approach used in the natural sciences. According to Neuman (1997:63), "positivism sees social science as an organized method for combining deductive logic with precise empirical observations of individual behaviour in order to discover and confirm a set of probabilistic causal laws that can be used to predict general patterns of human activity". The same writer defines the **interpretative approach** as "the systematic analysis of socially meaningful action through the direct detailed observation of people in natural settings in order to arrive at understandings and interpretations of how people create and maintain their social worlds" (Neuman, 1997:74). **Critical social science** is the third type of methodology that can be applied. Neuman (1997:74) defines it as "a critical process of inquiry that goes beyond surface illusions to uncover the real structures in the material world in order to help people change conditions and build a better world for themselves". Table 3.1 contains a summary of the differences between the three approaches.

Table 3.1: Comparison between positivism, interpretive social science and critical social science

	Positivism	Interpretive social science	Critical social science
1. Reason for research	To discover natural laws so people can predict and control events	To understand and describe meaningful social action	To refute myths and empower people to radically change society
2. Nature of social reality	Stable pre-existing patterns or order that can be discovered	Fluid definitions of a situation created by human interaction	Conflict fuelled and governed by hidden underlying structures
3. Nature of human beings	Self-interested and rational individuals who are shaped by external forces	Social beings who create meaning and who constantly make sense of their worlds	Creative, adaptive people with unrealised potential, trapped by illusion and exploitation
4. Role of common sense	Clearly distinct from and less valid than science	Powerful everyday theories used by ordinary people	False beliefs that hide power and objective conditions
5. Theory looks like	A logical, deductive system of interconnected definitions, axioms, and laws	A description of how a group's meaning system is generated and sustained	A critique that reveals true conditions and helps people see the way to a better world
6. An explanation that is true	Is logically connected to laws and based on facts	Resonates or feels right to those who are being studied	Supplies people with tools needed to change the world
7. Good evidence	Is based on precise observations that others can repeat	Is embedded in the context of fluid social interactions	Is formed by a theory that unveils illusions
8. Place for values	Science is value free, and values have no place except when choosing a topic	Values are an integral part of social life: no group's values are wrong, values only differ	All science must begin with a value proposition; some positions are right, some are wrong

Source: Adapted from Neuman (1997:83)

This research has a definite bias towards the **interpretative social science methodology,** since it is in essence a study of social behaviour or change dynamics within the context of the project configuration. It is based on the premise that, as Weber (cited in Neuman, 1997:68) argues, the social sciences need to study meaningful social action or social action with a purpose. He emphasised the need to study and learn the personal reasons or motives that shape a person's feelings, which in turn influence a person's decision to act in a particular way.

However, a component of the research can also be considered **positivist** in that deductive logic is used in tandem with empirical research (within the context or relevant theory) with regard to

what constitutes change dynamics in project management and also the design of a measuring instrument for change dynamics in project management.

3.1.2 Empiricism in the social sciences

Empirical research in the social sciences has always been a topic of rigorous debate as to whether social research is indeed on a par with natural sciences research and whether it can be considered objective and scientific. However, Krausz and Miller (1974:3) state that the social research procedure is indeed a scientific enterprise and strives "after objectively derived facts about the real world, and the systematic organisation of these facts into general explanations (theories) of social behaviour".

In Figure 3.1, Cook and Hunsaker (2001:A-8) depict the process of scientific research as applied to the study of organisational behaviour.

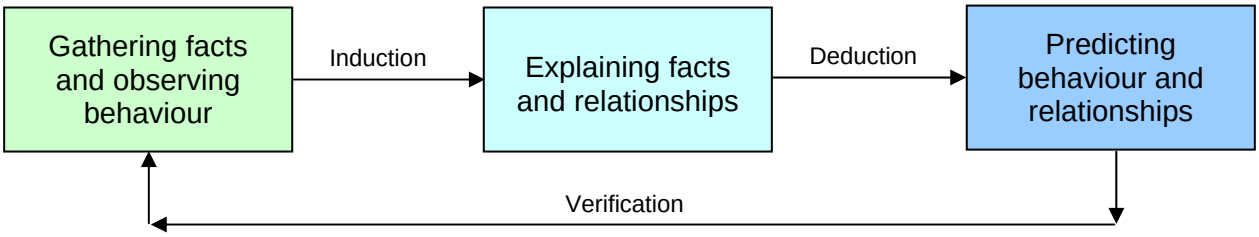


Figure 3.1: Process of scientific behaviour for the study of organisational behaviour
Source: Cook & Hunsaker (2001:A-8)

According to Cook and Hunsaker (2001), the scientific method uses a theory to guide systematic, empirical research from which generalisations can be made to influence the application of the theory. The scientific method therefore draws on facts underpinned by relevant theory, instead of on intuition and *ad hoc* observations. These authors conclude that "although the behavioural sciences may appear to lack the universal precision of the physical sciences, they all embrace the fundamentals of the scientific method" (Cook & Hunsaker, 2001:A-8).

3.2 RESEARCH METHODS

Once the area of study had been chosen, a topic has been selected and research questions have been defined, it is time to decide on an appropriate research approach. Kolb's experiential learning cycle explains the theoretical basis of the research, as is shown in Figure 3.2:

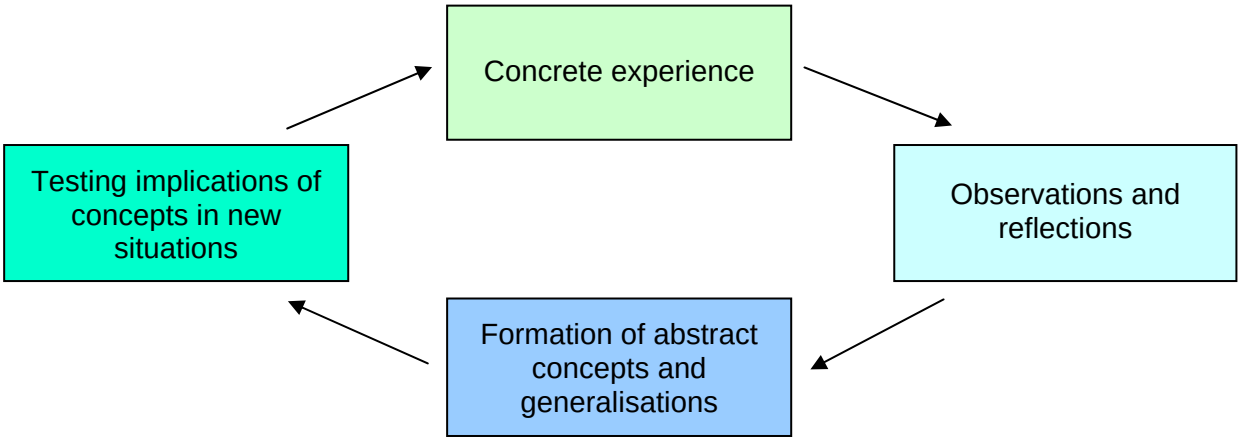


Figure 3.2: Kolb's experiential learning cycle
Source: cited in Ali (1998:5)

This figure suggests that Kolb's processes should be seen as attempts at constructing and evaluating explanatory statements or theories about what is happening around us. This enables us to differentiate between research methods that are deductive (based on logic) and those that are inductive (based on empirical evidence) (Gill & Johnson, cited in Ali, 1998:5).

3.2.1 Inductive and deductive reasoning

According to Neuman (1997:46), researchers normally approach the building and testing of theory from two possible directions. Some theories begin with abstract thinking, relate theoretical ideas to concrete evidence and then test the ideas against evidence. Other researchers start with specific observations based on empirical evidence, generalise and then build abstract ideas on the basis of evidence. He concludes that most researchers are flexible and use both approaches during various stages of the research process.

Ghauri *et al.* (cited in Ali, 1998:5) suggest that a researcher can, through a process of **induction**, draw general conclusions from empirical observations, implying that induction refers to the right side of Kolb's diagram in Figure 3.2.

Deductive research methods require "the development of a conceptual and theoretical structure prior to its testing through empirical observation, corresponding therefore to the left hand side of Kolb's experiential learning cycle" (Ali, 1998:5) in Figure 3.2.

Figure 3.3 indicates the difference between induction and deduction.

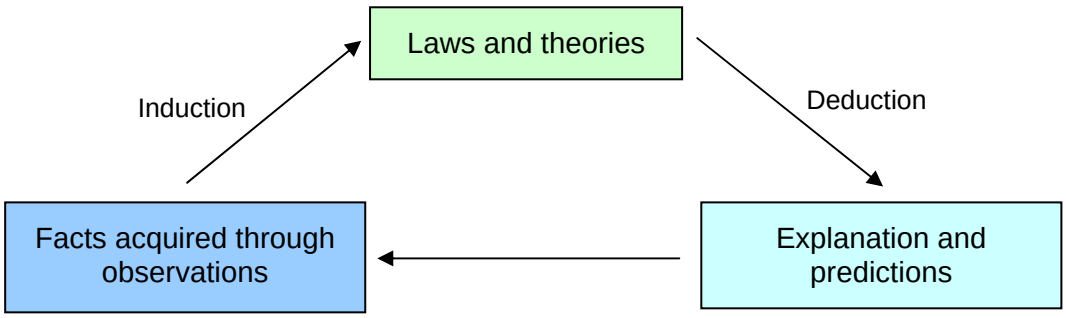


Figure 3.3: Difference between induction and deduction
Source: Chalmers, cited in Ali (1998:6)

The above figure suggests that induction refers to facts that are derived from observations and that lead to theories and hypotheses. Through the process of deduction, hypotheses are either accepted or rejected, resulting in an explanation or prediction. It is clear from Figure 3.3 above, that the research process is started by gathering facts from real-world behaviour and that it then progresses to a stage of inductive reasoning of possible general explanations or theories explaining the cause of behaviour and/or its effects. Alternatively, researchers can apply deductive logic by building on their logical-rational thoughts about phenomena to state testable hypotheses or models of predicted behaviour.

In this study, both inductive and deductive reasoning were used, since the researcher deduced some generalisations from an extensive literature survey and then used inductive reasoning throughout the empirical part of the study, while designing an assessment tool based on empirical research.

3.3 RESEARCH DESIGN

According to Ghauri *et al*. (cited in Ali, 1998:7), "the research design is the overall plan for connecting the conceptual research problems to pertinent (and achievable) empirical research".

They add that that empirical research is undertaken to answer research questions and that the research design that is chosen therefore needs to be appropriate to provide the required answers. They also argue that the research design that is chosen influences the eventual research activities, such as what data is collected and how. Hence, a thorough understanding of the research problem is imperative.

Research can be divided into three main categories, namely exploratory, descriptive and causal research (Ali, 1998:7). Figure 3.4 depicts the relationship between research design and the three research categories.

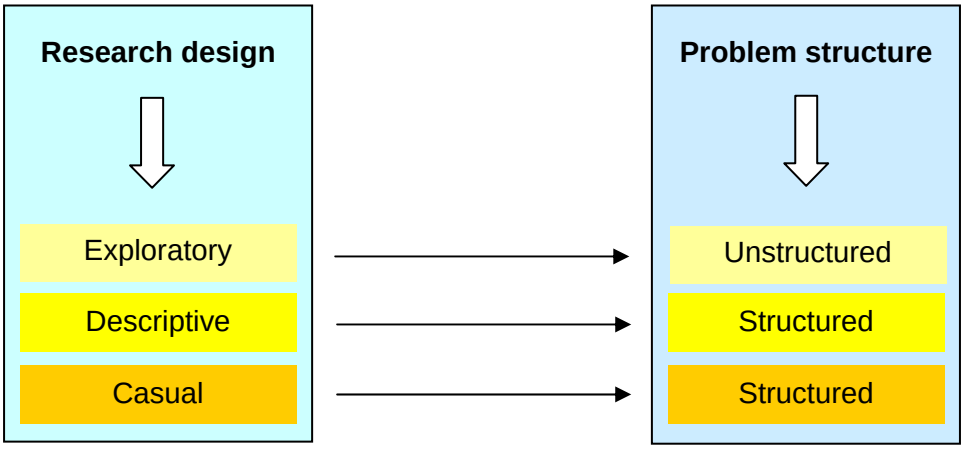


Figure 3.4: Relationship between research design and the three research categories
Source: Ghauri *et al*., cited in Ali, 1998:7)

From the above Figure 3.4 it is clear that as the research varies from exploratory to causal, there tends to be more formality with diminishing flexibility in the way the research is conducted.

Exploratory research was used in the preliminary stages of this study in order to determine the subject of the study, the scope of the study and the research questions through a literature study. It then advanced through to a more structured approach of descriptive research to develop an assessment tool for the measuring of change dynamics within project management through an iterative process of questionnaire or measurement instrument design containing all the relevant constructs and variables.

3.4 TYPE OF INFORMATION SOUGHT

After a research design has been chosen, it is important to decide which methodology to use. According to Adler *et al.* (cited in Ali, 1998:9), "choosing a methodology determines what we can study as well as the range of possible results and conclusions". **Qualitative methods** can be defined as "producing descriptive data that helps in understanding the 'why' of different attitudes and the underlying structures of values and perceptions affecting change which can include group and individual interviews, focus groups, observation, trend analysis and issues monitoring" (Felkins *et al.*, 1993:229). Wright (cited in Ali, 1998) states that qualitative research means "any research where number counting and statistical techniques are not the central issues, where an attempt is made to get close to the collection of data in their natural setting". **Quantitative methods** can be described as "yielding numerical data related to performance that can be analysed through statistical measures which could include surveys, questionnaires, audits, content analysis, and numerical documentation" (Felkins *et al.*, 1993:229).

This study used both qualitative and quantitative approaches to collecting data. The qualitative approach to data collection was in the form of a thorough literature study, and the administration of the Delphi technique in the initial stages of the research. Subsequent to this, a quantitative approach to data collection that included the administration of both the Lawshe (content validity) and DeVellis (scale development) methodologies, was applied. These methods were used as part of a validation or triangulation process (the use of multiple methods in an endeavour to overcome possible deficiencies that stem from one investigator or method), as recommended by Babbie and Mouton (2001:275).

Such an approach is supported by Ali (1998:14), who states that qualitative research should be used in conjunction with quantitative methods in a multi-method fashion. As can be seen from Table 3.2, international management research can benefit from the use of multiple methods, that is, a triangulation of both quantitative and qualitative methods.

Table 3.2: Comparison of methods in international management research

Quantitative methods	Qualitative methods
• Independence	• Interdependence
• Linear	• Linear and non-linear
• Cumulative, additive	• Multiplicative, interactive
• Deriving realities from measures of other realities	• Interdependent measures of the various realities
• Deductive	• Inductive
• Emphasis on testing and verification	• Emphasis on understanding

• Focus on facts and/or reasons of social events	• Focus on understanding from informant's point of view
• Logical and critical approach	• Interpretation and rational approach
• Controlled measurement	• Observation and measurements in natural settings
• Objective "outsider view" distant from data	• Subjective "insider view" and closeness to data
• Hypothetical/deductive focus on hypothesis testing	• Explorative orientation
• Results orientated	• Process orientated
• Particularistic and analytical	• Holistic perspective
• Generalisation by population membership	• Generalisation by comparison of properties and contexts of individual organisms

Source: Summarised from Wright (adapted from Kleiner and Okeke, 1991, cited in Ali, 1998:14) and Gauri *et al*. (adapted from Reichardt and Cook, cited in Ali, 1998:15)

3.5 SOURCE OF DATA

Both primary and secondary sources of data were used in this research project. **Primary data** was obtained by administering the Delphi technique and the Lawshe and DeVellis methodologies to generate data.

Secondary data was gathered through a literature study of previous studies done on some of the constructs applicable to this study.

3.6 RESEARCH DESIGN AND RESEARCH METHOD PER RESEARCH QUESTION

Table 3.3 indicates the research design and research method per research question as it applies to this study.

Table 3.3: Research design and research method per research question

Research question	Approach and method	Reasoning	Data analysis
• What constitutes change dynamics and how does it apply to the project management context?	• Literature study • Descriptive • Qualitative • Qualitative	• Inductive	• Collation, analysis and consolidation of themes in literature

	questionnaire • Quantification of dimensions and elements		• Verification of applicability by sample
• Is there a need for an assessment tool to measure change dynamics in project management?	• Literature study • Descriptive • Qualitative	• Inductive	• Collation, analysis and consolidation of themes in literature
• What process should be followed in developing an assessment tool to assess change dynamics in the context of project management?	• Literature study on measurement development • Design of measuring instrument and verification thereof • Application of the Delphi technique to establish change dynamics constructs • Application of Lawshe's content validity test • DeVellis scale development process	• Inductive	• Collation, analysis and consolidation of literature
• What constitutes the appropriate management of change dynamics in the project management context?	• Administration of assessment tool	• Deductive	• Multivariate statistical techniques such as factor analysis • Factor analysis • Likert scale • Scoring per element

3.7 SAMPLING

According to Singleton *et al.* (1988:69), the entities (objects or events) under review are referred to in social research as units of analysis. In this study, the units of analysis consisted of senior project managers across industries.

In terms of the required sample size for exploratory factor analysis, the likelihood of a reliable factor structure is a function of the sample size used in the analysis. "In general, the factor pattern that emerges from a large sample factor analysis will be more stable than that emerging from a smaller sample" (DeVellis, 1991:106). Both the number of variables to be analysed and the absolute number of subjects should be considered when determining the appropriate

sample size for a study. The following guidelines can be applied to establish whether a study's sample size is sufficiently large:

- there should be a ratio of a minimum of five to (preferably) ten subjects per item, up to about 300 subjects (Tinsley & Tinsley, 1987, cited in DeVellis, 1991; Hair, Anderson, Tatham, and Black (1998:373));
- a sample of 100 is poor, 200 is fair, 300 is good and 500 is very good (Comrey, 1973, cited in DeVellis, 1991);
- a sample size of 200 is adequate for most cases of factor analysis that involve no more than 40 items (Comrey, 1998, cited in DeVellis, 1991); and
- a researcher would not generally factor analyse a sample of less than 50 observations and the sample size should preferably be 100 or larger; but it is not uncommon to see factor analyses used in scale development based on more modest samples of, for example, 150 subjects (DeVellis, 1991:106).

3.8 ERRORS IN HUMAN INQUIRY

According to Babbie (1995:20), a number of errors should be avoided during the process of human inquiry. These are listed below, showing what was done to avoid such errors in this particular study.

- **Inaccurate observation** occurs when a researcher is not vigilant enough in observing – scientific observation should be regarded as a conscious activity and multiple measurement devices should assist in eliminating this error. The application of several different inquiry methods in this study greatly reduced this potential error.
- **Over-generalisation** occurs when a researcher works on the assumption that a few events that are perceived as similar can be generalised. This assumption is misleading. This risk was reduced by the fact that the researcher in this study did a thorough literature study, applied the Delphi technique and administered two rounds of questionnaires.
- **Selective observation** might occur when a researcher over-generalises. Once a researcher has established perceived generalisations, he or she may be tempted to revert to selective information. The number of observations used in this study eliminated this potential problem area.
- **Made-up information** occurs when observations and analyses do not correspond with the expectations of the researcher, creating *ex post facto* hypothesising. Extreme

caution was taken in this research project to remain focused on facts, theory and research conclusions.

- **Illogical reasoning** occurs when a researcher decides that a few observations that appear to contradict the conclusions are mere exceptions, thereby not conscientiously applying systems of logic.
- **Ego involvement in understanding** results when a researcher becomes subjective and personally involved in the conclusions reached in research projects. Extreme caution was taken in the course of this study to remain professional and objective.
- **Premature closure of inquiry** results when all the abovementioned errors occur during the course of research. This can happen if the research is concluded without due consideration being given to properly understanding the research issues. Care was taken to remain open to changes and/or new insights in the course of this research.
- **Mystification** occurs when undue obscure or mysterious causes are attributed to a phenomenon and it is regarded as beyond human understanding, resulting in the phenomenon's being declared incomprehensible or beyond human grasp. Care was taken to be as pragmatic as possible within the research design.
- **Human error is unavoidable,** but extreme caution was taken during this scientific inquiry to take special precautions to avoid making errors.

In this study, multiple method validation or triangulation was used in an endeavour to avoid these potential errors.

3.9 ETHICS

The study was conducted in an ethical manner. The University of Pretoria's ethical committee's approval was sought before the commencement of this study. According to Cooper and Schindler (2003:112), "research must be designed so a respondent does not suffer physical harm, discomfort, pain, embarrassment, or loss of privacy". In order to prevent any such detrimental effects for any subject, the researcher ensured that the context of the research was explained, that participation was voluntary (informed consent was obtained from all participants) and that confidentiality was guaranteed. Neuman (1997:455) adds to these aspects, citing the following principles of ethical social research:

- ethical responsibility rests with the individual researcher;
- subjects or students should not be exploited for personal gain;

- some form of informed consent is highly recommended or required;
- all guarantees of privacy, confidentiality and anonymity should be honoured;
- subjects should not be coerced or humiliated;
- deception should only used when needed and should always be accompanied by debriefing;
- an appropriate research method for the topic should be used;
- undesirable consequences to research subjects should be detected and removed;
- possible repercussions of the publication of the results should be anticipated;
- the sponsor funding the research should be identified;
- cooperation with hosting nations doing comparative research should be instituted;
- the details of the study should be released with the results;
- interpretations of the results consistent with the data should be made;
- high methodological standards should be used and the researcher should strive for accuracy; and
- secret research should not be conducted.

Obviously, not all these criteria apply to this study; however, in the opinion of the researcher, all the relevant requirements mentioned above were met in the execution of this research.

3.10 SHORTCOMINGS OF PREVIOUS STUDIES

As is evident from the literature review, some previous research has been done on a few of the elements of change management, project management and instrument design. There is some evidence that there is a strong correlation between project success and the appropriate management of change. However, it was the view of the researcher that

- an integrated holistic approach integrating these two constructs still needed to be developed; and
- an assessment tool to measure the management of change dynamics in the project realm required further research.

3.11 SUMMARY AND CONCLUDING REMARKS

This study was conducted using a social science paradigm applying both inductive and deductive reasoning. The research design contained both exploratory and descriptive components that informed the use of both qualitative and quantitative information gathering methods, resulting in an assessment tool that can measure change dynamics in project management.

CHAPTER 4: RESEARCH PROCESS AND OUTCOMES

4.1 INTRODUCTION

According to Babbie (1995:26) **scientific theory** "deals with the logical aspect of science; **research methods** deal with the observational aspect; and **statistics** offer a device for comparing what is logically expected with what is actually observed". The theory underpinning this study has already been covered in Chapters 1 and 2. Chapter 3 contains the context of the methodological approach, but the application of the chosen research methods and the resulting statistics are covered in Chapter 4.

4.2 RESEARCH APPROACH AND METHODOLOGY

The research was conducted in three main phases, namely the pre-understanding, constructing and testing phases.

4.2.1 Pre-understanding

At the start of the study, change management and its related dynamics, project management and instrument design literature were studied thoroughly. On the basis of the information gathered in the course of this process, the problem statement, research questions and the objectives of the study were formulated.

4.2.2 Construction

The initial research design and the verification of the inclusiveness of the change dynamics, dimensions and elements selected for this study were established by administering the Delphi technique. The information gathered by administering the Delphi technique formed the proposed dimensions of change management within the project management context. The Delphi technique is a research approach that is used to gain consensus through a series of iterations. The technique usually uses two or three iterations. Information and results are fed back to respondents between each round (Randall, 1998:1). The information gathered from administering the instrument was used to finalise the draft assessment tool containing change

management dynamics. Project managers and participants can use the assessment tool to improve the application of change management and therefore the success of their projects.

4.2.3 Testing

The information gathered by means of the Delphi technique resulted in the design of the questionnaire. The content validity technique developed by Lawshe (1975) was then used to evaluate the relevance of selected constructs.

The final verification of items in the framework was done by means of exploratory factor analysis. In the researcher's opinion, although the sample size was not as large as originally planned, the sample size was adequate to ensure rigorous testing for consistency, validity and reliability of the assessment tool.

Based on the process described above, an assessment tool was designed to analyse and measure change management within the project context by using the process stipulated by DeVellis (1991). After this process had been implemented, the reliability of the instrument was assessed by means of descriptive and inferential statistics to determine what the relationships (if any) between the different constructs were. The software package used for the statistical analyses was the BioMeDical Programs (BMDP) Statistical Software (release 7.1).

This research approach is depicted visually in Figure 4.1 overleaf.

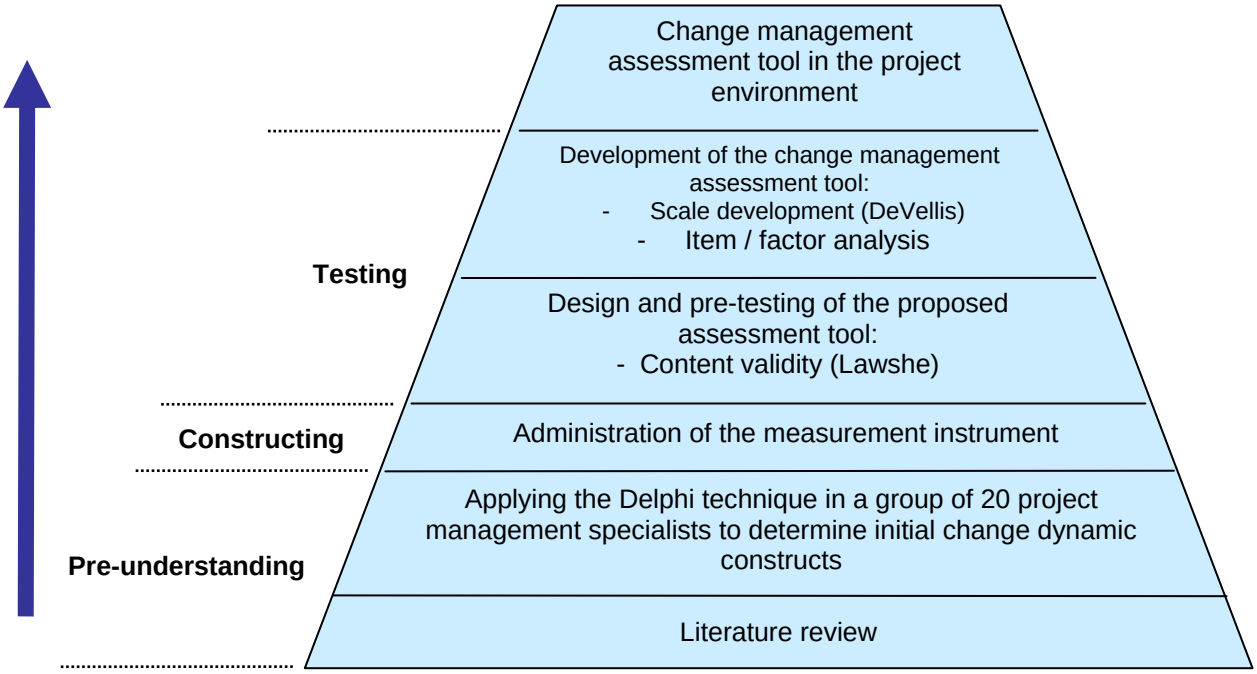


Figure 4.1: Research approach

4.2.4 Electronic administration of questionnaires

An emerging technique for exploratory research is the approximation of group dynamics using e-mail, websites, Usenet newsgroups or Internet chat rooms (Cooper & Schindler, 2003:144). Nicholls *et al*. (cited in Babbie & Mouton (2001:260)) assert that electronic techniques are more efficient than conventional techniques and, claim that they do not appear to result in a reduction of data quality. In this study, both electronic communication media and personal interaction were therefore used to gather data and information.

Due to the nature of the research objectives, information was obtained through structured questionnaires which were administered electronically and, in some instances, to maximise the response rate, in hard copy. This survey method to collect data allows a high level of standardisation and therefore, high reliability, as proposed by Singleton *et al*. (1988:235). It is relatively inexpensive, not too time consuming and matches the proposed sampling design as discussed in more detail in Section 4.5 below. Electronic administration of the questionnaire has the added benefit that it can be sent, completed and returned in real time and that respondents can easily be reached through electronic communication, irrespective of their geographic location. There are also, apart from network use, no costs involved for the respondents.

4.3 VERIFICATION OF ELEMENTS (PHASE 1)

An exercise involving 20 project management experts (Master's degree students in project management at the University of Pretoria), using the Delphi technique, was conducted to establish what constitutes change dynamics within the project management domain.

This session was arranged to ascertain what, according to these students, constitutes change dynamics in a project management context. Data was captured in real time during the session. Because of the time constraints imposed by such a session, the information that was captured was then sent to the same target audience to elaborate and build on the information gathered during the session. Two iterations were done electronically which influenced the first draft of the assessment instrument.

Subsequent to the process described above, a draft framework questionnaire was designed, containing multiple measurement items relating to all the change constructs identified for measurement. The framework questionnaire was **pre-tested** and verified by a group of 37 project management professionals registered with the Institute for Project Management of South Africa (IPMSA) on its data base (a setting similar to the eventual sample) to ensure the necessary validity, reliability, relevance, conciseness and clarity by the application of Lawshe's content validity methodology (Lawshe, 1975). Furthermore, the questionnaire was posted on the IPMSA website and, the researcher attended one of the institution's meetings and handed out copies of the questionnaire. Questionnaires were completed at the meeting using hard copies. A copy of this questionnaire is contained in Appendix A. Lawshe's content validity methodology was then applied to the responses to eliminate irrelevant items.

4.3.1 Lawshe's technique / content validity methodology

In this approach, a panel of subject matter experts, knowledgeable about a specific area of expertise, function or discipline, is asked to indicate whether or not a measurement item in a set of other measurement items is "essential" to the functionality of a theoretical construct. This methodological approach measures the extent to which the subject matter experts agree on the contributions of each measurement item to the overall content that the instrument is intended to measure. The subject matter experts' input is then used to compute the Content Validity Ratio (CVR) for each i^{th} candidate item in a measurement instrument as follows:

$$CVR_i = \frac{n_e - \left(\frac{N}{2}\right)}{\left(\frac{N}{2}\right)}$$

where

CVR_i = CVR value for the i^{th} measurement item

n_e = number of subject matter experts indicating that a measurement item is "essential"; and

N = total number of subject matter experts on the panel.

The CVR is a quasi-quantitative approach to content validity commonly used to facilitate "the rejection or retention of specific items" (Lawshe, 1975:568). One can infer from the CVR equation that it takes on values between -1.0 (where none of the subject matter experts think that a particular measurement item is "essential") and +1.0 (where all the subject matter experts think that a particular measurement item is "essential"). Where a CVR = 0.0 it means that 50% of the subject matter experts in the panel of size N believe that the measurement item is "essential". Therefore a CVR > 0.0 would indicate that more than half of the subject matter experts believe that a particular measurement item is "essential".

According to Lawshe (1975:567) two assumptions can be made, namely:

- any item which is perceived as "essential" by more than half of the subject matter experts, has some degree of content validity; and
- the more subject matter experts (above 50%) who perceive the item as "essential", the greater the extent or degree of its content validity.

On this basis, content validity is achieved when an item is considered "essential" by more than 50% of the subject matter experts. Lawshe (1975) has further established minimum CVRs for different panel sizes based on a one-tailed test at the α = 0.05 significance level. Table 4.1 indicates the minimum required CVR values as determined by Lawshe (1975:568).

Table 4.1: Minimum CVR values for different subject matter expert panel numbers

Number of panelists	5	10	15	20	25	30	35	40
Minimum CVR value	0.99	0.62	0.49	0.42	0.37	0.33	0.31	0.29

For example, if 25 subject matter experts constitute a panel, then the measurement items for a specific construct whose CVR values are less than 0.37 would be deemed not "essential" and would be deleted from subsequent consideration. The CVR required for items to be included in the next phase of this particular measurement instrument development would therefore be between 0.29 (regarded as essential by 40 subject matter experts) and 0.31 (regarded as essential by 35 subject matter experts). With a panel size of 37 for Phase 1 of the study, the more conservative CVR threshold level of 0.31 was used for testing content validity. All items with CVR values of less than 0.31 were rejected.

Thereafter, the means of the CVR were calculated and included in the Content Validity Index (CVI). To determine the CVI for the survey, it was necessary to

- identify those determinants which have significant CVR values for the survey; and
- compute the mean CVI for the whole survey.

4.3.2 Lawshe's technique result tables

The results of using Lawshe's technique for Phase 1 of the assessment tool development in this study for each of the sections of the project management life cycle are presented below.

Table 4.2: Lawshe test results: Section A - conceptualisation / initiation phase

(pre-feasibility assessment of the project and its parameters / scope)

Item	Elements	Endorsements of statement			CVR	Retain (yes / no)	CVI
		Essential	Useful, but not essential	Not necessary			
Creating the need for change, by							
A-1.1	Creating awareness of the need	26	8	3	0.405	Yes	**0.446**
A-1.2	Making a case for change	28	7	2	0.514	Yes	
A-1.3	Ensuring the need for change (creating a "burning platform")	16	13	8	-0.135	**No**	
A-1.4	Internalising / energising for change	25	8	4	0.351	Yes	
A-1.5	Comprehending complexity	27	8	2	0.459	Yes	
A-1.6	Communicating strategic issues and objectives	32	4	1	0.730	Yes	
A-1.7	Establishing a sense of urgency	25	12	0	0.351	Yes	

A-1.8	Forming a guiding coalition of stakeholders	26	9	2	0.405	Yes	
A-1.9	Motivating employees	25	9	3	0.351	Yes	
A-1.10	Developing a critical mass support base	25	6	6	0.351	Yes	
Assessing the readiness for change, by							
A-2.11	Assessing management competence and experience	25	10	2	0.351	Yes	
A-2.12	Diagnosing the organisational environment	26	9	2	0.405	Yes	
A-2.13	Identifying problems and priorities	29	8	0	0.568	Yes	
A-2.14	Assessing readiness for change	27	7	3	0.459	Yes	
A-2.15	Identifying and planning for barriers and resistance to change	27	9	1	0.459	Yes	
A-2.16	Assessing the level of change fatigue	15	15	7	-0.189	**No**	
A-2.17	Developing change readiness / resilience	25	9	3	0.351	Yes	
A-2.18	Developing measurement criteria for success	26	9	2	0.405	Yes	
A-2.19	Assessing the propensity for risk	27	8	2	0.459	Yes	
A-2.20	Assessing cost, morale and other related implications	30	6	1	0.622	Yes	
A-2.21	Aligning change intervention with overall business strategy	26	8	3	0.405	Yes	
A-2.22	Ensuring adequate management understanding of change management	28	7	2	0.514	Yes	
Average no. of endorsements:		**25.7**	**8.6**	**2.7**			**26.8**
Average (in %):		**69.5%**	**23.2%**	**7.2%**			**72.3%**

Table 4.3: Lawshe test results: Section B - planning phase

(planning the execution of the project scope, deliverables, timeframe and resource requirements)

Item	Elements	Endorsements of statement			CVR	Retain (yes / no)	CVI
		Essential	Useful, but not essential	Not necessary			
Communication and engagement, by							
B-1.1	Visible commitment and leadership presence	27	10	0	0.459	Yes	**0.425**
B-1.2	Sponsorship of change project by top management	26	8	3	0.405	Yes	
B-1.3	Leadership that is aligned to potential project outcomes	27	9	1	0.459	Yes	
B-1.4	The development of appropriate leadership behaviour	25	8	4	0.351	Yes	
B-1.5	Sustained leadership behaviour	17	13	7	-0.081	**No**	

B-1.6	Candid communication by leadership to staff on the scope of change	27	7	3	0.459	Yes
B-1.7	Open discussion on the planned changes and potential problems	20	8	9	0.081	**No**
B-1.8	Open communication and synergy between the project team and line management	29	8	0	0.568	Yes
B-1.9	Encouragement of the use of an adequate variety of communication channels	25	11	1	0.351	Yes
B-1.10	Messages about the vision from the leadership should be consistent	28	7	2	0.514	Yes
B-1.11	Alignment of staff to potential project outcomes	12	16	9	-0.351	**No**
B-1.12	Engaging in two-way communication	19	10	8	0.027	**No**
B-1.13	The development of focused engagement plans with stakeholders	27	10	0	0.459	Yes
B-1.14	The involvement of all stakeholders (employees, line management and labour)	25	9	3	0.351	Yes
B-1.15	Managed, meaningful and integrated participation	25	11	1	0.351	Yes
B-1.16	Transparent decision-making processes	27	10	0	0.459	Yes
B-1.17	The development of consensus and a shared vision	25	10	2	0.351	Yes
B-1.18	Management of the career expectations of project members	20	12	5	0.081	**No**
B-1.19	Ensuring that people and infrastructure support changes in business procedures	16	9	12	-0.135	**No**
B-1.20	The establishment of a dedicated team for change management and communication	15	16	6	-0.189	**No**
B-1.21	Avoiding alienation of the organisation by understanding the company culture	26	10	1	0.405	Yes
B-1.22	Orienting team members with regard to change management and dynamics	25	9	3	0.351	Yes
B-1.23	Celebrating and communicating “quick wins” throughout	25	6	6	0.351	Yes
Creation of an enabling environment, by						
B-2.24	Inspiring leadership	20	13	4	0.0811	**No**
B-2.25	Addressing organisational power and political dynamics	25	11	1	0.3514	Yes
B-2.26	Creating an enabling environment and project structures	26	8	3	0.4054	Yes
B-2.27	Staffing the project team with credible people	28	7	2	0.5135	Yes

B-2.28	Ensuring role clarity for everyone involved	27	9	1	0.4595	Yes	
B-2.29	Conducting risk analysis to inform mitigation strategies	26	9	2	0.4054	Yes	
B-2.30	Redefining the business	14	13	10	-0.2432	**No**	
B-2.31	Identifying the necessary tools and know-how required	27	4	6	0.4595	Yes	
B-2.32	Evaluating the training needs for the use of new tools and technology	25	10	2	0.3514	Yes	
B-2.33	Transitioning project members from a functional role to a project role	25	8	4	0.3514	Yes	
B-2.34	Managing the workload of project members	26	9	2	0.4054	Yes	
B-2.35	Continuous involvement of stakeholders to ensure alignment of agendas	26	8	3	0.4054	Yes	
B-2.36	Adopting a systems engineering approach in the design and planning of the project	20	12	5	0.0811	**No**	
B-2.37	Timely training in new requirements to ensure that capacity is built and fear is reduced	27	9	1	0.4595	Yes	
B-2.38	Creating a learning project environment	25	10	2	0.3514	Yes	
B-2.39	Managing differences in cultures between contractors, suppliers, operations and the project team	26	6	5	0.4054	Yes	
B-2.40	Capacity building for the changes through both generic and job-specific training	26	9	2	0.4054	Yes	
B-2.41	Promoting and facilitating a learning environment	25	12	0	0.3514	Yes	
B-2.42	Placing credible change agents in the organisation	25	10	2	0.3514	Yes	
B-2.43	Aligning corporate strategy and project outcomes	28	8	1	0.5135	Yes	
B-2.44	Allocating adequate budget and resources	29	5	3	0.5676	Yes	
B-2.45	Managing and monitoring progress at a strategic and senior level	19	11	7	0.0270	**No**	
B-2.46	Forming multi-disciplinary teams with participation from all stakeholder groupings	25	7	5	0.3514	Yes	
B-2.47	Including a change management expert in the project team	15	10	12	-0.1892	**No**	
B-2.48	Quantitative and qualitative measurement of project success	26	10	1	0.4054	Yes	
B-2.49	Cooperating across function areas	27	7	3	0.4595	Yes	
B-2.50	Prioritising and removing potential competing issues	25	10	2	0.3514	Yes	

B-2.51	Building a supportive infrastructure around the change agents	25	10	2	0.3514	Yes	
B-2.52	Developing a clear migration plan	30	7	0	0.6216	Yes	
B-2.53	Focusing on "softer" skills capacity building	25	8	4	0.3514	Yes	
B-2.54	Harnessing organisational values such as collaboration, openness, trust and supportiveness	26	10	1	0.4054	Yes	
B-2.55	Creating an environment supportive of innovation	25	10	2	0.3514	Yes	
B-2.56	Taking quick remedial action to solve emerging problems	28	7	2	0.5135	Yes	
B-2.57	Fostering continuous cooperation between line and project management	26	8	3	0.4054	Yes	
B-2.58	Maintaining enthusiasm and comprehension for the project	27	10	0	0.4595	Yes	
B-2.59	Allowing managed risk taking	25	7	5	0.3514	Yes	
B-2.60	Managing resistance to change	26	9	2	0.4054	Yes	
B-2.61	Paying attention to understanding project objectives and quality of communication	31	6	0	0.6757	Yes	
B-2.62	Investigating alternatives and establishing action plans	18	10	9	-0.0270	**No**	
B-2.63	Focusing on data collection and feedback	26	9	2	0.4054	Yes	
B-2.64	Determining the future state of the company	28	5	4	0.5135	Yes	
B-2.65	Allowing top management to have a medium to long term focus	25	7	5	0.3514	Yes	
B-2.66	Avoiding unreasonable expectations of the project outcome as a "fix-all" solution	26	10	1	0.4054	Yes	
B-2.67	Utilising an appropriate change management methodology	25	9	3	0.3514	Yes	
B-2.68	Addressing fears surrounding potential job losses to minimise resistance to change	25	12	0	0.3514	Yes	
B-2.69	Contextualising the project within organisational systems, structures and processes	33	2	2	0.7838	Yes	
Average no. of endorsements:		**24.7**	**9.1**	**3.2**			**26.4**
Average (in %):		**66.6%**	**24.6%**	**8.8%**			**71.2%**

Table 4.4: Lawshe test results: Section C - implementation phase

(executing the stated outcome and objectives)

Item	Elements	Endorsements of statement			CVR	Retain (yes / no)	CVI
		Essential	Useful, but not essential	Not necessary			
C-1.1	Functional area ("silo") mentality and fragmented departmental interests should be dealt with	26	7	4	0.405	Yes	**0.445**
C-1.2	Organisational integration should be fostered	27	7	3	0.459	Yes	
C-1.3	A transparent decision-making should be instituted	26	9	2	0.405	Yes	
C-1.4	Proper change management should be followed throughout	29	8	0	0.568	Yes	
C-1.5	New values should be promoted	25	5	7	0.351	Yes	
C-1.6	"Quick wins" as tangible short term results must be targeted	12	16	9	-0.351	**No**	
C-1.7	Perception management should receive adequate focus	26	10	1	0.405	Yes	
C-1.8	Continuous staff motivation should be a priority	30	5	2	0.622	Yes	
C-1.9	Communication should focus on mindsets and cultural shifts of all involved	26	10	1	0.405	Yes	
C-1.10	Anxiety surrounding potential job loss, loss of autonomy or authority should be managed	25	9	3	0.351	Yes	
C-1.11	Behaviour patterns and feelings should be closely monitored	25	8	4	0.351	Yes	
C-1.12	Employees should be empowered to act on the new vision	29	5	3	0.568	Yes	
C-1.13	New symbols should be created to further embed the change	11	20	6	-0.405	**No**	
C-1.14	Interventions to entrench new organisational culture and values should be undertaken	17	11	9	-0.081	**No**	
C-1.15	Continuous measurement and feedback on progress should be done	20	6	11	0.081	**No**	
C-1.16	Changes effected during the project should be consolidated	18	11	8	-0.027	**No**	
C-1.17	The systems nature of the organisation should continuously be emphasized	15	12	10	-0.189	**No**	
C-1.18	The necessary changes in HR and other policies should be made to sustain the change	19	9	9	0.027	**No**	
C-1.19	Appropriate, flexible organisational structures must be implemented	17	9	11	-0.081	**No**	

C-1.20	Line managers should be receptive to change and innovation	19	11	7	0.027	**No**	
Average no. of endorsements:		**22.1**	**9.4**	**5.5**			**26.7**
Average (in %):		**59.7%**	**25.4%**	**14.9%**			**72.2%**

Table 4.5: Lawshe test results: Section D - post implementation phase

(embedding and institutionalising the changes effected through the project)

Item	Elements	Endorsements of statement			CVR	Retain (yes / no)	CVI
		Essential	Useful, but not essential	Not necessary			
D-1.1	Change(s) should be institutionalised through processes	29	8	0	0.568	Yes	**0.446**
D-1.2	New culture and behaviour should be reinforced through incentives	25	10	2	0.351	Yes	
D-1.3	Performance management should reward new behaviour and outputs	26	7	4	0.405	Yes	
D-1.4	The impact of change should be measured	29	7	1	0.568	Yes	
D-1.5	Continuous behavioural / output training should be done	26	6	5	0.405	Yes	
D-1.6	The organisation should be stabilised	26	9	2	0.405	Yes	
D-1.7	The new state should be formalised	25	9	3	0.351	Yes	
D-1.8	Adherence to the new state should be monitored	18	9	10	-0.027	**No**	
D-1.9	Reverting to the old order should be discouraged	28	4	5	0.514	Yes	
Average no. of endorsements:		**25.8**	**7.7**	**3.6**			**26.8**
Average (in %):		**69.7%**	**20.7%**	**9.6%**			**72.3%**

The results indicate that the majority of the measurement items are valid, as the CVRs were higher than or equal to the α = 0.05 significance level of 0.31. The large majority of measurement items were therefore essential and were thus retained for the next phase of the quantitative statistical analysis.

4.3.3 Item exclusions resulting from the application of Lawshe's technique

Based on the results achieved through the two iterations of the Delphi technique and the application of Lawshe's content validity technique to the items included in the questionnaire, the

following changes were effected (items eliminated from the next phase of the assessment tool development).

Table 4.6: Summary of measurement items omitted during the next phase of the assessment tool development

Section	Item	Measurement item description
A	A-1.3	A critical need ("burning platform") should exist for the change
	A-2.16	The level of change fatigue should be assessed
B	B-1.5	Leadership behaviour should be sustained
	B-1.7	Openly discuss planned changes and potential problems
	B-1.11	Staff should be aligned to potential project outcomes
	B-1.12	Engaging in two-way communication should be a priority
	B-1.18	Career expectations of project members should be managed
	B-1.19	Changes in business procedures due to project implementation should be communicated to ensure that people and infrastructure support it
	B-1.20	A dedicated team for change management and communication should be established
	B-2.24	Leadership should be inspiring
	B-2.30	The business should be redefined
	B-2.36	A systems engineering approach is advisable. People, systems and processes affected by the project should be included in the design and planning of the project
	B-2.45	An internal team comprising of senior executives should be set up to manage and monitor progress at a strategic level
	B-2.47	A change management expert should be part of the project team
	B-2.62	Alternatives and establishing action plans should be investigated
C	C-1.6	"Quick wins" should be targeted as tangible short-term results
	C-1.13	New symbols should be created to further embed the change
	C-1.14	Multiple interventions to entrench new organisational culture and values should be undertaken
	C-1.15	Continuous measurement and feedback on progress should be done rigorously
	C-1.16	Changes effected during the project should be consolidated
	C-1.17	The systems nature of the organisation should be continuously emphasised
	C-1.18	The necessary changes in HR and other policies should be made to sustain the change
	C-1.19	Rigid hierarchical structures should be replaced by more appropriate organisational structures
	C-1.20	Line managers should be receptive to change and innovation
D	D-1.8	Monitoring of adherence of the new state should be ongoing

Subsequent to the above process, the draft assessment tool was also analysed by two project management experts to enhance it further in terms of its readability and content. The inputs from the two subject matter experts were included in the penultimate draft of the measuring instrument.

4.4 ASSESSMENT TOOL DEVELOPMENT (PHASE 2)

The draft assessment tool was discussed with the Department of Statistics at the University of Pretoria to assess the format and categorisation of the questions. Since the concepts tested may have a number of states, or the data may contain a number of values that can be rank ordered to determine the significance of each item, a Likert scale was used. A five-point scale was used to maximise the number of possible deductions from the data. Walliman (2001:79) argues that the "ordinal level of quantification" applies to concepts that vary from those different states of the concept that they can be rank ordered in respect of a certain characteristic. More statistical techniques can be applied to data when using an ordinal scale of measurement, such as testing by Chi-square, indicating relationships by means of rank correlation, determining the mode, median and percentage or percentile rank. This technique was also applied in the case of this study. Accordingly, the respondents were asked to express their degree of agreement or disagreement with a series of statements. A five-point agreement scale was used and ranked as follows:

- 1 – strongly disagree;
- 2 – disagree;
- 3 – neither disagree nor agree;
- 4 – agree; and
- 5 – strongly agree.

A detailed memorandum containing the research context, objectives and comprehensive instructions on how to complete it was compiled and was sent with the questionnaire to the target population. Confidentiality was guaranteed and respondents will be privy to the outcome and results of the research. The context within which these concepts were measured was described at the beginning of the measuring instrument to ensure a consistent and correct understanding amongst all respondents.

The questionnaire was also divided into the following sections:

- **Section A** - questions related to the conceptual or initiation phase of the project, with a total of 25 items;
- **Section B** - questions regarding the planning phase of the project, with a total of 73 items;
- **Section C** - questions regarding the implementation of the project, with a total of 11 items;
- **Section D** - questions in relation to the post implementation phase of the project, with a total of 9 items; and
- **Section E** - an open question regarding any other aspect that the respondent considered relevant to the measurement of change dynamics in the project management domain that runs continuously throughout all the project phases, such as communication and risk management.

Apart from measuring items in each of the project life cycle phases mentioned above, the questionnaire contained a section on relevant demographic details which enabled the researcher to establish whether certain patterns or tendencies are present in certain sectors or categories within which the respondents are working. **The final section** contains the following biographical information:

- age;
- gender;
- length of time spent in the sector;
- economic sector;
- qualifications;
- organisational level;
- home language;
- number of years of project management experience as a team member; and
- number of years of project management experience in the role of project manager.

The questionnaire used in this part of the study is contained in Appendix B.

4.5 TESTING (PHASE 2)

It was initially envisaged that the measuring instrument would only be administered to South African project managers, but the study was expanded also to include some project managers from abroad.

The testing process involved administering the second phase questionnaire electronically on past and present databases of project management Master's degree students at the University of Pretoria, as well as on a group of international project management experts from the following databases:

- The Project Management Institute of the United Arab Emirates Yahoo group, with approximately 430 members – mostly from the United Arab Emirates but about 20% to 30% of these members come from various countries in the Middle East with only a few members from outside this region;
- The Project Management Professionals of Dubai group, with approximately 200 members – mostly from the United Arab Emirates but including some members from Egypt;
- The Saytam Yahoo group, with approximately 500 members – this is an India-based organization, but with members and operations from around the globe; and
- The class at the National Bank of Abu Dhabi, with approximately 30 participants – most participants are in the information technology (IT) or banking sectors (there was only one respondent from the oil sector and a single other respondent from the gas sector).

Respondents were chosen based on their previous experience in the project management field. In all cases the target audience was project management institute (PMI) and project management professional (PMP) members or respondents who aspire to be PMP members. The Saytam Yahoo group is more IT focused but, the other groups are from various industries (including airlines). The rationale for choosing these respondents was that most are PMI members and have years of project management experience.

In addition to this, the questionnaire was also distributed to reputable companies responsible for the management of sizeable projects as convenience sampling to enhance the response rate further.

The second phase was the administration of the amended measuring instrument to a target populated from the databases as mentioned above. A total of 1200 questionnaires were sent out with a response rate of 172 unspoilt questionnaires. This represents a response rate of 14.33%.

4.6 STATISTICAL ANALYSIS OF DATA COLLECTED

4.6.1 Initial Item Analysis

The statistical analysis process commenced with the verification of data captured against information contained in the questionnaires to ensure the integrity of the data. Subsequent to this, the ITEMAN™ Conventional Item and Test Analysis Program, version 3.6 was used to conduct the statistical analysis for each of the two target audiences. This was done to determine the initial item mean, item variance, standard deviation, item-scale correlation and the number of respondents (as a percentage) per item in order to analyse the distribution of the values of each item included in the different factors. In addition, measures of shape (skewness and kurtosis) were calculated.

Item-scale correlation values were calculated using the Pearson (product moment) correlation coefficient (*r*), which varies across a range of -1.0 through 0.0 to +1.0 (Cooper & Schindler, 2003:533). Correlation coefficients provide information on the magnitude (the degree to which variables move in unison or in opposition to each other) and the direction (either positive or inverse) of the relationships between the variables. The following formula cited in Hall (1998) was used to calculate Pearson's correlation coefficient (*r*):

$$r = \frac{\sum xy - \frac{(\sum x)(\sum y)}{n}}{(n)(\sigma_x)(\sigma_y)}$$

where

$$\sigma_x = \sqrt{\frac{\sum (x - M_x)^2}{N}} \qquad \text{and} \qquad \sigma_y = \sqrt{\frac{\sum (y - M_y)^2}{N}}$$

and

x = individual scores in group X;

y = individual scores in group Y;

n = number of score pairs;

M = mean; and

N = number of scores in the group.

The statistical significance of *r* can be tested, based on probability table values, depending on the degrees of freedom (df = n - 2) and the probability value required (typically $p < 0.05$).

According to Cooper and Schindler (2003:472-477), the mean and standard deviation are called dimensional measures (in other words, they are expressed in the same units as the measured quantities). By contrast, skewness (sk) and kurtosis (ku) are regarded as non-dimensional measures. Skewness is an index that characterizes the degree of asymmetry of a distribution around its mean. Positive skewness indicates a distribution with an asymmetric tail extending towards positive infinity, including more positive values. Negative skewness indicates a distribution with an asymmetric tail extending towards negative infinity, including more negative values. Normal distributions produce a skewness statistic of approximately zero, ("approximately" because small variations may occur merely by chance). As the skewness statistic departs further from zero, a positive value indicates the possibility of a positively skewed distribution (that is, with scores bunched up at the low end of the score scale) or a negative value indicates the possibility of a negatively skewed distribution (that is, with scores bunched up at the high end of the scale). Values of two standard errors of skewness (*ses*) or more (regardless of sign) are probably skewed to a significant degree. The *ses* can be estimated using the following formula, according to Tabachnick and Fidell (1996):

$$ses = \sqrt{\frac{6}{N}}$$

Kurtosis characterises the relative shape of a distribution in terms of how peaked or flat the distribution is, compared to the normal distribution. According to Cooper and Schindler (2003:472), there are three different types of kurtosis

- peaked or leptokurtic distributions - scores cluster heavily in the centre (indicated by a positive ku value);
- flat or platykurtic distributions - evenly distributed scores and facts flatter than a normal distribution (the ku value is negative); and
- intermediate or mesokurtic distributions - neither too peaked nor too flat and very similar to the normal distribution (the ku value is close to 0).

As with skewness, the larger the absolute value of the index, the more extreme the characteristic of the index. Values of two standard errors of kurtosis (*sek*) or more (regardless of sign) probably differ from the mesokurtic distribution to a significant degree. The *sek* can be roughly estimated using the following formula (Tabachnick and Fidell, 1996):

$$sek = \sqrt{\frac{24}{N}}$$

4.6.2 Initial reliability analysis

Internal consistency is typically equated with Cronbach's (1951) alpha coefficient α, and is concerned with the homogeneity of the items comprising a scale (DeVellis, 1991:25; Clark & Watson, 1995). The alpha coefficient is widely used as a measure of reliability and it also reflects important information about the proportion of error variance contained in a scale. According to Cortina (1993), the alpha coefficient is a sound measure of error variance and can be used to confirm the unidimensionality of a scale, or to measure the strength of a dimension once the existence of a single factor has been determined. A scale is internally consistent to the extent that its items are highly intercorrelated, since high inter-item correlations indicate that the items all attempt to measure similar elements. Alpha is defined as the proportion of a scale's total variance that is attributable to a common source, presumably the true score of a latent variable underlying the items. The following expression was used to calculate alpha (DeVellis, 1991:27-30):

$$\alpha = \frac{k}{k-1}\left(1 - \frac{\sum \sigma_i^2}{\sigma_{yi}^2}\right)$$

where

k	=	number of items on the diagonal of the covariance matrix;
$\sum \sigma_i^2$	=	sum of all **unique** variances (all diagonal elements in the covariance matrix); and
σ_{yi}^2	=	sum of variances and covariances (total of all elements in the covariance matrix).

4.6.2.1 Initial item and reliability analysis results (South African responses)

The dimensional and non-dimensional measurement results for the South African target population are presented in Tables 4.7 to 4.12 below.

Table 4.7: Item analysis of the South African responses for Section A (n = 85)

Section A question number (items)	Percentage endorsements					Mean	Variance	Item to section correlation
	Strongly disagree	Disagree	Neither disagree nor agree	Agree	Strongly agree			
A1	1.2%	32.9%	22.4%	35.3%	8.2%	3.165	1.032	0.69
A2	1.2%	23.5%	14.1%	45.9%	15.3%	3.506	1.097	0.67
A3	1.2%	10.6%	20.0%	55.3%	12.9%	3.682	0.758	0.50
A4	2.4%	12.2%	28.0%	30.5%	26.8%	3.671	1.148	0.55
A5	1.2%	11.8%	23.5%	44.7%	18.8%	3.682	0.899	0.60
A6	3.5%	17.6%	14.1%	31.8%	32.9%	3.729	1.421	0.58
A7	3.5%	34.1%	38.8%	17.6%	5.9%	2.882	0.880	0.41
A8	2.4%	8.2%	31.8%	50.6%	7.1%	3.518	0.697	0.49
A9	4.7%	18.8%	49.4%	21.2%	5.9%	3.047	0.821	0.71
A10	1.2%	34.1%	22.4%	25.9%	16.5%	3.224	1.256	0.67
A11	1.2%	12.9%	36.5%	43.5%	5.9%	3.400	0.687	0.60
A12	0.0%	18.8%	28.2%	42.4%	10.6%	3.447	0.835	0.46
A13	4.7%	21.2%	36.5%	32.9%	4.7%	3.118	0.904	0.71
A14	0.0%	22.4%	23.5%	42.4%	11.8%	3.435	0.928	0.54
A15	0.0%	5.9%	25.9%	54.1%	14.1%	3.765	0.580	0.37
A16	8.2%	25.9%	30.6%	28.2%	7.1%	3.000	1.153	0.70
A17	0.0%	28.2%	23.5%	42.4%	5.9%	3.259	0.874	0.68
A18	3.5%	27.1%	29.4%	32.9%	7.1%	3.129	1.007	0.78
A19	4.7%	22.4%	30.6%	30.6%	11.8%	3.224	1.138	0.76
A20	0.0%	7.1%	9.4%	55.3%	28.2%	4.047	0.657	0.59
A21	0.0%	2.4%	27.1%	55.3%	15.3%	3.835	0.491	0.55
A22	0.0%	12.9%	22.4%	55.3%	9.4%	3.612	0.685	0.66
A23	1.2%	3.5%	23.5%	37.6%	34.1%	4.000	0.824	0.57
A24	1.2%	14.1%	17.6%	38.8%	28.2%	3.788	1.085	0.63
A25	1.2%	14.1%	28.2%	40.0%	16.5%	3.565	0.928	0.61
Section A averages	**1.93%**	**17.71%**	**26.30%**	**39.62%**	**14.44%**	**3.469**	**0.334**	**0.60**

Table 4.8: Item analysis of the South African responses for Section B (n = 85)

Section B question number (Items)	Percentage endorsements					Mean	Variance	Item to section correlation
	Strongly disagree	Disagree	Neither disagree nor agree	Agree	Strongly agree			
B26	0.0%	4.7%	17.6%	55.3%	22.4%	3.953	0.586	0.48
B27	1.2%	11.8%	52.9%	31.8%	2.4%	3.224	0.527	0.49
B28	0.0%	7.1%	12.9%	42.4%	37.6%	4.106	0.777	0.52
B29	4.7%	8.2%	30.6%	38.8%	17.6%	3.565	1.046	0.55

B30	1.2%	5.9%	22.4%	62.4%	8.2%	3.706	0.561	0.59
B31	2.4%	10.6%	32.9%	47.1%	7.1%	3.459	0.742	0.53
B32	0.0%	14.1%	18.8%	55.3%	11.8%	3.647	0.746	0.57
B33	2.4%	22.4%	23.5%	35.3%	16.5%	3.412	1.160	0.70
B34	0.0%	7.1%	40.0%	42.4%	10.6%	3.565	0.599	0.66
B35	0.0%	18.8%	24.7%	48.2%	8.2%	3.459	0.789	0.62
B36	0.0%	5.9%	40.0%	32.9%	21.2%	3.694	0.753	0.56
B37	1.2%	5.9%	25.9%	44.7%	22.4%	3.812	0.788	0.64
B38	0.0%	10.6%	34.1%	37.6%	17.6%	3.624	0.799	0.72
B39	1.2%	15.3%	14.1%	42.4%	27.1%	3.788	1.085	0.53
B40	4.7%	23.5%	15.3%	44.7%	11.8%	3.353	1.217	0.60
B41	4.7%	32.9%	41.2%	18.8%	2.4%	2.812	0.765	0.45
B42	2.4%	16.5%	40.0%	35.3%	5.9%	3.259	0.780	0.55
B43	1.2%	3.5%	30.6%	60.0%	4.7%	3.635	0.467	0.45
B44	0.0%	20.0%	30.6%	45.9%	3.5%	3.329	0.691	0.48
B45	0.0%	25.3%	24.1%	42.2%	8.4%	3.337	0.898	0.48
B46	3.6%	9.5%	32.1%	47.6%	7.1%	3.452	0.795	0.34
B47	0.0%	15.3%	38.8%	36.5%	9.4%	3.400	0.734	0.38
B48	4.7%	9.4%	25.9%	48.2%	11.8%	3.529	0.955	0.57
B49	5.9%	11.8%	51.8%	23.5%	7.1%	3.141	0.851	0.31
B50	1.2%	9.4%	34.1%	51.8%	3.5%	3.471	0.579	0.65
B51	2.4%	12.9%	41.2%	37.6%	5.9%	3.318	0.734	0.63
B52	3.5%	5.9%	16.5%	61.2%	12.9%	3.741	0.780	0.59
B53	3.5%	4.7%	12.9%	55.3%	23.5%	3.906	0.862	0.48
B54	0.0%	10.6%	20.0%	32.9%	36.5%	3.953	0.986	0.58
B55	0.0%	15.3%	27.1%	51.8%	5.9%	3.482	0.673	0.57
B56	0.0%	14.1%	25.9%	47.1%	12.9%	3.588	0.783	0.57
B57	1.2%	20.0%	20.0%	41.2%	17.6%	3.541	1.072	0.69
B58	4.7%	23.5%	44.7%	25.9%	1.2%	2.953	0.727	0.59
B59	1.2%	32.9%	29.4%	31.8%	4.7%	3.059	0.879	0.38
B60	2.4%	11.8%	44.7%	36.5%	4.7%	3.294	0.678	0.38
B61	4.7%	15.3%	29.4%	44.7%	5.9%	3.318	0.923	0.59
B62	8.2%	49.4%	21.2%	20.0%	1.2%	2.565	0.881	0.41
B63	5.9%	25.9%	40.0%	20.0%	8.2%	2.988	1.023	0.43
B64	3.5%	20.0%	20.0%	48.2%	8.2%	3.376	1.011	0.67
B65	2.4%	16.5%	29.4%	45.9%	5.9%	3.365	0.820	0.48
B66	3.5%	20.0%	41.2%	31.8%	3.5%	3.118	0.786	0.57
B67	2.4%	16.5%	37.6%	38.8%	4.7%	3.271	0.762	0.61
B68	0.0%	24.7%	31.8%	36.5%	7.1%	3.259	0.827	0.66
B69	0.0%	4.7%	8.2%	50.6%	36.5%	4.188	0.600	0.56
B70	0.0%	8.2%	17.6%	61.2%	12.9%	3.788	0.590	0.41
B71	0.0%	14.1%	27.1%	41.2%	17.6%	3.624	0.870	0.48
B72	1.2%	12.9%	22.4%	40.0%	23.5%	3.718	1.003	0.46
B73	0.0%	7.1%	41.2%	41.2%	10.6%	3.553	0.600	0.17
B74	0.0%	15.3%	5.9%	50.6%	28.2%	3.918	0.946	0.50
B75	0.0%	15.3%	29.4%	37.6%	17.6%	3.576	0.903	0.38
B76	1.2%	20.0%	34.1%	38.8%	5.9%	3.282	0.791	0.60
B77	0.0%	4.7%	30.6%	60.0%	4.7%	3.647	0.417	0.63
B78	0.0%	31.8%	30.6%	36.5%	1.2%	3.071	0.724	0.58
B79	1.2%	13.1%	26.2%	42.9%	16.7%	3.607	0.905	0.52
B80	2.5%	16.0%	30.9%	38.3%	12.3%	3.420	0.960	0.48
B81	0.0%	11.8%	38.8%	35.3%	14.1%	3.518	0.767	0.66
B82	1.2%	20.0%	35.3%	37.6%	5.9%	3.271	0.786	0.44
B83	0.0%	20.0%	16.5%	51.8%	11.8%	3.553	0.882	0.70

B84	2.4%	16.5%	35.3%	37.6%	8.2%	3.329	0.856	0.71
B85	2.4%	8.2%	32.9%	42.4%	14.1%	3.576	0.832	0.69
B86	0.0%	12.9%	34.1%	43.5%	9.4%	3.494	0.697	0.59
B87	4.7%	17.6%	27.1%	43.5%	7.1%	3.306	0.989	0.68
B88	3.6%	17.9%	40.5%	35.7%	2.4%	3.155	0.750	0.66
B89	0.0%	2.4%	10.6%	40.0%	47.1%	4.318	0.570	0.53
B90	0.0%	5.9%	17.6%	49.4%	27.1%	3.976	0.682	0.65
B91	1.2%	4.7%	48.2%	36.5%	9.4%	3.482	0.603	0.32
B92	0.0%	16.5%	30.6%	43.5%	9.4%	3.459	0.766	0.56
B93	0.0%	8.2%	18.8%	57.6%	15.3%	3.800	0.631	0.27
B94	1.2%	27.1%	28.2%	34.1%	9.4%	3.235	0.980	0.30
B95	2.4%	15.3%	37.6%	35.3%	9.4%	3.341	0.860	0.41
B96	3.5%	18.8%	25.9%	40.0%	11.8%	3.376	1.058	0.53
B97	5.9%	17.6%	25.9%	44.7%	5.9%	3.271	1.021	0.58
B98	0.0%	9.4%	31.8%	49.4%	9.4%	3.588	0.619	0.52
Section B averages	**1.73%**	**14.79%**	**29.15%**	**42.12%**	**12.21%**	**3.483**	**0.227**	**0.53**

Table 4.9: Item analysis of the South African responses for Section C (n = 85)

Section C question number (Items)	Percentage endorsements					Mean	Variance	Item to section correlation
	Strongly disagree	Disagree	Neither disagree nor agree	Agree	Strongly agree			
C99	8.2%	21.2%	25.9%	38.8%	5.9%	3.129	1.148	0.75
C100	0.0%	9.5%	28.6%	47.6%	14.3%	3.667	0.698	0.83
C101	4.7%	18.8%	48.2%	25.9%	2.4%	3.024	0.729	0.71
C102	3.5%	17.6%	25.9%	41.2%	11.8%	3.400	1.040	0.86
C103	1.2%	10.6%	48.2%	32.9%	7.1%	3.341	0.648	0.79
C104	3.5%	28.2%	16.5%	36.5%	15.3%	3.318	1.299	0.87
C105	3.7%	20.7%	43.9%	28.0%	3.7%	3.073	0.775	0.79
C106	0.0%	10.6%	25.9%	54.1%	9.4%	3.624	0.635	0.70
C107	2.4%	28.2%	36.5%	29.4%	3.5%	3.035	0.811	0.80
C108	3.5%	31.8%	34.1%	28.2%	2.4%	2.941	0.832	0.73
C109	0.0%	14.3%	42.9%	39.3%	3.6%	3.321	0.575	0.61
Section C averages	**2.79%**	**19.24%**	**34.23%**	**36.55%**	**7.20%**	**3.255**	**0.501**	**0.77**

Table 4.10: Item analysis of the South African responses for Section D (n = 85)

Section D question number (Items)	Percentage endorsements					Mean	Variance	Item to section correlation
	Strongly disagree	Disagree	Neither disagree nor agree	Agree	Strongly agree			
D110	0.0%	2.4%	15.3%	49.4%	32.9%	4.129	0.560	0.62
D111	4.7%	20.0%	18.8%	43.5%	12.9%	3.400	1.181	0.74
D112	2.4%	17.6%	24.7%	47.1%	8.2%	3.412	0.901	0.71
D113	5.9%	18.8%	54.1%	17.6%	3.5%	2.941	0.738	0.80
D114	4.7%	16.5%	38.8%	37.6%	2.4%	3.165	0.796	0.74
D115	4.7%	15.3%	58.8%	18.8%	2.4%	2.988	0.623	0.62
D116	1.2%	9.4%	34.1%	43.5%	11.8%	3.553	0.741	0.75

D117	1.2%	14.3%	40.5%	39.3%	4.8%	3.321	0.670	0.42
D118	0.0%	10.6%	23.5%	52.9%	12.9%	3.682	0.687	0.72
Section D averages	**2.75%**	**13.87%**	**34.30%**	**38.87%**	**10.20%**	**3.398**	**0.355**	**0.68**

Table 4.11: Overall scale statistics for the South African target population (n = 85)

	Section			
	A	**B**	**C**	**D**
Number of items	25	69	11	9
Number of examinees	85	85	85	85
Mean	3.469	3.483	3.255	3.398
Variance	0.334	0.227	0.501	0.355
Standard deviation	0.578	0.476	0.707	0.596
Skewness	0.066	0.375	-0.230	-0.381
Kurtosis	-0.604	-0.059	-0.110	0.474
Minimum	2.320	2.507	1.200	1.667
Maximum	5.000	4.959	5.000	5.000
Median	3.520	3.438	3.364	3.556
Cronbach's alpha coefficient	0.9277	0.9658	0.9304	0.8535

Table 4.12: Scale intercorrelations for the South African target population (n = 85)

		Section			
		A	**B**	**C**	**D**
Section	**A**	1.000	0.854	0.774	0.729
	B	0.854	1.000	0.724	0.675
	C	0.774	0.724	1.000	0.825
	D	0.729	0.675	0.825	1.000

4.6.2.2 Initial item and reliability analysis results (international responses)

The dimensional and non-dimensional measurement results for the international target population are presented in Tables 4.13 to 4.18 below.

Table 4.13: Item analysis of the international responses for Section A (n = 87)

Section A question number (Items)	Percentage endorsements					Mean	Variance	Item to section correlation
	Strongly disagree	Disagree	Neither disagree nor agree	Agree	Strongly agree			
A1	3.4%	12.6%	20.7%	47.1%	16.1%	3.598	1.022	0.55
A2	1.1%	11.5%	29.9%	41.4%	16.1%	3.598	0.861	0.67
A3	2.3%	6.9%	25.3%	42.5%	23.0%	3.770	0.913	0.58
A4	4.6%	3.4%	16.1%	52.9%	23.0%	3.862	0.924	0.70
A5	0.0%	9.2%	24.1%	47.1%	19.5%	3.770	0.752	0.70

A6	0.0%	3.4%	5.7%	59.8%	31.0%	4.184	0.472	0.60
A7	1.1%	18.4%	29.9%	37.9%	12.6%	3.425	0.934	0.67
A8	1.1%	11.5%	11.5%	46.0%	29.9%	3.920	0.971	0.58
A9	3.4%	12.6%	24.1%	48.3%	11.5%	3.517	0.939	0.73
A10	1.1%	14.9%	21.8%	40.2%	21.8%	3.667	1.027	0.66
A11	5.7%	9.2%	21.8%	43.7%	19.5%	3.621	1.155	0.75
A12	3.4%	13.8%	36.8%	42.5%	3.4%	3.287	0.757	0.62
A13	3.4%	13.8%	26.4%	35.6%	20.7%	3.563	1.143	0.73
A14	1.1%	11.5%	14.9%	56.3%	16.1%	3.747	0.810	0.64
A15	1.1%	9.2%	23.0%	51.7%	14.9%	3.701	0.761	0.67
A16	10.3%	13.8%	13.8%	47.1%	14.9%	3.425	1.440	0.76
A17	1.1%	13.8%	19.5%	51.7%	13.8%	3.632	0.853	0.57
A18	2.3%	17.2%	19.5%	48.3%	12.6%	3.517	0.985	0.78
A19	1.1%	14.9%	18.4%	46.0%	19.5%	3.678	0.977	0.68
A20	1.1%	1.1%	9.2%	49.4%	39.1%	4.241	0.574	0.41
A21	0.0%	8.0%	13.8%	63.2%	14.9%	3.851	0.587	0.51
A22	0.0%	8.0%	27.6%	39.1%	25.3%	3.816	0.817	0.57
A23	5.7%	3.4%	12.6%	26.4%	51.7%	4.149	1.277	0.76
A24	6.9%	9.2%	6.9%	48.3%	28.7%	3.828	1.315	0.76
A25	5.7%	6.9%	28.7%	42.5%	16.1%	3.563	1.051	0.81
Section A averages	**2.71%**	**10.34%**	**20.09%**	**46.21%**	**20.64%**	**3.717**	**0.407**	**0.66**

Table 4.14: Item analysis of the international responses for Section B (n = 87)

Section B question number (Items)	Percentage endorsements					Mean	Variance	Item to section correlation
	Strongly disagree	Disagree	Neither disagree nor agree	Agree	Strongly agree			
B26	0.0%	3.4%	3.4%	44.8%	48.3%	4.379	0.511	0.57
B27	0.0%	13.8%	47.1%	35.6%	3.4%	3.287	0.550	0.60
B28	3.4%	9.2%	12.6%	34.5%	40.2%	3.989	1.207	0.59
B29	0.0%	6.9%	18.4%	48.3%	26.4%	3.943	0.721	0.52
B30	0.0%	12.6%	20.7%	49.4%	17.2%	3.713	0.802	0.68
B31	0.0%	13.8%	18.4%	54.0%	13.8%	3.678	0.770	0.71
B32	4.6%	9.2%	6.9%	46.0%	33.3%	3.943	1.181	0.64
B33	5.7%	10.3%	16.1%	31.0%	36.8%	3.828	1.430	0.75
B34	6.9%	12.6%	20.7%	46.0%	13.8%	3.471	1.192	0.67
B35	0.0%	10.3%	25.3%	46.0%	18.4%	3.724	0.774	0.69
B36	1.1%	9.2%	17.2%	37.9%	34.5%	3.954	0.986	0.76
B37	0.0%	8.0%	16.1%	47.1%	28.7%	3.966	0.769	0.80
B38	4.6%	6.9%	16.1%	51.7%	20.7%	3.770	1.005	0.78
B39	2.3%	2.3%	27.6%	40.2%	27.6%	3.885	0.837	0.61
B40	4.6%	6.9%	14.9%	41.4%	32.2%	3.897	1.150	0.61
B41	8.0%	16.1%	41.4%	25.3%	9.2%	3.115	1.090	0.43
B42	1.1%	10.3%	37.9%	43.7%	6.9%	3.448	0.661	0.63
B43	0.0%	9.2%	23.0%	58.6%	9.2%	3.678	0.586	0.31
B44	0.0%	4.6%	43.7%	36.8%	14.9%	3.621	0.626	0.47
B45	2.3%	16.1%	6.9%	43.7%	31.0%	3.851	1.208	0.55
B46	0.0%	2.3%	23.3%	65.1%	9.3%	3.814	0.384	0.43
B47	0.0%	5.7%	32.2%	57.5%	4.6%	3.609	0.445	0.48
B48	1.2%	5.8%	17.4%	53.5%	22.1%	3.895	0.722	0.50

B49	2.3%	23.0%	33.3%	36.8%	4.6%	3.184	0.840	0.22
B50	4.6%	11.5%	28.7%	46.0%	9.2%	3.437	0.936	0.63
B51	0.0%	3.4%	28.7%	59.8%	8.0%	3.724	0.430	0.41
B52	0.0%	2.3%	17.2%	46.0%	34.5%	4.126	0.593	0.61
B53	0.0%	10.3%	14.9%	52.9%	21.8%	3.862	0.763	0.48
B54	1.1%	4.6%	6.9%	36.8%	50.6%	4.310	0.766	0.65
B55	2.3%	12.6%	21.8%	49.4%	13.8%	3.598	0.907	0.75
B56	0.0%	2.3%	17.2%	51.7%	28.7%	4.069	0.547	0.66
B57	0.0%	5.7%	26.4%	49.4%	18.4%	3.805	0.640	0.64
B58	1.1%	17.2%	41.4%	37.9%	2.3%	3.230	0.637	0.38
B59	8.0%	19.5%	28.7%	31.0%	12.6%	3.207	1.291	0.63
B60	1.1%	21.8%	27.6%	34.5%	14.9%	3.402	1.045	0.52
B61	1.1%	8.0%	25.3%	50.6%	14.9%	3.701	0.738	0.69
B62	2.3%	16.1%	39.1%	36.8%	5.7%	3.276	0.774	0.62
B63	9.2%	21.8%	35.6%	32.2%	1.1%	2.943	0.951	0.66
B64	1.1%	9.2%	28.7%	49.4%	11.5%	3.609	0.721	0.57
B65	0.0%	16.1%	29.9%	42.5%	11.5%	3.494	0.802	0.57
B66	0.0%	13.8%	29.9%	48.3%	8.0%	3.506	0.687	0.62
B67	5.7%	20.7%	33.3%	36.8%	3.4%	3.115	0.929	0.65
B68	2.3%	25.3%	23.0%	44.8%	4.6%	3.241	0.919	0.62
B69	1.1%	5.7%	9.2%	50.6%	33.3%	4.092	0.750	0.60
B70	3.4%	11.5%	5.7%	41.4%	37.9%	3.989	1.207	0.74
B71	5.7%	8.0%	4.6%	35.6%	46.0%	4.080	1.338	0.70
B72	0.0%	12.6%	13.8%	39.1%	34.5%	3.954	0.986	0.66
B73	2.3%	13.8%	34.5%	46.0%	3.4%	3.345	0.709	0.37
B74	2.3%	8.0%	1.1%	59.8%	28.7%	4.046	0.825	0.35
B75	0.0%	6.9%	18.4%	58.6%	16.1%	3.839	0.595	0.50
B76	1.1%	3.4%	34.5%	49.4%	11.5%	3.667	0.590	0.72
B77	0.0%	2.3%	28.7%	49.4%	19.5%	3.862	0.556	0.78
B78	3.4%	16.1%	20.7%	51.7%	8.0%	3.448	0.937	0.76
B79	1.1%	14.9%	4.6%	43.7%	35.6%	3.977	1.103	0.77
B80	1.1%	10.3%	49.4%	29.9%	9.2%	3.356	0.689	0.64
B81	5.7%	8.0%	39.1%	35.6%	11.5%	3.391	0.974	0.74
B82	0.0%	11.5%	21.8%	52.9%	13.8%	3.690	0.720	0.59
B83	0.0%	6.9%	19.5%	54.0%	19.5%	3.862	0.648	0.63
B84	1.1%	12.6%	24.1%	33.3%	28.7%	3.759	1.080	0.62
B85	0.0%	10.3%	25.3%	46.0%	18.4%	3.724	0.774	0.73
B86	1.1%	18.4%	18.4%	51.7%	10.3%	3.517	0.893	0.72
B87	1.1%	24.1%	13.8%	44.8%	16.1%	3.506	1.124	0.78
B88	4.6%	17.2%	37.9%	31.0%	9.2%	3.230	0.982	0.67
B89	0.0%	3.4%	8.0%	43.7%	44.8%	4.299	0.577	0.68
B90	0.0%	5.7%	14.9%	51.7%	27.6%	4.011	0.655	0.60
B91	0.0%	5.7%	40.2%	51.7%	2.3%	3.506	0.411	0.11
B92	0.0%	9.2%	14.9%	72.4%	3.4%	3.701	0.462	0.54
B93	2.3%	10.3%	25.3%	44.8%	17.2%	3.644	0.919	0.62
B94	6.9%	12.6%	28.7%	35.6%	16.1%	3.414	1.231	0.61
B95	2.3%	21.8%	26.4%	37.9%	11.5%	3.345	1.031	0.51
B96	2.3%	12.6%	9.2%	56.3%	19.5%	3.782	0.952	0.75
B97	3.4%	13.8%	24.1%	43.7%	14.9%	3.529	1.031	0.72
B98	0.0%	5.7%	5.7%	60.9%	27.6%	4.103	0.553	0.64
Section B averages	**1.94%**	**10.90%**	**22.85%**	**45.41%**	**18.90%**	**3.684**	**0.307**	**0.63**

Table 4.15: Item analysis of the international responses for Section C (n = 87)

Section C question number (Items)	Percentage endorsements					Mean	Variance	Item to section correlation
	Strongly disagree	Disagree	Neither disagree nor agree	Agree	Strongly agree			
C99	6.9%	5.7%	11.5%	59.8%	16.1%	3.724	1.050	0.81
C100	3.4%	8.0%	11.5%	56.3%	20.7%	3.828	0.924	0.83
C101	0.0%	23.0%	37.9%	29.9%	9.2%	3.253	0.833	0.64
C102	3.4%	5.7%	25.3%	44.8%	20.7%	3.736	0.930	0.85
C103	5.7%	10.3%	27.6%	48.3%	8.0%	3.425	0.957	0.71
C104	4.6%	6.9%	25.3%	48.3%	14.9%	3.621	0.948	0.76
C105	5.7%	12.6%	37.9%	40.2%	3.4%	3.230	0.844	0.73
C106	6.9%	2.3%	19.5%	47.1%	24.1%	3.793	1.107	0.85
C107	4.6%	6.9%	32.2%	47.1%	9.2%	3.494	0.848	0.85
C108	11.5%	18.4%	37.9%	27.6%	4.6%	2.954	1.101	0.76
C109	1.1%	10.3%	9.2%	57.5%	21.8%	3.885	0.814	0.63
Section C averages	**4.91%**	**10.03%**	**25.08%**	**46.08%**	**13.90%**	**3.540**	**0.552**	**0.68**

Table 4.16: Item analysis of the international responses for Section D (n = 87)

Section D question number (Items)	Percentage endorsements					Mean	Variance	Item to section correlation
	Strongly disagree	Disagree	Neither disagree nor agree	Agree	Strongly agree			
D110	0.0%	6.9%	6.9%	54.0%	32.2%	4.115	0.653	0.73
D111	3.4%	8.0%	17.2%	51.7%	19.5%	3.759	0.942	0.81
D112	2.3%	9.2%	26.4%	48.3%	13.8%	3.621	0.833	0.71
D113	1.1%	20.7%	42.5%	32.2%	3.4%	3.161	0.687	0.74
D114	1.1%	6.9%	31.0%	43.7%	17.2%	3.690	0.766	0.76
D115	1.1%	5.7%	52.9%	35.6%	4.6%	3.368	0.508	0.71
D116	0.0%	11.5%	12.6%	46.0%	29.9%	3.943	0.882	0.72
D117	4.6%	4.6%	34.5%	49.4%	6.9%	3.494	0.756	0.68
D118	1.1%	0.0%	8.0%	62.1%	28.7%	4.172	0.442	0.63
Section D averages	**1.66%**	**8.17%**	**25.80%**	**47.00%**	**17.37%**	**3.702**	**0.371**	**0.73**

Table 4.17: Overall scale statistics for the international target population (n = 87)

	Section			
	A	B	C	D
Number of items	25	69	11	9
Number of examinees	87	87	87	87
Mean	3.717	3.684	3.540	3.702
Variance	0.407	0.307	0.552	0.371
Standard deviation	0.638	0.554	0.743	0.609
Skewness	-0.689	-0.454	-1.227	-0.951
Kurtosis	-0.135	-0.323	1.402	0.494
Minimum	2.000	2.397	1.364	2.111
Maximum	5.000	4.877	4.727	4.889

Median	3.840	3.753	3.727	3.889
Cronbach's alpha coefficient	0.9455	0.9768	0.9290	0.8837

Table 4.18: Scale intercorrelations for the international target population (n = 87)

		Section			
		A	**B**	**C**	**D**
Section	**A**	1.000	0.936	0.789	0.707
	B	0.936	1.000	0.802	0.706
	C	0.789	0.802	1.000	0.823
	D	0.707	0.706	0.823	1.000

4.6.2.3 Summary and discussion of initial item and reliability analysis results

The item analysis of the South African and international population groups for all of the sections reveals that the item means vary between 2.565 and 4.379, with a variance of between 0.227 and 1.440, as summarised in Table 4.19 below.

Table 4.19: Summary of mean, variance and item to section correlation (minimum and maximum values) dimension for the two population groups (n = 172)

		South African responses				International responses			
		Section				Section			
		A	**B**	**C**	**D**	**A**	**B**	**C**	**D**
Mean	Min	2.882	2.565	2.941	2.941	3.287	2.943	2.954	3.161
	Max	4.047	4.318	3.667	4.129	4.241	4.379	3.885	4.172
Variance	Min	0.334	0.227	0.501	0.355	0.407	0.307	0.552	0.371
	Max	1.421	1.217	1.299	0.901	1.440	1.430	1.107	0.882
Item to section correlation	Min	0.368	0.168	0.612	0.422	0.410	0.112	0.629	0.626
	Max	0.781	0.716	0.867	0.796	0.806	0.798	0.848	0.759

All the means of the responses to the questions are above the Likert scale level of 3, except in the following instances:

- South African responses
  - Questions A7 and A16;
  - Questions B41, B58, B62 and B63 ;
  - Question C108; and
  - Questions D113 and D115.
- International responses
  - Question B63; and
  - Question C108.

From Tables 4.7 to 4.10 (South African responses), 4.13 to 4.18 (international responses) and Table 4.19, it can be observed that the item to section correlation values are positive for all four sections, A to D, of the assessment tool. This is above Pearson's r two-tailed level of significance critical value of 0.217 (degrees of freedom (df) = n – 2 = 80 and $p < 0.05$) as stated by Hall (1998), except in the following instances:

- South African responses - Question B73 (0.168); and
- International responses - Question B91 (0.112).

The Cronbach alpha coefficients for all sections of both the South African (α's between 0.8535 and 0.9658) and international responses (α's between 0.8837 and 0.9768) are considered highly acceptable, compared to the guideline of an alpha greater than 0.70 (Nunnally & Bernstein, 1994; Smit, 1991).

From the skewness results presented in Tables 4.11 and 4.17, it can be observed that the South African population's responses to questions from Section A display the most symmetrical distribution while, international responses to the questions in Sections C and D are the least symmetrical in terms of the shape of the respective distributions. The absolute skewness statistics for the South African responses to all four sections are less than two standard errors of skewness (*ses*), indicating that there is no significant skewness problem. However, the skewness statistics for Sections A, C and D for the international population's responses are all greater than two standard errors of skewness. It can therefore be deduced that these distributions are significantly skewed. Since the sign of the aforementioned skewness statistics are all negative, one can further conclude that the data is concentrated at the high end of the scale. This is consistent with the higher median statistics reported for the international population in Table 4.17.

Similarly, the kurtosis results indicate that the results are largely flat (or platykurtical) with evenly distributed scores that are flatter than a normal distribution, except in respect of the responses of the South African population to Section D and the international responses to Sections C and D. Once again, the absolute kurtosis statistics for the South African responses to all four sections are smaller than two standard errors of kurtosis (*sek*), indicating that there was no significant kurtosis problem (kurtosis within the range of the chance fluctuations within this statistic). The same conclusion can be reached for the international data, except in the instance

of responses to Section C. The significantly positive kurtosis result (> 2 *sek*) for Section C's data indicates a leptokurtic distribution (very peaked with flat tails).

From the initial statistical item analysis, it appears that the items of the assessment tool have acceptable levels of internal consistency. The ITEMAN™ (Conventional Item and Test Analysis Program, Version 3.6) statistical software results for the combined South African and International population groups are included in Appendix C.

Following the initial item and reliability analysis described above, an exploratory factor analysis was conducted. This analysis then formed the underlying content of the measuring instrument.

4.6.3 Introduction to the exploratory factor analysis technique

Broadly speaking, factor analysis addresses the problem of analysing the structure of the interrelationships (correlations) between a large number of variables (such as test scores, test items and questionnaire responses) by defining a set of common underlying dimensions known as factors (Hair *et al*., 1998:367). This process has two primary uses and can ultimately result in summarisation (describing the data by means of a much smaller number of surrogate items) and data reduction (calculating factor scores to replace the original variables).

In exploratory factor analysis the researcher has little or no knowledge about the factor structure. In other words, there is very little theory that can be used to answer specific research questions. In such cases, researchers may collect data and explore or search for a factor structure or theory which explains the correlations between the variables. Data is used to help reveal or identify the structure of the factor model. Exploratory factor analysis can be regarded as a technique to aid in theory building. Confirmatory factor analysis on the other hand, assumes that the factor structure is known or hypothesised *a priori*. In other words, the complete factor structure, along with the respective indicators and the nature of the pattern loadings, is specified *a priori*, based on a particular underlying theory. The objective is to verify or confirm an expected factor structure empirically rather than to determine a structure that was previously unknown (Sharma, 1996:128; DeVellis, 1991:108). Exploratory factor analysis was used in this study.

According to Sharma (1996:99), the objectives of factor analysis are to use the computed correlation matrix to

- identify the smallest number of common factors that best explain or account for the correlations among the indicators;
- identify, via factor rotations, the most plausible factor solution;
- estimate the pattern or structure loadings, communalities of the variables (the square of the pattern loadings or the squared multiple correlation of a variable with the factors) and the unique variances of the indicators;
- provide an interpretation for the common factor(s); and, if necessary,
- estimate the factor scores.

Hair *et al*. (1998:368, 371) state that factor analysis techniques can meet any of three objectives:

- identifying the structure of relationships among either variables or respondents by examining correlations between the variables or respondents;
- identifying representative variables from a much larger set of variables for use in subsequent multivariate analysis; and
- creating an entirely new set of fewer variables to partially or completely replace the original set for inclusion in subsequent techniques.

Similarly, factor analysis serves several related purposes (DeVellis, 1991:92):

- assisting in determining how many latent variables underlie a set of other variables;
- condensing information so that variation can be explained by using a smaller number of variables; and
- defining the substantive meaning of the factors or latent variables.

4.6.4 Factor analysis process

Factor analysis begins with the construction of a covariance or correlation matrix from the data collected from respondents. In the case of a covariance matrix, the matrix is comprised of diagonal elements that are the variances of the individual items (representing that portion of total variance that is unique to the particular variable) and off-diagonal items that are the covariances (the portion of total variance that is shared) between all paired items. Conversely,

with common factor analysis, communalities which are estimates (square multiple correlations) of the shared or common variance among variables are inserted in the diagonal and factors are only based on the common variance. Because the objective is to identify interrelated sets of variables, Hair *et al*. (1998:374) suggest that one of the critical assumptions of factor analysis is that the data matrix has sufficient correlations (with a value greater than 0.30) to justify the application of factor analysis.

This initial step is followed by a "process of factor extraction that involves identifying hypothetical latent variables (factors) that can account mathematically for the patterns of covariance among items" (DeVellis, 1991:93). Essentially, a factor would be a latent variable that is presumed to cause the covariation among various data items and the factor loading would represent the correlation between each original item and the new latent variable. Various criteria have been developed to assist in deciding how many factors should be extracted:

- the latent root criterion, where only factors with eigenvalues greater than 1.0 are retained (mostly applicable when there are between 20 and 50 variables));
- Kaiser's eigenvalue rule (found in Nunnally (1978)) where only retaining factors that explain more variance than the average amount explained by one of the original items are retained;
- the percentage of variance approach, in which cumulative percentages of the variance extracted by successive factors is the criterion (and a common threshold when applied to study in the field of social sciences is to retain factors that account for 60% of total variance); and
- Cattell's (1966) scree test criterion, which calls for retaining the factors above the eigenvalue elbow on the scree plot and rejecting those below it, or the point at which the curve first begins to straighten is considered to indicate the maximum number of factors.

Defining the content or meaning of the factors extracted typically requires factor rotation. The goal of factor rotation is to find a set of factors that provides the clearest conceptual picture of the relationships among items. Rotation of the factors is intended to enhance the interpretation by reducing some of the ambiguities that are often associated with initial unrotated factor solutions. Orthogonal or oblique rotation techniques can be used depending on the overall objective of the factor analysis. Orthogonal rotation is applied when factors are required to be statistically independent and are rotated in a manner that ensures that they remain perpendicular to each other. Oblique rotation allows for correlation between rotated factors and

the optimal fit between each successive factor. No specific guidelines have been developed to assist in decision-making in this regard (Hair *et al*., 1998:384).

Interpreting the factor matrix involves, first, assessing the significance of the individual factor loadings; second, assessing each variable's communality with the factors; and third, assigning a meaning to the pattern of factor loadings.

First, in assessing the significance of factor loadings, the larger the absolute size of the factor loading, the more important the loading is in interpreting the factor matrix. A decision must be made about which factor loadings are worth considering when interpreting factors. The following four guidelines aid in the interpretation of factor loadings (Hair *et al*., 1998:384-386):

- practical significance and empirical evidence (when the sample size is 100 or larger) should be looked at;
- factor loadings that are greater than ±0.30 are considered to meet the minimum required level;
- loadings of ±0.40 are considered more important; and,
- loadings that are equal to or greater than ±0.50 are considered practically significant.

A more conservative approach is based on the argument that a factor loading represents the correlation between the original variable and the factor. Assuming that the stated objective is to use the 0.05 significance level in the interpretation of loadings, the following loadings should be used for the following different sample sizes:

- loadings of 0.65 for a sample size of 70;
- loadings of 0.60 for a sample size of 85;
- loadings of 0.55 for a sample size of 100;
- loadings of 0.45 for a sample size of 150; and
- loadings of 0.40 for a sample size of 200.

Sharma (1996:118) states that "high loading of a variable on a factor indicates that there is much in common between the factor and that respective variable. Although there is no definitive cut-off point to tell us how high is 'high', it has been suggested that the loadings should be at least greater than 0.60, and many researchers have used cut-off values as low as 0.40."

Secondly, as mentioned above, it is necessary to assess each variable's communality with the factor to determine if it meets acceptable levels of explanation. For example, the researcher may specify that at least one third of the variances of each variable must be accounted for. Using this guideline, the researcher would identify all variables with communalities less than 0.33 as not being sufficiently explained.

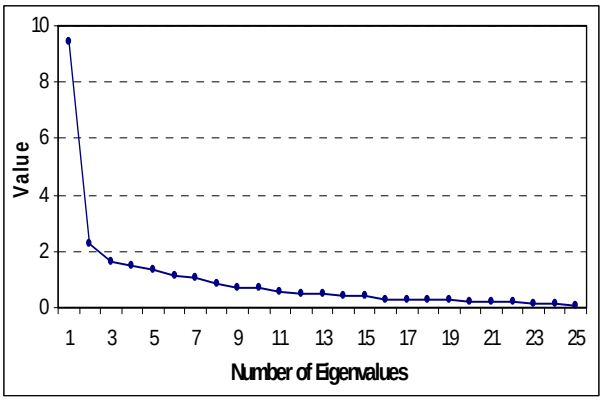
Lastly, it is necessary to assign meaning to the pattern of factor loadings. Variables with higher loadings are considered more important than other and the most emphasis should be placed on these items. These items should also have a greater influence on the name or label selected to represent the factor or underlying construct (Hair *et al*., 1998:387).

4.6.5 Exploratory factor analysis results (Section A)

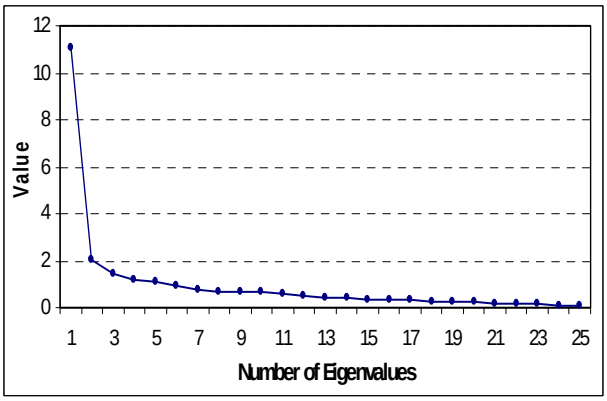
4.6.5.1 Latent roots and initial factor analysis solution (Section A)

Following the initial item and reliability analysis described above, a range of iterations of exploratory factor analysis was conducted to explore the internal structure of questionnaire items. During each of these iterations, the number of initial factors was determined based on the eigenvalues of latent roots. Scree plots were drawn up and the appropriate number of factors was identified in the various rounds. The significance of the rotated factor loadings was then evaluated and tested.

For Section A of the questionnaire, a factor analysis using BMDP statistical software was applied to the South African population's responses to determine the number of appropriate factors, which resulted in a very dominant factor with an eigenvalue of 9.4075 (explaining 37.63% of the variance) and a second potential factor with an eigenvalue of 2.2860 (accounting for 9.14% of the variance). The same process was applied to the international target population which resulted in one very dominant factor with an eigenvalue of 11.0487 (44.19% of variance) with second and third factors with eigenvalues of 2.0560 (8.24% of variance) and 1.4566 (5.83% of variance) respectively. The relevant scree plots of the eigenvalues (all 25 items originally included in Section A of the second phase questionnaire) are shown in Graphs 4.1 and 4.2 below.

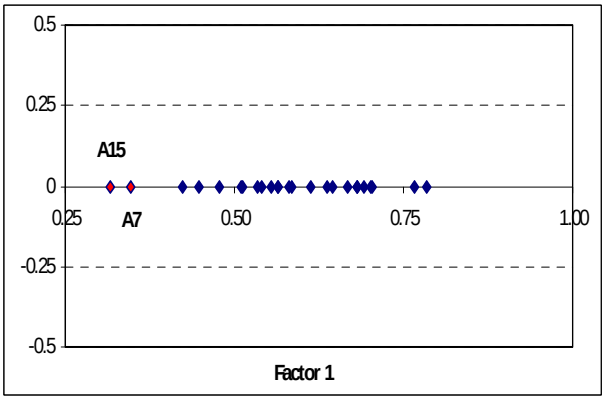


Graph 4.1: Scree plot of initial eigenvalues (South African responses to Section A)

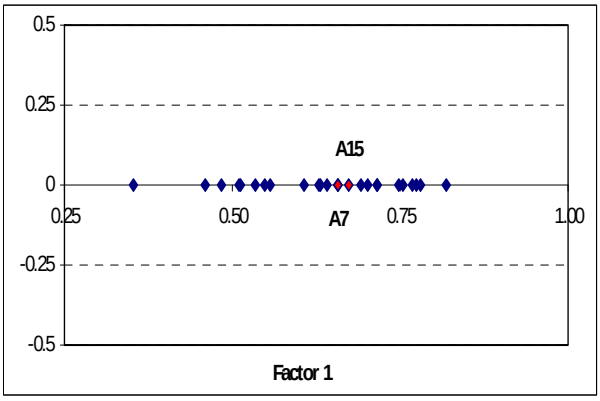


Graph 4.2: Scree plot of initial eigenvalues (international responses to Section A)

The application of the factor extraction criteria discussed above each resulted in the retention of a different numbers of factors for each of the criteria. Applying the latent root criterion required seven factors to be retained. Four factors would be retained if the percentage of variance criterion was used and a single factor would be retained if Cattell's scree test was applied. When the relevance and/or possibility of two or more factors was analysed, it was determined that the identified dominant factor was adequate, based on the Cattell criterion and that a single factor is the best descriptor of the construct. Scatter plots of the rotated (and unrotated) factor loadings (pattern) for all 25 items originally included in Section A of the second phase questionnaire are shown in Graphs 4.3 and 4.4 below.



Graph 4.3: Scatter plot of initial factor loadings (South African responses to Section A)



Graph 4.4: Scatter plot of initial factor loadings (international responses to Section A)

When Section A of the questionnaire (the conceptual / initiation phase of the project) was analysed by means of factor analysis, it became apparent that two items which measure the need to:

- communicate a sense of urgency (Item A7), and

- prioritise project objectives (Item A15);

each received different emphasis from the two target populations, namely South African and international project managers. The factor loadings for these items for the two population groups are highlighted in red to illustrate their difference locations in the respective scatter plots presented in Graphs 4.3 and 4.4 above. The factor loadings and communalities (squared multiple correlations) for the South African and international target population groups for Item A7 were 0.347, 0.657, 0.1202 and 0.4320 respectively. The identical statistical measures for Item A15 were 0.316, 0.673, 0.0995 and 0.4529. It can be observed from these results that the communality indices of these items (A7 and A15) with the primary factor identified for the South African responses to Section A of the assessment tool were extremely low.

4.6.5.2 Contingency table / chi-square test results (Section A items)

Due to the relatively small sets of data within the 1, 2, 4 and 5 dimensions of the Likert scale, it was decided to cluster these four dimensions into two categories (1 and 2 were combined into a single category and likewise, 4 and 5 were combined to form a single category). This was done to make the data more meaningful in order to be able to apply the various chi-square tests in the context of contingency table analysis. The chi-square (χ^2) test is probably the most widely used nonparametric test of significance (Cooper & Schindler, 2003:499). This technique is used to test for significant differences between the observed distribution of data among categories and the expected distribution based on the null hypothesis. "The greater the difference between them, the less is the probability that these differences can be attributed to chance. The value of χ^2 is the measure that expresses the extent of the difference. The larger the divergence, the larger is the χ^2 value" (Cooper & Schindler, 2003). With two degrees of freedom, the null hypothesis is rejected (at the 0.05 level of rejection) if the computed chi-square value is greater than or equal to

$$\chi^2_{0.05,2} = 5.991$$ (Dowdy, Wearden & Chilko, 2004:111 & 532)

Applying the chi-square test of homogeneity to the data collected on Item A7 (communicating a sense of urgency about the project), resulted in a χ^2 value of 14.401 with a probability value of 0.0007. Since this result is significantly higher than the critical chi-square value threshold of 5.991 given above, the null hypothesis (that the South African and international respondents agree on the importance of communicating a sense of urgency surrounding the project) is rejected; and it is concluded that there is evidence to indicate that the South African and

international samples are different in respect of their opinions on the importance of communicating a sense of urgency around the project. Table 4.20 below contains the relevant contingency table data in this regard.

Table 4.20: Item A7 - communicating a sense of urgency by sample (for a sample size of 172)

Likert scale dimensions	Statistical measure	South Africa	International	Total
1 to 2	Frequency	32	17	49
	Row %	65.31%	34.69%	100%
	Column %	37.65%	19.54%	28.49%
3	Frequency	33	26	59
	Row %	55.93%	44.07%	100%
	Column %	38.82%	29.89%	34.30%
4 to 5	Frequency	20	44	64
	Row %	31.25%	68.75%	100%
	Column %	23.53%	50.57%	37.21%
Total	Frequency	85	87	172
	Row %	49.42%	50.58%	100%
	Column %	100%	100%	100%

On the item of prioritisation of project objectives (item A15) both target population groups recorded similar frequencies as presented in the contingency Table 4.21 below. The chi-square test for homogeneity yielded a χ^2 value of 1.215 with a p-value of 0.5447. Similarly, since this result is lower that the same critical chi-square value of 5.991 specified above, the null hypothesis (that the South African and international groupings agree on the importance of prioritisation of project objectives) is accepted. Based on this evidence, it was concluded, that the opinions of the South African and international samples on the importance of prioritising project objectives are largely similar.

Table 4.21: Item A15 - prioritisation of project objectives by sample (for a sample size of 172)

Likert scale dimensions	Statistical measure	South Africa	International	Total
1 to 2	Frequency	5	9	14
	Row %	35.71%	64.29%	100%
	Column %	5.88%	10.34%	8.14%
3	Frequency	22	20	42
	Row %	52.38%	47.62%	100%
	Column %	25.88%	22.99%	24.42%
4 to 5	Frequency	58	58	116
	Row %	50.00%	50.00%	100%
	Column %	68.24%	66.67%	67.44%

Total	Frequency	85	87	172
	Row %	49.42%	50.58%	100%
	Column %	100%	100%	100%

It is clear from Table 4.20 above that the South African population does not regard "communicating a sense of urgency" in the project management context as important, with frequencies of 37.65% and 38.82% for the 1 to 2 and 3 categories within the Likert scale respectively. By contrast, the international target audience regarded "communicating a sense of urgency" in a project management context as important with a frequency of 50.57% (as opposed to the 23.53% for the South African sample) on the combined 4 and 5 dimensions on the Likert scale. This might be attributable to the difference in the level of maturity of project management in the international context compared to the South African context, where project and change management skills and capacity are still being developed (albeit at a rapid pace) and where "the sense of urgency" which is normally associated with successful project completion is still evolving.

The relationship between Items A7 and A15 was then determined for both samples, using the chi-square test of independence. With four degrees of freedom, the null hypothesis is usually rejected (at the 0.05 level of rejection) if the computed chi-square value is greater than or equal to

$$\chi^2_{0.05,4} = 9.488$$

Table 4.22 below contains the contingency table for the South African data for this analysis.

Table 4.22: South African respondent data (Items A7 and A15)

			Item: Prioritisation			
	Likert Scale Dimensions		**1 to 2**	**3**	**4 to 5**	**Total**
Item: Sense of urgency	**1 to 2**	Frequency	4	11	17	32
		Row %	12.50%	34.38%	53.13%	100%
		Column %	80.00%	50.00%	29.31%	37.65%
	3	Frequency	1	8	24	33
		Row %	3.03%	24.24%	72.73%	100%
		Column %	20.00%	36.36%	41.38%	38.82%
	4 to 5	Frequency	0	3	17	20
		Row %	0.00%	15.00%	85.00%	100%
		Column %	0.00%	13.64%	29.31%	23.53%
	Total	Frequency	5	22	58	85
		Row %	5.88%	25.88%	68.24%	100%
		Column %	100%	100%	100%	100%

For the South African responses, the chi-square test for independence determined a χ^2 value of 7.8484 with a p-value of 0.0973. Since this result is lower that the critical chi-square value of 9.488 specified above, the null hypothesis (that the South African opinions on the importance of communicating a sense of urgency about the project and on the importance of prioritisation of project objectives are independent) was accepted. It was concluded that the opinions of the South African sample on the importance of the two items, namely A7 and A15, are not significantly related.

The international target audience had the following view on the two items, as set out in Table 4.23 below. The international target audience resulted in a chi-square independence test value of 16.9276 with a p-value of 0.0020, indicating that the appropriate null hypothesis in this instance should be rejected and that international opinions on the two items (A7 and A15) are, in fact, dependent and related.

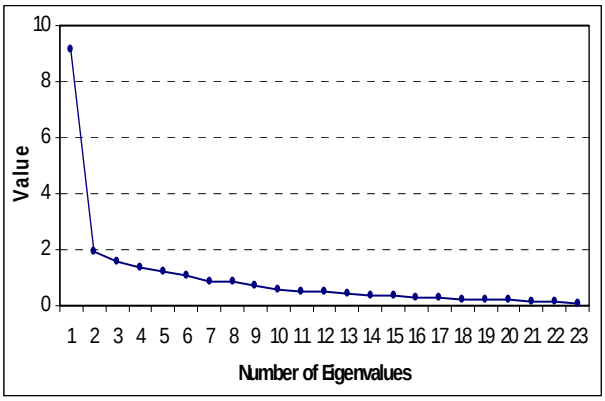
Table 4.23: International respondents data (Items A7 and A15)

			Item: Prioritisation			
	Likert Scale Dimensions		**1 to 2**	**3**	**4 to 5**	**Total**
Item: Sense of urgency	**1 to 2**	Frequency	5	6	6	17
		Row %	29.41%	35.29%	35.29%	100%
		Column %	55.56%	30.00%	10.34%	19.54%
	3	Frequency	1	9	16	26
		Row %	3.85%	34.62%	61.54%	100%
		Column %	11.11%	45.00%	27.59%	29.89%
	4 to 5	Frequency	3	5	36	44
		Row %	6.82%	11.36%	81.82%	100%
		Column %	33.33%	25.00%	62.07%	50.57%
	Total	Frequency	9	20	58	87
		Row %	10.34%	22.99%	66.67%	100%
		Column %	100%	100%	100%	100%

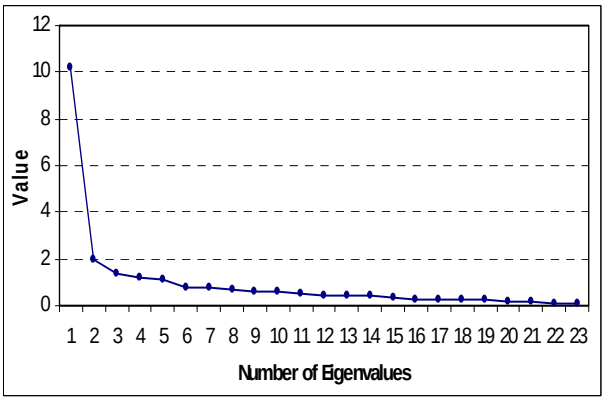
Because both chi-square tests (for homogeneity and for independence) described above, yielded opposing results in relation to the respective null hypothesis, it was subsequently decided to remove both items (A7 and A15) from the proposed assessment tool to reduce the possibility of any data contamination in any future analyses.

4.6.5.3 Final factor solution and loadings (Section A)

A final round of factor analysis was then applied to both target audiences for Section A, excluding Items A7 and A15 in an attempt to confirm the structure. The scree plots of the eigenvalues (with the reduced number of 23 items in Section A of the Phase 2 questionnaire) are shown in Graph 4.5 and Graph 4.6 below. Two dominant factors with eigenvalues of 9.158 for the South African and 10.191 for the international group were extracted. Each factor accounted for 39.8% and 44.3% of the total variance.



Graph 4.5: Scree plot of final eigenvalues (South African responses to Section A)

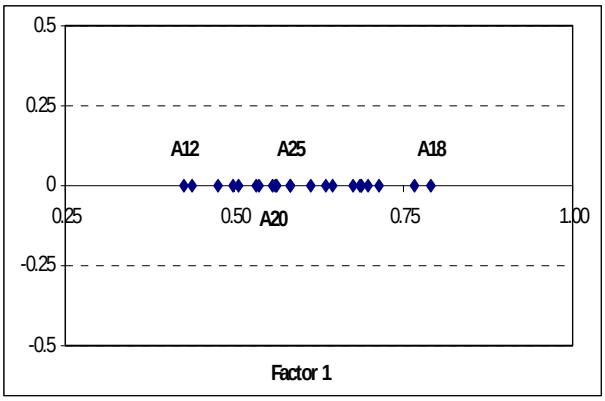


Graph 4.6: Scree plot of final eigenvalues (international responses to Section A)

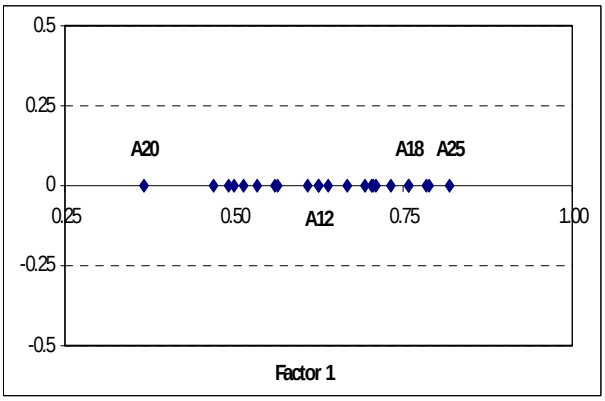
Once again, applying the factor extraction criteria discussed before resulted in the retention of different numbers of factors as follows:

- six factors when the latent root criterion was applied;
- four factors when applying the percentage of variance criterion; and
- one factor according to Cattell's scree test.

Furthermore, when the relevance of two or more factors was analysed, it was determined that the identified dominant factor was adequate, based on the Cattell criterion; and that a single factor was the best descriptor of the final Section A construct. Scatter plots of the rotated (and unrotated) factor loadings (pattern) for the reduced number of 23 items included in Section A of the Phase 2 questionnaire are shown in Graph 4.7 and Graph 4.8 below.



Graph 4.7: Scatter plot of factor final loadings (South African responses to Section A)



Graph 4.8: Scatter plot of factor final loadings (international responses to Section A)

Table 4.24 below gives a summary of the sorted rotated factor loadings for the two target audiences and the combined group in relation to the construct underpinning Section A. Factor rotation was done using the direct quartimin (oblique rotation) method.

Table 4.24: Section A - sorted rotated factor loadings (South African, international and combined group (n = 172) respondents)

SECTION A					
South African responses		**International responses**		**Combined group**	
Question	**Factor loadings**	**Question**	**Factor loadings**	**Question**	**Factor loadings**
A18	0.791	A25	0.819	A18	0.791
A19	0.766	A23	0.788	A16	0.735
A16	0.713	A24	0.785	A19	0.725
A13	0.698	A11	0.759	A13	0.720
A17	0.687	A18	0.759	A9	0.712
A9	0.687	A16	0.732	A25	0.685
A1	0.686	A13	0.709	A24	0.682
A22	0.675	A5	0.706	A11	0.679
A2	0.646	A9	0.704	A23	0.660
A10	0.635	A4	0.694	A10	0.656
A24	0.612	A19	0.668	A2	0.636
A25	0.582	A10	0.639	A5	0.621
A11	0.582	A14	0.626	A22	0.617
A5	0.563	A12	0.624	A17	0.615
A6	0.560	A2	0.609	A1	0.614
A20	0.556	A6	0.565	A4	0.599
A21	0.536	A3	0.560	A14	0.569
A23	0.532	A22	0.535	A6	0.562
A4	0.507	A8	0.515	A3	0.520
A14	0.498	A17	0.499	A8	0.519
A3	0.475	A1	0.492	A21	0.493
A8	0.438	A21	0.469	A20	0.484

		A12	0.426	A20	0.367	A12	0.481
Cronbach's alpha coefficient (all variables)		**0.929**		**0.941**		**0.937**	
Variance explained		**8.5628**		**9.6108**		**9.1522**	
Cumulative proportion of variance	In data Space	**37.23%**		**41.79%**		**39.79%**	
	In factor Space	**100%**		**100%**		**100%**	
Factor score covariance		**93.80%**		**95.10%**		**94.30%**	

It can be seen from the above results that all the factor loadings exceed the required minimum threshold level of 0.45 for a sample size of 150, at the 0.05 significance level. The communalities of the variables with the primary factor range from 0.2316 (Item A12) to 0.6254 (Item A18).

4.6.5.4 Scale naming / description (Section A)

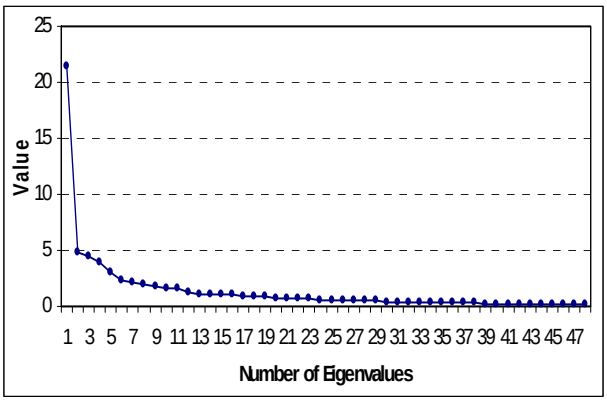
More detailed information on the various aspects of the construct for Section A of the measuring instrument can be found in Appendix B. Section A of the measuring instrument can essentially be described as "**ensuring alignment and organisational readiness after assessing and/or creating the need for change**" in the conceptual/initiation phase of the project. To summarise, the underlying construct for Section A covers the following most important aspects and critical elements:

- diagnosing the organisational operating environment and assessing readiness for and implications of change;
- identifying and acting to eliminate anxiety surrounding potential job losses and potential barriers and resistance to change;
- developing capacity and resilience for change within an organisation;
- creating an awareness of the importance of change management and motivating stakeholders constantly to ensure support;
- ensuring leadership understands the complexities of change management and is able to manage change dynamics and demonstrates visible commitment; and
- aligning the change intervention with overall business strategy.

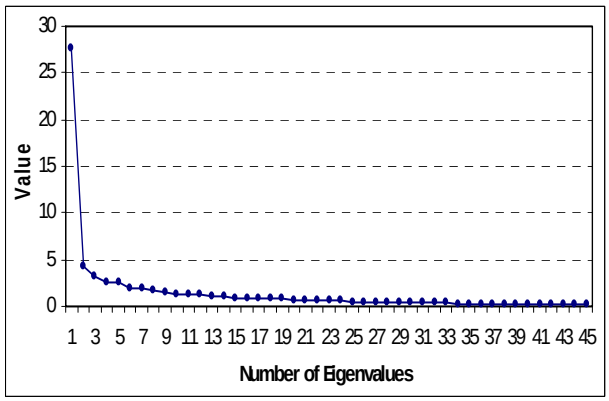
4.6.6 Exploratory factor analysis results (Section B)

4.6.6.1 Latent roots and initial factor analysis solution (Section B)

Numerous rounds of exploratory factor analysis of the responses to Section B of the assessment tool were then conducted. Each round of analysis resulted in a different number of dominant factors being extracted and several of the items in Section B of the original questionnaire were excluded during the next round of analysis. The results of one of the rounds of factor analysis (after three items had already been discarded) are included here for illustrative purposes. The relevant scree plots of the eigenvalues (69 of the items that were originally included in Section B of the Phase 2 questionnaire) for the particular round of Section B factor analysis are used as an example, as shown in Graphs 4.9 and 4.10 below.

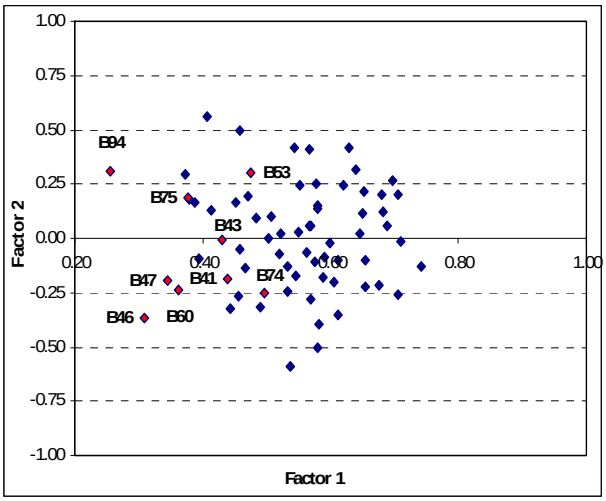


Graph 4.9: Scree plot of initial eigenvalues (South African responses to Section B)

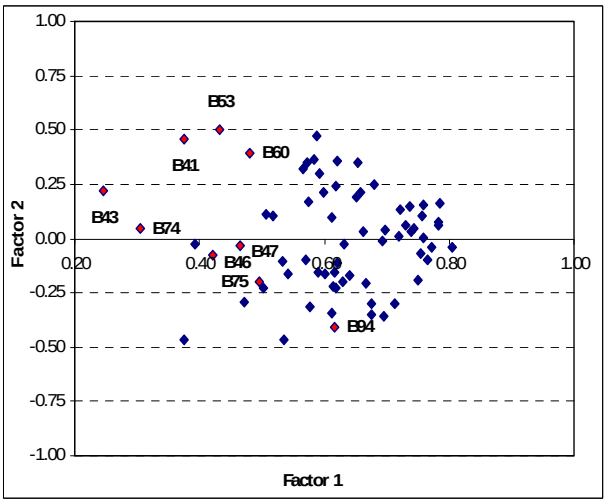


Graph 4.10: Scree plot of initial eigenvalues (international responses to Section B)

Scatter plots of the unrotated factor loadings (pattern) for a two-factor solution of the remaining 69 items included in Section B of the Phase 2 questionnaire are shown in Graphs 4.11 and 4.12 overleaf.

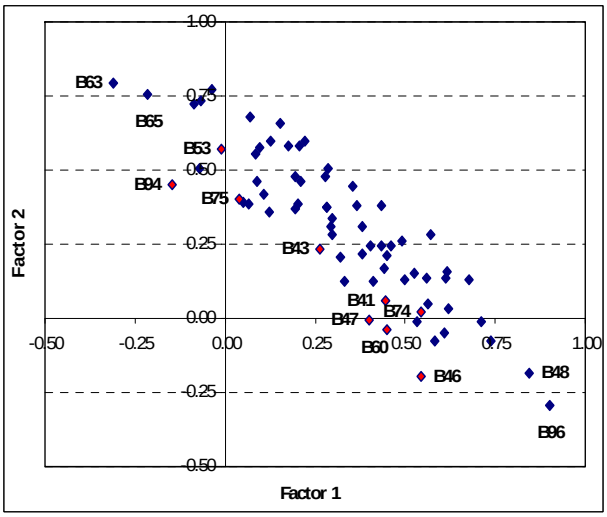


Graph 4.11: Scatter plot of unrotated factor loadings (South African responses to Section B)

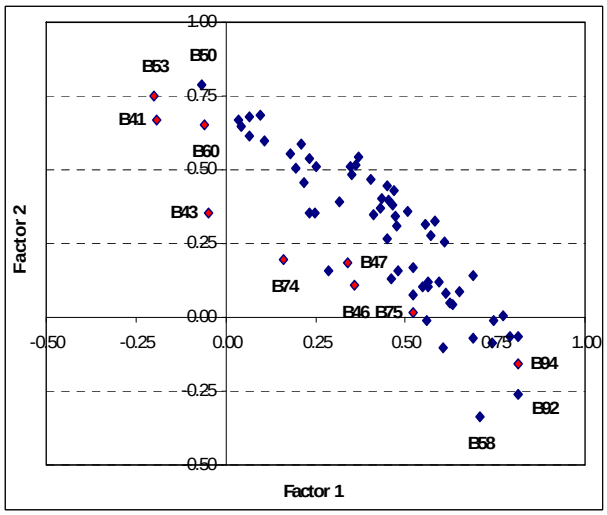


Graph 4.12: Scatter plot of unrotated factor loadings (international responses to Section B)

Graphs 4.13 and 4.14 below show scatter plots of the rotated factor loadings (pattern) for the same two factor solution of the remaining 69 items included in Section B of the Phase 2 questionnaire.



Graph 4.13: Scatter plot of rotated factor loadings (South African responses to Section B)



Graph 4.14: Scatter plot of rotated factor loadings (international responses to Section B)

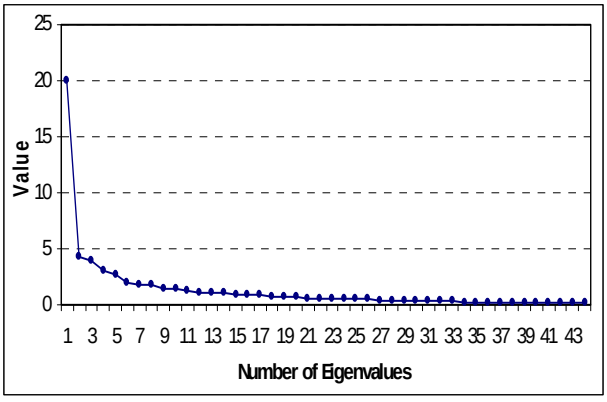
The variance explained by the first factor for the South African and international responses were 20.8594 and 27.1236 respectively. Factor 2 merely accounted for 4.1226 and 3.8497 of the total variance for the same population groupings respectively. Communalities of the variables

with the factors ranged from 0.6343 (Item B96) to 0.1586 (Item B47) for the South African responses and from 0.6479 (Item B37) to 0.0951 (Item B74) for the international group.

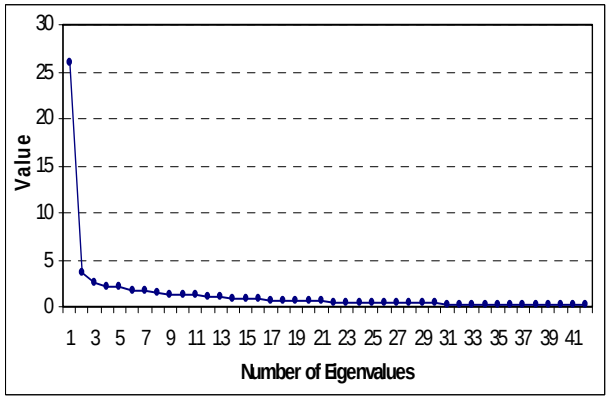
In addition to the above, chi-square tests (for homogeneity and for independence) of the various items highlighted in red in Graphs 4.12 to 4.14 above were done in order to confirm the significant differences between the responses from the two population groups. In the interest of brevity, the complete set of Section B results in this regard is not reported here, since the detail of a similar process has been fully described in the discussion above on the statistical results for Section A of the assessment tool. This iterative process resulted in the exclusion of 13 items originally included in Section B of the questionnaire for the purposes of further analysis. These excluded items are summarised in Table 4.33 below.

4.6.6.2 Final factor solution and loadings (Section B)

After the exclusion of 13 of the original items included in Section B of the Phase 2 questionnaire, a final round of factor analysis was performed. Eigenvalues of 20.0539 (explaining 33.42% of the total variance) and 25.8892 (accounting for 43.15% of the total variance) were obtained for the primary factor associated with the South African and international responses respectively. The resulting eigenvalues for a potential second factor for each of the population groups were 4.3229 and 3.5950 (each accounting for 7.20% and 5.99% of total variance respectively). Scree plots of the relevant eigenvalues are shown in Graphs 4.15 and 4.16 below.



Graph 4.15: Scree plot of final eigenvalues (South African responses to Section B)



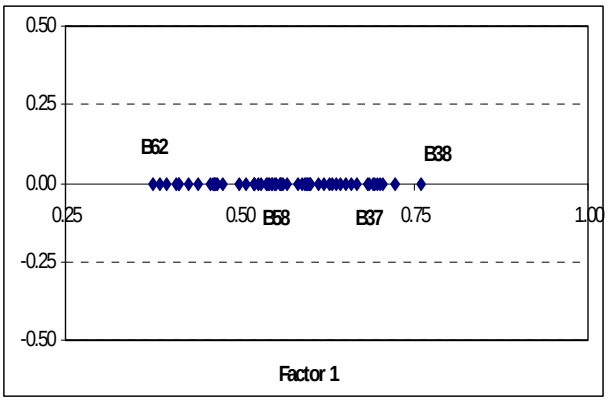
Graph 4.16: Scree plot of final eigenvalues (international responses to Section B)

Three different numbers of factors would be retained if the factor extraction criteria discussed before was applied. The number of factors to be retained for each of the three factor extraction criteria applied was:

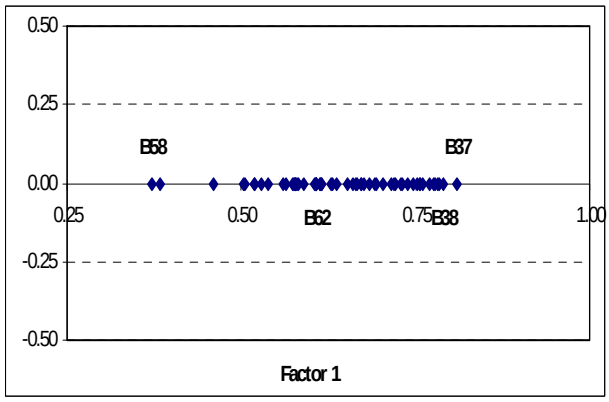
- twelve (latent root criterion):
- six (percentage of variance criterion); and
- one (Cattell's scree test).

However, when the relevance of two or more factors was analysed, it was determined that the identified primary factor was sufficiently dominant (and compliant with the Cattell criterion) and that a single factor was the best descriptor of the construct.

Scatter plots of the rotated factor loadings (pattern) for the further reduced number of 60 items included in Section B of the Phase 2 questionnaire are shown in Graphs 4.17 and 4.18 below.



Graph 4.17: Scatter plot of final rotated factor loadings (South African responses to Section B)



Graph 4.18: Scatter plot of final rotated factor loadings (international responses to Section B)

Table 4.25 below gives a summary of the sorted rotated factor loadings for the two target audiences and the combined group in relation to the construct underpinning Section B. Factor rotation was done using the direct quartimin (oblique rotation) method.

Table 4.25: Section B - sorted rotated factor loadings (South African, international and combined group respondents)

SECTION B					
South African responses		International responses		Combined group	
Question	Factor loadings	Question	Factor loadings	Question	Factor loadings
B38	0.761	B37	0.809	B38	0.773
B83	0.724	B38	0.790	B33	0.755
B84	0.706	B87	0.784	B37	0.749
B33	0.701	B77	0.783	B87	0.743
B87	0.698	B96	0.778	B77	0.723
B64	0.693	B36	0.776	B85	0.716
B57	0.692	B33	0.770	B36	0.695
B85	0.685	B79	0.760	B84	0.675
B37	0.684	B55	0.756	B96	0.673
B68	0.668	B85	0.756	B76	0.671
B88	0.661	B76	0.753	B78	0.671
B34	0.653	B70	0.747	B83	0.670
B81	0.644	B81	0.738	B61	0.669
B50	0.638	B78	0.731	B55	0.668
B90	0.633	B97	0.730	B81	0.665
B67	0.628	B86	0.722	B97	0.665
B61	0.622	B31	0.720	B35	0.662
B51	0.613	B61	0.715	B79	0.659
B40	0.602	B71	0.704	B88	0.654
B35	0.602	B35	0.694	B86	0.653
B30	0.600	B89	0.691	B57	0.650
B77	0.598	B30	0.684	B30	0.643
B69	0.596	B54	0.676	B32	0.639
B32	0.593	B72	0.673	B31	0.636
B86	0.590	B56	0.673	B34	0.635
B97	0.584	B88	0.667	B54	0.631
B36	0.568	B32	0.665	B64	0.625
B54	0.562	B63	0.660	B71	0.622
B92	0.561	B34	0.653	B70	0.617
B76	0.559	B98	0.636	B56	0.614
B52	0.558	B57	0.631	B90	0.608
B48	0.552	B84	0.629	B40	0.607
B58	0.551	B39	0.616	B68	0.605
B55	0.547	B52	0.616	B89	0.597
B78	0.547	B80	0.614	B52	0.593
B42	0.543	B83	0.614	B50	0.585
B29	0.540	B67	0.608	B67	0.584
B56	0.539	B62	0.608	B98	0.584
B66	0.530	B69	0.608	B42	0.579

		B39	0.526	B90	0.607	B72	0.576
		B96	0.521	B42	0.606	B69	0.575
		B31	0.520	B59	0.590	B66	0.566
		B28	0.520	B40	0.582	B39	0.561
		B89	0.510	B68	0.580	B26	0.547
		B80	0.499	B50	0.577	B48	0.547
		B98	0.476	B28	0.577	B29	0.545
		B79	0.468	B26	0.576	B80	0.544
		B44	0.466	B66	0.575	B92	0.539
		B27	0.464	B64	0.574	B28	0.529
		B65	0.464	B82	0.565	B45	0.521
		B26	0.463	B27	0.561	B62	0.521
		B71	0.458	B45	0.539	B59	0.519
		B45	0.440	B92	0.528	B63	0.519
		B72	0.427	B29	0.519	B82	0.517
		B82	0.413	B65	0.518	B27	0.514
		B63	0.412	B95	0.506	B51	0.506
		B59	0.410	B48	0.503	B65	0.493
		B95	0.396	B44	0.461	B44	0.48
		B70	0.386	B51	0.383	B58	0.463
		B62	0.375	B58	0.371	B95	0.457
Cronbach's alpha coefficient (all variables)		**0.965**		**0.977**		**0.974**	
Variance explained		**19.3934**		**25.3313**		**22.5574**	
Cumulative proportion of variance	In data space	**32.32%**		**42.22%**		**37.58%**	
	In factor space	**100%**		**100%**		**100%**	
Factor score covariance		**96.90%**		**98.00%**		**97.35%**	

It can be observed from the results presented in Table 4.25 above that all of the factor loadings exceed the required minimum threshold level of 0.45 for a sample size of 150, at the 0.05 significance level. The communalities of the variables with the primary factor range from 0.1373 (Item B58) to 0.6540 (Item B37).

4.6.6.3 Scale naming / description (Section B)

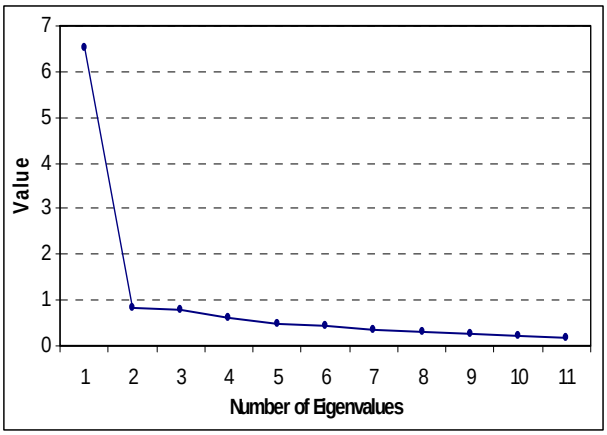
Appendix B contains more descriptive information concerning the construct for Section B which is intended to measure change dynamics during the planning phase of the project. The underlying factor for Section B can best be described as the "**creation of an enabling environment for change through communication and engagement**". Furthermore, some of the most important sub-elements of this construct are summarised below

- reliable, consistent, open, quality and adequate communication from leadership and the project management team on the vision, scope and impact of all potential organisational changes to maintain enthusiasm and comprehension for the project throughout;
- conducting comprehensive risk analysis, together with managing risk in accordance with mitigation strategies;
- prioritising and dealing with competing issues by acting quickly to resolving emerging problems;
- ensuring role clarity, orientation and continuous cooperation between line, function and project management;
- using and maintaining an appropriate change management methodology, including the provision of infrastructure, tools, expertise and adequate resources to empower and support change agents;
- assessing training needs in relation to new tools required for project success and (customised) training of affected employees on new requirements to ensure adequate capacity;
- fostering desired organisational values;
- clear migration and stakeholder engagement planning;
- aligning top management behaviour with the goals and outcomes of the project; and
- exploiting synergies between top management and the project team.

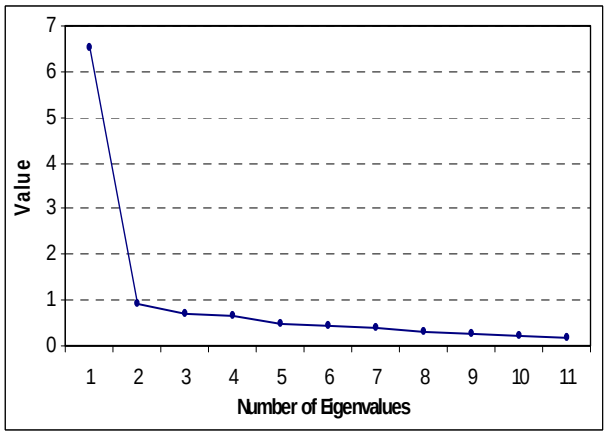
4.6.7 Exploratory factor analysis results (Section C)

4.6.7.1 Latent roots and factor loadings (Section C)

The first round factor analysis of responses to Section C of the questionnaire resulted in primary factors with eigenvalues of 6.5355 and 6.5013 (South African and international respondents) each accounting for more than 59% of the total variance. Potential second factors with an eigenvalues of 0.8463 and 0.9305 were both eliminated based on the latent root criterion. The relevant scree plots of the eigenvalues are shown in Graphs 4.19 and 4.20 overleaf.

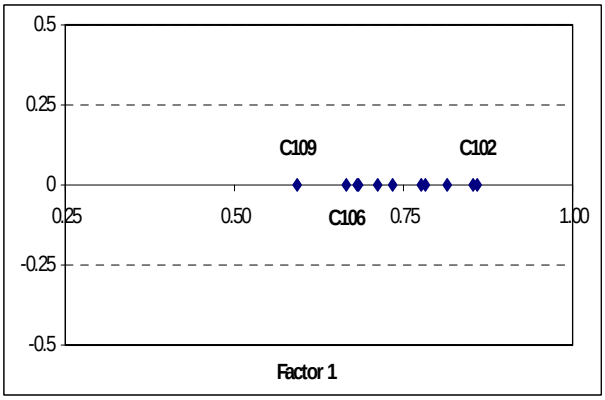


Graph 4.19: Scree plot of eigenvalues (South African responses to Section C)

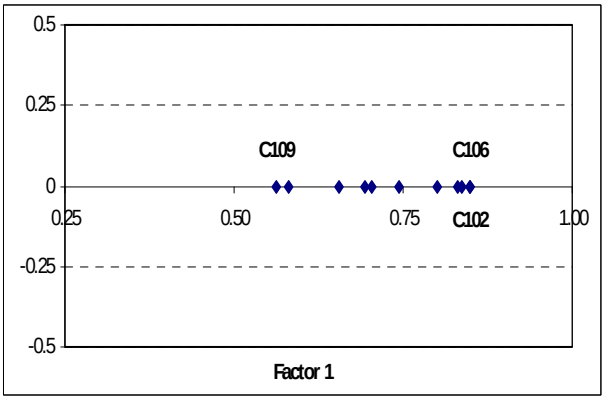


Graph 4.20: Scree plot of eigenvalues (international responses to Section C)

Scatter plots of the rotated factor loadings (pattern) for the original 11 items included in Section C of the Phase 2 questionnaire are shown in Graphs 4.21 and 4.22 below.



Graph 4.21: Scatter plot of rotated factor loadings (South African responses to Section C)



Graph 4.22: Scatter plot of rotated factor loadings (international responses to Section C)

Table 4.26 overleaf gives a summary of the sorted rotated (using the direct quartimin, oblique rotation method) factor loadings for the two target audiences and the combined group in relation to the construct underpinning Section C.

Table 4.26: Section C - sorted rotated factor loadings (combined group n = 172)

		SECTION C					
		South African responses		International responses		Combined group	
		Question	Factor loadings	Question	Factor loadings	Question	Factor loadings
		C102	0.858	C106	0.849	C102	0.856
		C104	0.852	C102	0.848	C100	0.826
		C100	0.815	C100	0.836	C107	0.814
		C107	0.783	C107	0.831	C104	0.794
		C103	0.776	C99	0.800	C106	0.765
		C105	0.734	C104	0.744	C99	0.764
		C99	0.711	C108	0.703	C105	0.717
		C101	0.683	C105	0.693	C103	0.700
		C108	0.682	C103	0.655	C108	0.686
		C106	0.665	C101	0.580	C101	0.643
		C109	0.593	C109	0.562	C109	0.586
Cronbach's alpha coefficient (all variables)		**0.930**		**0.929**		**0.931**	
Variance explained		**6.1133**		**6.0776**		**6.1073**	
Cumulative proportion of variance	In data Space	**55.58%**		**55.25%**		**55.52%**	
	In factor Space	**100%**		**100%**		**100%**	
Factor score covariance		**94.00%**		**94.20%**		**93.90%**	

As can be seen from the above results, with a minimum value of 0.586 for the combined group, all the factor loadings exceed the required minimum threshold level of 0.45 for a sample size of 150, at the 0.05 significance level as previously recommended. The communalities of the variables with the primary factor range from 0.3153 (Item C109) to 0.7205 (Item C106) with an average of 0.5552.

4.6.7.2 Scale naming / description (Section C)

Section C of the assessment tool measures change dynamics during the implementation phase of the project. The construct for Section C can most accurately be labelled as "**executing to achieving the stated objectives and outcomes of the project**". The most important aspect of the underlying factor is the need for properly managed change throughout the process. Additional sub-elements are

- fostering organisational integration without fragmented, departmental interests and with inclusive and transparent decision-making;

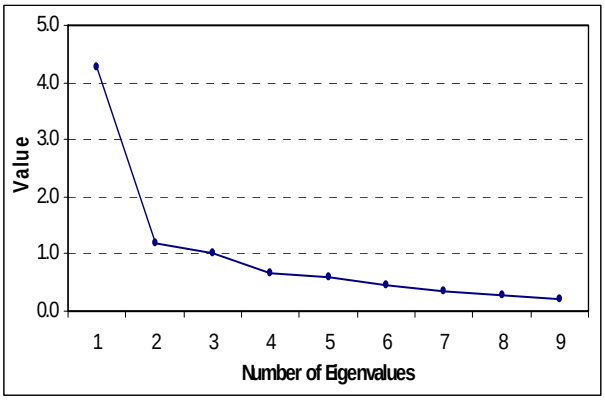
- focusing on perception management and management of anxiety associated with change (loss of positional power and job losses);
- continuously promoting and communicating of new values to all stakeholders; and
- motivating staff according to their needs.

Section C of Appendix B contains more descriptive information surrounding the construct for the implementation phase of the project.

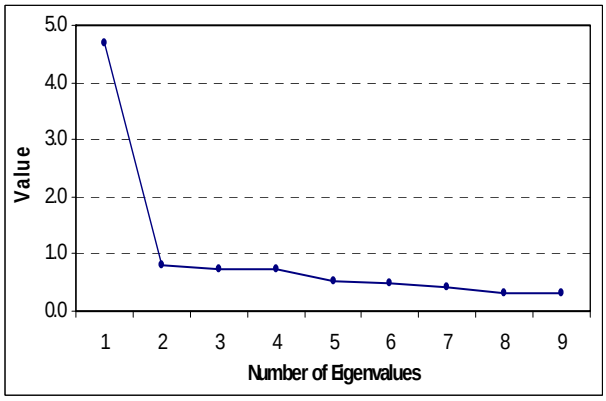
4.6.8 Exploratory factor analysis results (Section D)

4.6.8.1 Latent roots and factor loadings (Section D)

Factor analysis on the South African population responses to Section D of the instrument resulted in three potential factors with eigenvalues of 4.2554, 1.1926 and 1.0237. These factors would account for 47.28%, 13.25% and 11.37% of the total variance. Similarly, the most important latent root eigenvalues for the international population were 4.6775 and 0.8056 (each explaining 51.97% and 8.95% of the total variance respectively). The relevant scree plots of the eigenvalues (all the items originally included in Section D of the Phase 2 questionnaire) are shown in Graphs 4.23 and 4.24 below.



Graph 4.23: Scree plot of eigenvalues (South African responses to Section D)



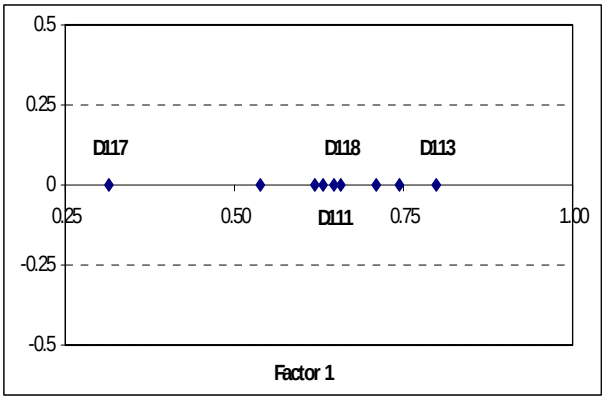
Graph 4.24: Scree plot of eigenvalues (international responses to Section D)

The factor extraction criteria already discussed indicated that the following number of factors should be retained

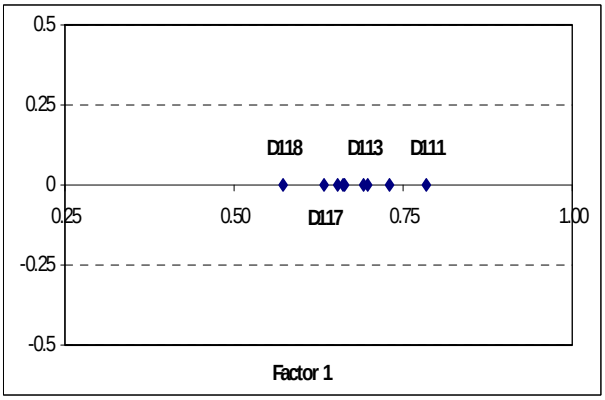
- latent root criterion:

- o South African population - three factors to be retained;
- o international population - one factor to be retained;
- percentage of variance criterion - two factors to be retained; and
- Cattell's scree test - one factor to be retained.

When the relevance of two or more factors was analysed, it was determined that the identified dominant factor was adequate based on the latent root and Cattell criterion. It was decided to use a single factor since it was best suited for the purposes of this study and was consistent with the theoretical construct. Scatter plots of the rotated factor loadings (pattern) for the original nine items included in Section D of the Phase 2 questionnaire are shown in Graphs 4.25 and 4.26 below.



Graph 4.25: Scatter plot of rotated factor loadings (South African responses to Section D)



Graph 4.26: Scatter plot of rotated factor loadings (international responses to Section D)

Table 4.27 below gives a summary of the sorted rotated (direct quartimin, oblique rotation method) factor loadings for the two target audiences and the combined group in relation to the construct underpinning Section D.

Table 4.27: Section D - sorted rotated factor loadings (combined group n = 172)

SECTION D					
South African responses		**International responses**		**Combined group**	
Question	**Factor loadings**	**Question**	**Factor loadings**	**Question**	**Factor loadings**
D113	0.798	D111	0.784	D113	0.751
D114	0.744	D114	0.730	D114	0.749
D116	0.709	D110	0.698	D116	0.717

	D118	0.658	D113	0.692	D118	0.716
	D111	0.647	D115	0.664	D111	0.656
	D112	0.631	D116	0.662	D112	0.654
	D115	0.618	D112	0.654	D115	0.645
	D110	0.538	D117	0.633	D110	0.588
	D117	0.315	D118	0.573	D117	0.475
Cronbach's alpha coefficient (all variables)	**0.854**		**0.884**		**0.875**	
Variance explained	**3.713**		**4.1482**		**3.9975**	
Cumulative proportion of variance – In data Space	**41.26%**		**46.09%**		**44.42%**	
Cumulative proportion of variance – In factor Space	**100%**		**100%**		**100%**	
Factor score covariance	**87.90%**		**89.00%**		**88.50%**	

It is evident from the results presented in Table 4.27 above that all factor loadings exceed the required minimum threshold level of 0.45 for a sample size of 150, at the 0.05 significance level, as required. The communalities of the variables with the primary factor range from 0.2316 (Item D117) to 0.5646 (Item D114), with an average of 0.4442.

4.6.8.2 Scale naming / description (Section D)

Appendix B contains more detailed information on the various elements addressed by the construct for Section D which is best described as "**embedding and institutionalising the changes effected through the project**". Section D measures the change dynamics during the post-implementation phase of the project. Briefly, some of the most important aspects of the construct are the need for the following:

- measuring and monitoring the impact of change on a continual basis;
- continuously providing (desired) behavioural training;
- encouraging, accepting, formalising and reinforcing of the new organisational state, culture and desired organisational behaviour through performance management and incentive systems; and
- continuously communicating and sensitising people about the change.

4.6.9 Final item and reliability analysis on remaining items

After the abovementioned processes of factor analysis, the initial item analysis was repeated on the remaining scale items for both samples. Tables 4.28 to 4.31 contain the information for the two target populations.

Table 4.28: Overall scale statistics (South African responses)

	Section			
	A	B	C	D
Number of items	23	60	11	9
Number of examinees	85	85	85	85
Mean	3.481	3.484	3.255	3.398
Variance	0.361	0.263	0.501	0.355
Standard deviation	0.601	0.513	0.707	0.596
Skewness	0.015	0.302	-0.230	-0.381
Kurtosis	-0.705	-0.359	-0.110	0.474
Minimum	2.217	2.450	1.200	1.667
Maximum	5.000	4.950	5.000	5.000
Median	3.522	3.433	3.364	3.556
Cronbach's alpha coefficient	0.929	0.965	0.930	0.854

Table 4.29: Scale intercorrelation statistics (South African responses)

		Section			
		A	B	C	D
Section	A	1.000	0.844	0.765	0.729
	B	0.844	1.000	0.726	0.680
	C	0.765	0.726	1.000	0.825
	D	0.729	0.680	0.825	1.000

Table 4.30: Overall scale statistics (international responses)

	Section			
	A	B	C	D
Number of items	23	60	11	9
Number of examinees	87	87	87	87
Mean	3.731	3.708	3.540	3.702
Variance	0.412	0.357	0.552	0.371
Standard deviation	0.642	0.598	0.743	0.609
Skewness	-0.745	-0.560	-1.227	-0.951
Kurtosis	-0.015	-0.273	1.402	0.494
Minimum	1.913	2.217	1.364	2.111
Maximum	5.000	4.917	4.727	4.889
Median	3.826	3.783	3.727	3.889
Cronbach's alpha coefficient	0.941	0.977	0.929	0.884

Table 4.31: Scale intercorrelation Statistics (international Responses)

		Section			
		A	B	C	D
Section	A	1.000	0.946	0.777	0.704
	B	0.946	1.000	0.808	0.705
	C	0.777	0.808	1.000	0.823
	D	0.704	0.705	0.823	1.000

From Tables 4.28 and 4.30, above, it can be seen that the following scale statistics for the responses to Sections A and B of the assessment tool have all increased (compared to the original results reported above) as a result of the excluding the items reported in Table 4.33. The median statistics have also changed between -0.36% and 0.80%:

- Mean - by between 0.03% and 0.65%
- Variance - by between 1.12% and 16.21%
- Standard deviation - by between 0.56% and 7.80%

The shape of the various distributions also did not change significantly as a result of the item omissions, based on the skewness and kurtosis results presented above, even though the skewness results for the South African responses to section A and B of the questionnaire changed by -77.84% and -19.48% respectively (the distribution became more symmetrical). The international responses to Section B became less symmetrical by 23.49%. No significant skewness problem arose from the final item analysis results shown above. Similarly, the kurtosis results indicated that the results of the South African Section A and B responses were even more flat (or platykurtical) than in the original scenario, especially in the instance of the South African Section B responses. The distributions for the international population group became more peaked than before, but still within the previously discussed *sek* limits.

The Cronbach alpha coefficients for the reduced number of scale items in Sections A and B of the assessment instrument varied between -0.49% and 0.13%, compared to the results obtained and reported above in relation to the original Phase 2 questionnaire. The final Cronbach alpha coefficients for all sections of both the South African (α's between 0.8535 and 0.9651) and international responses (α's between 0.8837 and 0.9769) that resulted from the reduced number of items in Sections A and B of the assessment tool are still considered highly acceptable, compared to the guideline of alpha > 0.70 (Nunnally & Bernstein, 1994; Smit, 1991).

From Tables 4.29 and 4.31, it is also clear that the scale inter-correlations were relatively high (and that these statistics for the international grouping were higher than those for the South African responses). This was not unexpected, since strong links exists between the respective project management life cycle phases. This result was congruent with the theoretical construct.

The final round of item analysis confirmed that the items of the assessment tool had acceptable levels of internal consistency.

4.6.10 Structural equivalence (Tucker's phi results)

In exploratory factor analysis, construct (structural) equivalence is defined operationally as factorial invariance (Meredith 1993; Rensvoeld & Cheung 1998; Ten Berge 1986). This definition implies that a construct is equivalent across groups if the factor loadings of the items on the latent factor are invariant across groups. The agreement between factor loadings of items from two different groups (in this case the South African and international response data) can be expressed via Tucker's coefficient of agreement or, phi (Tucker, 1951). The index measures the identity of two factors by a positive, multiplying constant. The following formula is used to compute Tucker's phi (Van de Vijver & Leung, 1997):

$$p_x = \frac{\sum x_i y_i}{\sqrt{\sum x_i^2 \sum y_i^2}}$$

where

x_i = rotated factor loadings for South African data; and

y_i = rotated factor loadings for international data

Unfortunately, the index has an unknown sampling distribution, which makes it impossible to construct statistical confidence intervals. Some empirical rules have been proposed. Values higher than 0.95 are taken to indicate factorial invariance, whereas values lower than 0.90 (Van de Vijver & Poortinga, 1994) or 0.85 (Ten Berge, 1986) are indicative of non-negligible incongruities. This index is, however, accurate enough to examine factorial similarity at a global level (Van de Vijver & Leung, 1997).

The difference in factor loadings per item between the two population groups and Tucker's phi results for each section of the assessment tool are included in Table 4.32 below.

Table 4.32: Construct equivalence of the different sections of the assessment tool

Section A		Section B		Section C		Section D	
Concept / initiation Phase		Planning phase		Implementation phase		Post implementation phase	
Quest-ion	Difference in factor loadings	Quest-ion	Difference in factor loadings	Quest-ion	Difference in factor loadings	Quest-ion	Difference in factor loadings
A1	-0.194	B26	0.113	C99	0.089	D110	0.160
A2	-0.037	B27	0.097	C100	0.021	D111	0.137
A3	0.085	B28	0.057	C101	-0.103	D112	0.023

A4	0.187	B29	-0.021	C102	-0.010	D113	-0.106
A5	0.143	B30	0.084	C103	-0.121	D114	-0.014
A6	0.005	B31	0.200	C104	-0.108	D115	0.046
A8	0.077	B32	0.072	C105	-0.041	D116	-0.047
A9	0.017	B33	0.069	C106	0.184	D117	0.318
A10	0.004	B34	0.000	C107	0.048	D118	-0.085
A11	0.177	B35	0.092	C108	0.021		
A12	0.198	B36	0.208	C109	-0.031		
A13	0.011	B37	0.125				
A14	0.128	B38	0.029				
A16	0.019	B39	0.090				
A17	-0.188	B40	-0.020				
A18	-0.032	B42	0.063				
A19	-0.098	B44	-0.005				
A20	-0.189	B45	0.099				
A21	-0.067	B48	-0.049				
A22	-0.140	B50	-0.061				
A23	0.256	B51	-0.230				
A24	0.173	B52	0.058				
A25	0.237	B54	0.114				
		B55	0.209				
		B56	0.134				
		B57	-0.061				
		B58	-0.180				
		B59	0.180				
		B61	0.093				
		B62	0.233				
		B63	0.248				
		B64	-0.119				
		B65	0.054				
		B66	0.045				
		B67	-0.020				
		B68	-0.088				
		B69	0.012				
		B70	0.361				
		B71	0.246				
		B72	0.246				
		B76	0.194				
		B77	0.185				
		B78	0.184				
		B79	0.292				
		B80	0.115				
		B81	0.094				
		B82	0.152				
		B83	-0.110				
		B84	-0.077				
		B85	0.071				
		B86	0.132				
		B87	0.086				
		B88	0.006				
		B89	0.181				
		B90	-0.026				
		B92	-0.033				
		B95	0.110				

			B96	0.257				
			B97	0.146				
			B98	0.160				
Proportionality coefficient per factor (Tucker's phi)		**0.9767**		**0.9813**		**0.9921**		**0.9800**
Identity coefficient per factor		**0.98**		**0.97**		**0.99**		**0.98**

Inspecting Table 4.32 shows that the Tucker's phi-coefficients for the South African and the international groups were all acceptable (> 0.95). Therefore, it can be deduced that the factor structures for all four sections of the assessment tool were equivalent for the two groups. This may be the result of the fact that respondents from both groups have been exposed to the field of project management due to its prominence over the last few years. Another contributing factor could be the fact the South Africa has become part of the global arena over the past decade. Therefore, South African project managers have interacted with their international counterparts and gained experience in the best practice application of the project management methodology and its various components.

Table 4.33: Summary of measurement items omitted during the next phase of the assessment tool development

Section	Item	Measurement item description
A	A7	A sense of urgency is communicated and understood by each stakeholder
	A15	Priorities are identified and discussed by all stakeholders and the project team
B	B41	Stakeholders, together with the project team, are involved in bringing about change management
	B43	The project manager manages the participation of all project team members and stakeholders as an integral part of the project plan
	B46	Project team members understand the company culture
	B47	Project team members conduct themselves in such a way as not to alienate the organisation
	B49	Project teams communicate and celebrate early gains (“quick wins”)
	B53	The project manager selects competent people to become part of the project team
	B60	Stakeholders are continuously involved to ensure that the project is aligned to both organisational and political agendas
	B73	A multi-disciplinary team comprising all stakeholders is put together for the project
	B74	The project success is measured quantitatively
	B75	The project success is measured qualitatively

	B91	Responsible project team members take ownership of data collection and data feedback
	B93	Top management has a medium-to-long term focus
	B94	Top management does not place emphasis on a “quick-fix” mentality
C	None	
D	None	

4.6.11 Responses to the open question included in the questionnaire

An open question was included in Section E of the questionnaire in an attempt to collect any additional change management aspects that respondents viewed as pertinent to the study. The open question read as follows:

- “Please mention any other aspects that you consider to be relevant to the measurement of change dynamics within the project management domain THAT RUNS CONTINUOUSLY THROUGHOUT ALL THE PROJECT PHASES, e.g. communication, risk management, etc.“

The responses from the target population groups to the open question mentioned above amounted to the following input which is summarized in Table 4.34 below.

Table 4.34: Summary of open question responses (Section E of the questionnaire)

Change management element	Number of responses
Effective communication to ensure continuous improvement rather that corrective action	1
Team involvement throughout	1
Continuous focus on strategy (including mission, vision, values, etc)	2
Transparency in decision-making	1
Stakeholders and their buy-in to be regarded as equally important and treated as such	3
Continuity of project leadership	1
Pre-planning and sharing the project scope with all stakeholders	1
Proper risk management throughout the course of the project	2
Formalisation of roles of the project management team	1
Recognition for the need to change	1
Organizational maturity	1
Knowledge sharing	1
Corporate culture to include values of trust and empowerment	1
Maintenance of business continuity during the project duration	1

Because of the rather limited response from the target population in this regard, it was not considered as statistically significant and was therefore not included in the final assessment tool. However, it is presented here as part of the final research report in order to provide comprehensive findings on the response to the questionnaire.

4.6.12 Analysis of variance (ANOVA) technique

Subsequent to the item, reliability, factor and structural equivalence analyses, an ANOVA, utilising SAS/STAT® statistical analysis software (version 9.2), was administered to determine whether any tendencies were apparent for different demographic elements as set out in the assessment instrument for the identified factor across the four phases of a project life cycle.

The data was clustered in the following way to combine sets of data for each of the South African and international groups, to make it meaningful in terms of statistical analysis for the ANOVA. Table 4.35 contains this categorisation:

Table 4.35: Demographic data categorisation

Main category	Sub-category
Age (E1)	Equal to or less than 30 years of age
	31 to 40 years
	41 to 50 years
	51 years and older
Gender (E2)	Male
	Female
Length of service in sector (E3)	1 to 10 years
	11 to 20 years
	21 years or more
Economic sector (E4)	Manufacturing
	Electricity, gas and water
	Transport, storage and communication
	Financial intermediation, insurance, real estate and business services
	Other
Qualifications (E5)	Grade 12 (Standard 10) or equivalent to National diploma/National higher diploma
	Bachelor's degree or equivalent qualification
	Honours degree or equivalent qualification
	Master's or Doctoral degree or equivalent qualification

Organisational level (E6)	Senior management
	Middle management
	Supervisory
	Other
Years of project management Experience as a project team member (E8)	1 to 10 years
	11 to 15 years
	16 and more years
Years of project manager experience (E9)	0 to 5 years
	6 to 10 years
	11 and more years

The purpose of the analysis of variance is to test differences in means (of groups or variables) for statistical significance (StatSoft, 2006). "Analysis of variance (ANOVA) is used to uncover the main and interaction effects of categorical independent variables (called "factors") on an interval dependent variable. The new general linear model GLM implementation of ANOVA also supports categorical dependents" (Garson, 2006). The variables that are measured (in this case the scale items) are called **dependent** variables. Variables that are manipulated, controlled or divided into groups that can be compared through some other criterion are called **factors** or **independent** variables (StatSoft, 2006).

ANOVA relies on the fact that variances (computed as the sum of squared (SS) deviations from the overall mean, divided by one less than the sample size or n-1), can be divided up into components. This is accomplished by partitioning the total variance into the components that are due to true random errors (within-group *SS*) and components that are due to differences between means. These difference between means variance components are then tested for statistical significance, and if significant, the null hypothesis of no differences between means is rejected, and the alternative hypothesis that the means (in the population) are different from each other is accepted (StatSoft, 2006).

The results of the ANOVA are presented in an ANOVA table that is likely to resemble the one in Table 4.36.

Table 4.36: Example of an ANOVA results table

Source	df	SS	MS	F-ratio	Prob
Between groups	3	1234.56	345.67	12.567	0.0034
Within groups	25	2345.67	56.78		
Total	28	3580.23			

An ANOVA table contains columns labelled “Source” or “Source of variation”, “df” or “degrees of freedom”, “SS” or “Sum of squares”, “MS” or “Mean square”, “F-value” or “F-ratio” (a ratio of explained variance versus error) and “p”, “P-value”, “prob”, “probability”, “sig.”, “sig. of F” or “Pr > F” (the probability of an F-ratio of the magnitude observed). The “Between groups”, “Model” or “Effect” row represents what is often called the “explained variance” or “systematic variance” that is due to the differences in means between the groups of the independent variable. The “Within groups” or “Error” variance represents what is often called “error variance”. This is the variance within the groups, in other words, variance that is not due to the independent variable (Hall, 1998). In interpreting ANOVA table results, the row labelled "Between groups", which has a probability value associated with it, is the most important in the initial ANOVA analysis, particularly the values appearing in the last two columns (Stockburger, 1998).

In an ANOVA, the F-ratio is the statistic used to test the null hypothesis that the group means of the dependent variable are not significantly different from one another (in other words, that the effects are not real) (Garson, 2006). The F-ratio can be interpreted as a measure of how different the means are relative to the variability within each sample. The larger this value, the greater the likelihood that the differences between the means are due to something other than chance (Stockburger, 1998). If the computed F-value is approximately 1.0, differences in group means are merely random variations. If the computed F-score is significantly greater than 1.0, then there is more variation between groups than within groups, from which one can infer that the grouping variable is significant. If the F-score is sufficiently above 1.0, it will be found to be significant in a table of F-values. A "Sig." or "p" probability value of 0.05 (or any other critical value (α) specified for the study) or less on the F test, conventionally leads to the conclusion that the effect is real (significant) and not due to chance sampling, while any value greater than this value will result in negligible effects. If F is significant, we can conclude that there are differences in group means, indicating that the independent variable has an effect on the dependent variable (Garson, 2006).

To summarise, the purpose of the ANOVA test is to ascertain whether there are significant differences between various groups. The GLM procedure in the SAS/STAT® software package was used for this purpose. Univariate GLM is the version of the GLM now often used to implement two long-established statistical procedures - ANOVA and analysis of covariance (ANCOVA). Univariate GLM, ANOVA, and ANCOVA all deal with a situation where there is one dependent variable and one or more independent variables (Garson, 2006). The overall significance level was specified as “alpha = 0.05”.

4.6.12.1 ANOVA table results for all four project phases (Sections A to D)

The ANOVA table results for all four sections of the assessment tool are given in Tables 4.37 to 4.44 below.

Table 4.37: Overall ANOVA results for Section A (dependent variable) of the measuring instrument

		SECTION A			
Source of variation	**Degrees of freedom (df)**	**Sum of squares**	**Mean squares**	**F-value**	**P-value (Pr > F)**
Model	19	24.3332	1.2807	4.53	< 0.0001
Error	144	40.6855	0.2825		
Corrected total	163	60.0187			

Table 4.38: ANOVA results for Section A of the measuring instrument by independent variables

Source of variation	**Degrees of freedom (df)**	**Type III sum of squares**	**Mean squares**	**F-value**	**P-value (Pr > F)**
E1 (Age)	3	0.4409	0.1470	0.52	0.6691
E2 (Gender)	1	5.1927	5.1927	18.38	< 0.0001
E3 (Work history in sector)	2	0.0016	0.0008	0.00	0.9971
E4 (Economic sector)	4	5.7822	1.4456	5.12	0.0007
E5 (Qualifications)	2	6.8480	3.4240	12.12	< 0.0001
E6 (Organisational level)	2	0.9522	0.4761	1.69	0.1891
E8 (PM Experience as team member)	2	1.5457	0.7729	2.74	0.0682
E9 (Experience as project manager)	2	0.4207	0.2104	0.74	0.4768
Combined group	1	0.3869	0.3869	1.37	0.2438

Note [1]: Demographic E7 (the "home language" section in the questionnaire, which contains all eleven official South African languages) has been omitted from this analysis for all sections (A to D) because it is not possible to compare the South African and international response data in this regard.

From Table 4.38 it can be seen that the following demographic categories for Section A, all have Pr values greater than F-values (or ratios) which are well above the 0.05 cut-off level:

- E1 (age) - 0.6691;
- E3 (work history in the sector) - 0.9971;
- E6 (organisational level) - 0.1891;
- E8 (project management experience as a team member) - 0.0682 (marginal);
- E9 (experience as project manager) - 0.4768; and

- the combined group; - 0.2438.

From these values, it can be concluded that the means of the demographic subgroup are not significantly different from one another and that the above independent variables do not have a significant effect on the dependent variable (Section A – concept/initiation phase of the project).

The Pr > F-values for E2 (gender), E4 (economic sector) and E5 (qualifications), set out in Table 4.38, are all well below the 0.05 cut-off threshold and indicate that gender, economic sector and qualifications all have a statistically significant effect on the concept/initiation phase of the project. The statistical differences between the subgroup are explained in more detail in Table 4.45 in section 4.6.12.2 below.

Table 4.39: Overall ANOVA results for Section B (dependent variable) of the measuring instrument

		SECTION B			
Source of variation	**Degrees of freedom (df)**	**Sum of squares**	**Mean squares**	**F-value**	**P-value (Pr > F)**
Model	19	19.3155	1.0166	4.45	< 0.0001
Error	144	32.8907	0.2284		
Corrected total	163	52.2062			

Table 4.40: ANOVA results for Section B of the measuring instrument by independent variables

Source of variation	**Degrees of freedom (df)**	**Type III sum of squares**	**Mean squares**	**F-value**	**P-value (Pr > F)**
E1 (Age)	3	1.1197	0.3732	1.63	0.1841
E2 (Gender)	1	4.6345	4.6345	20.29	< 0.0001
E3 (Work history in sector)	2	0.0466	0.0233	0.10	0.9030
E4 (Economic sector)	4	4.1504	1.0376	4.54	0.0017
E5 (Qualifications)	2	4.0493	2.0247	8.86	0.0002
E6 (Organisational level)	2	1.0278	0.5139	2.25	0.1091
E8 (PM Experience as team member)	2	0.3216	0.1608	0.70	0.4963
E9 (Experience as project manager)	2	0.3943	0.1971	0.86	0.4240
Combined group	1	0.4011	0.4011	1.76	0.1872

The ANOVA results reported for Section B in Table 4.40 are similar to the corresponding results reported for Section A in Table 4.38. With Pr > F-values greater than the 0.05 significant level,

the following independent variable demographics do not have a significant effect on the dependent variable, Section B – planning phase of the project:

- E1 (age);
- E3 (work history in the sector);
- E6 (organisational level);
- E8 (project management experience as a team member);
- E9 (experience as project manager); and
- the combined group.

From the Pr > F-values for E2 (gender), E4 (economic sector) and E5 (qualifications), set out in Table 4.40, it can be concluded that gender, economic sector and qualifications all have a statistically significant effect on the planning phase of the project. The significant differences between the means of the subgroups for the gender, economic sector and qualifications, are investigated in more detail in Table 4.46 in section 4.6.12.2 below.

Table 4.41: Overall ANOVA results for Section C (dependent variable) of the measuring instrument

		SECTION C			
Source of variation	**Degrees of freedom (df)**	**Sum of squares**	**Mean squares**	**F-value**	**P-value (Pr > F)**
Model	19	31.0497	1.6342	4.03	< 0.0001
Error	144	58.4333	0.4058		
Corrected total	163	89.483			

Table 4.42: ANOVA results for Section C of the measuring instrument by independent variables

Source of variation	**Degrees of freedom (df)**	**Type III sum of squares**	**Mean squares**	**F-value**	**P-value (Pr > F)**
E1 (Age)	3	2.8198	0.9399	2.32	0.0782
E2 (Gender)	1	6.7248	6.7248	16.57	< 0.0001
E3 (Work history in sector)	2	1.7155	0.8577	2.11	0.1245
E4 (Economic sector)	4	5.7804	1.4451	3.56	0.0084
E5 (Qualifications)	2	5.8647	2.9324	7.23	0.0010
E6 (Organisational level)	2	1.2280	0.6140	1.51	0.2237
E8 (PM Experience as team member)	2	3.0603	1.5301	3.77	0.0253
E9 (Experience as project manager)	2	0.1629	0.0815	0.20	0.8183
Combined group	1	0.6573	0.6573	1.62	0.2052

The ANOVA results for Section C are similar to those of sections A and B except in the instance of the E8 (project management experience as a team member) demographic group. The Pr > F-value of 0.0253 for E8 is less than the 0.05 cut-off level, indicating that project management experience as a team member (in addition to the gender, economic sector and qualifications grouping reported for sections A and B) has a statistically significant effect on the implementation phase of the project (Section C).

The statistically significant effects and differences between the means of the subgroups for the E2 (gender), E4 (economic sector), E5 (qualifications) and E8 (related team membership project management experience) demographic groupings, as indicated by the results set out in Table 4.42, are discussed in more detail in Table 4.47 in section 4.6.12.2 below.

Age, work history in the sector, organisational level, experience as project manager and the combined group do not have any statistically significant effects on the implementation phase of the project.

Table 4.43: Overall ANOVA results for Section D (dependent variable) of the measuring instrument

		SECTION D			
Source of variation	**Degrees of freedom (df)**	**Sum of squares**	**Mean squares**	**F-value**	**P-value (Pr > F)**
Model	19	24.0182	1.2641	4.66	< 0.0001
Error	144	39.0854	0.2714		
Corrected total	163	63.1036			

Table 4.44: ANOVA results for Section D of the measuring instrument by independent variables

Source of variation	**Degrees of freedom (df)**	**Type III sum of squares**	**Mean squares**	**F-value**	**P-value (Pr > F)**
E1 (Age)	3	3.1805	1.0602	3.91	0.0102
E2 (Gender)	1	4.4651	4.4651	16.45	< 0.0001
E3 (Work history in sector)	2	0.1342	0.0671	0.25	0.7812
E4 (Economic sector)	4	4.3010	1.0753	3.96	0.0044
E5 (Qualifications)	2	2.7959	1.3980	5.15	0.0069
E6 (Organisational level)	2	0.0500	0.0250	0.09	0.9120
E8 (PM Experience as team member)	2	4.0980	2.0490	7.55	0.0008

E9 (Experience as project manager)	2	1.0951	0.5475	2.02	0.1368
Combined group	1	0.7952	0.7952	2.93	0.0891

The ANOVA results for Section D in Table 4.44 indicate that age (with a Pr > F-value of 0.0102 (< 0.05)), gender, economic sector, qualifications and project management experience as a team member all have a statistically significant effect on the post implementation phase of the project. Work history in the sector, organisational level, experience as project manager and the combined group do not have any statistically significant effects on the post implementation phase of the project.

As can be seen from the F-values for all four sections (A to D) of the measurement instrument in Table 4.37, Table 4.39, Table 4.41 and Table 4.43 above, all are well below the critical P-value cut-off level of 0.05. As stated before, it can be concluded that the groups are statistically significantly different from one another. However, two very important questions remain. First, which means are significantly different from which other means and, second, what were the actual scores of the group (Hall, 1998)?

When the effects are significant, the means must then be examined in order to determine the nature of the effects. "*Post hoc* tests" are procedures used to assist a researcher in this task, but the analysis is often fairly evidently determined simply by looking at the size of the various means (Stockburger, 1998). Tukey's *post hoc* tests, which are similar to a series of t-tests, can be used to address pair-wise comparison questions.

The Tukey honestly significant difference (HSD) test method is preferred when the number of groups is large, as it is a very conservative pair-wise comparison test. Researchers prefer to be conservative when a large number of groups threaten to inflate Type I errors (Garson, 2006). Tukey's HSD is the most conservative of the *post hoc* tests, since it is the most likely test to accept the null hypothesis of no group differences. Tukey's HSD test is based on the q-statistic (the studentised range distribution) and is limited to pair-wise comparisons. When one studies Tukey's *post hoc* test results tables, one notices that *post hoc* tests are consistent with what is observed in the means (Hall, 1998).

As part of the ANOVA analysis in this study, a Tukey test evaluation was done to compare the various sets of data. The GLM procedure in the SAS/STAT® software package was again used for this purpose. The results are set out in Tables 4.45 to 4.48 below:

4.6.12.2 ANOVA on Section A with Tukey's post hoc studentised range (HSD) test

Table 4.45: Section A ANOVA with Tukey's *post hoc* studentised range (HSD) test results

		SECTION A						
Source	**Level**	**N**	**Mean**	**Standard deviation**	**Difference between means**	**Statistically significant difference**	**F-value**	**P-value (Pr > F)**
E1 (Age)	< or = to 30 years	8	3.821	0.738		None	0.52	0.6691
	51 years or more	42	3.793	0.575				
	41 to 50 years	58	3.635	0.641				
	31 to 40 years	56	3.474	0.625				
E2 (Gender)	Female	30	3.857	0.655	0.278	1 (Male)	18.38	**< 0.0001**
	Male	134	3.579	0.617	-0.278	2 (Female)		
E3 (Work history in the sector)	11 to 20 years	72	3.714	0.628		None	0	0.9971
	21 years or more	32	3.633	0.575				
	1 to 10 years	60	3.562	0.658				
E4 (Economic sector)	8 (Financial and business services)	21	3.872	0.562	0.598	4 (Elec., gas and water)	5.12	**0.0007**
					0.421	7 (Log. and comms.)		
	Other	57	3.787	0.567	0.336	7 (Log. and comms.)		
					0.514	4 (Elec., gas and water)		
	3 (Manufacturing)	25	3.722	0.494	0.448	4 (Elec., gas and water)		
	7 (Logistics and communications)	30	3.451	0.765	-0.421	8 (Fin. and business services)		
					-0.336	Other		
	4 (Electricity, gas and water)	31	3.273	0.582	-0.598	8 (Fin. and business services)		
					-0.514	Other		
					-0.448	3 (Manufacturing)		
E5 (Qualifications)	2 to 4 (Grd 12/Std 10, certificate or diploma)	23	3.828	0.726	0.467	7 to 8 (Master's or PhD)	12.12	**< 0.0001**
	6 (Honours degree)	83	3.762	0.535	0.402	7 to 8 (Master's or PhD)		
	7 to 8 (Master's degree or PhD)	58	3.361	0.640	-0.467	2 to 4 (Grd12/Std 10, cert. or diploma)		
					-0.402	6 (Honours degree)		
E6 (Organisational level)	1 (Senior management)	64	3.702	0.597		None	1.69	0.1891
	2 (Middle management)	75	3.617	0.644				
	3 to 4 (Supervisory or other)	25	3.480	0.674				

E8 [1] (PM experience as team member)	11 to 15 years	57	3.799	0.499	0.305	1 to 10 years	2.74	***0.0682***
	16 years or more	28	3.665	0.656				
	1 to 10 years	79	3.494	0.682	-0.305	11 to 15 years		
E9 (Experience as project manager)	11 years or more	21	3.725	0.672		None	0.74	0.4768
	6 to 10 years	65	3.686	0.606				
	1 to 5 years	78	3.556	0.642				
Group	International	84	3.760	0.636		None	1.37	0.2438
	South African	80	3.492	0.600				

Note [1]: Demographic E7 (the "home language" section in the questionnaire, which contains all eleven official South African languages) has been omitted from this analysis for all sections (A to D) because it is not possible to compare the South African and international response data in this regard.

From Table 4.45, it can be seen that the Pr > F-values for E2 (gender), E4 (economic sector) and E5 (qualifications) are all well below the 0.05 cut-off threshold and therefore the means of the various subgroups within these aforementioned demographic categories are statistically different from one another. The F-value for E8 (project management experience as a team member) of 0.0682 is marginal and has been analysed further. The significant differences are set out in Table 4.45 above. To elaborate further on the particular demographic categories in question, the significant differences for the conceptual/initiation phase of the project are the following:

- E2 (gender)
  - between the means of the male and female respondents;
- E4 (economic sector)
  - between the means of the respondents from the financial and business services sector from those of electricity, water and gas; and logistics and communications;
  - between the means of the respondents from the "other" sector from those from logistics and communications and electricity, water and gas;
  - between the means of the manufacturing sector respondents and those from electricity, water and gas;
- E5 (qualifications)
  - between the means of Grade 12 (Standard 10), Certificate or Diploma level and the Master's degree or PhD grouping;

- between the means of the respondents with Honours degrees and those with Master's or PhD degrees; and

- E8 (project management) - between the respondents with 11 to 15 years experience as members of a project management teams and those with one to ten years' experience.

It can also be noted that *post hoc* tests are consistent with what is observed in the difference between means.

4.6.12.3 ANOVA on Section B with Tukey's post hoc studentised range (HSD) test

The Section B results for Tukey's *post hoc* studentised range test are given in Table 4.46.

Table 4.46: Section B ANOVA with Tukey's *post hoc* studentised range (HSD) test results

		SECTION B						
Source	**Level**	**N**	**Mean**	**Standard deviation**	**Difference between means**	**Statistically significant difference**	**F-value**	**P-value (Pr > F)**
E1 (Age)	< or = to 30 years	8	3.825	0.783		None	1.63	0.1841
	51 years or more	42	3.798	0.483				
	41 to 50 years	58	3.667	0.564				
	31 to 40 years	56	3.411	0.539				
E2 (Gender)	Female	30	3.886	0.587	0.325	1 (Male)	20.29	**< 0.0001**
	Male	134	3.561	0.546	-0.325	2 (Female)		
E3 (Work history in the sector)	11 to 20 years	72	3.717	0.537		None	0.1	0.903
	21 years or more	32	3.627	0.484				
	1 to 10 years	60	3.502	0.623				
E4 (Economic sector)	8 (Financial and business services)	21	3.810	0.558	0.485	4 (Elec., gas and water)	4.54	**0.0017**
	Other	57	3.755	0.496	0.300	7 (Log. and comms.)		
					0.430	4 (Elec., gas and water)		
	3 (Manufacturing)	25	3.723	0.461	0.398	4 (Elec., gas and water)		
	7 (Logistics and communications)	30	3.455	0.725	-0.300	Other		
	4 (Electricity, gas and water)	31	3.325	0.458	-0.485	8 (Fin. and business services)		
					-0.430	Other		
					-0.398	3 (Manufactur-ing)		

E5 (Qualificat-ions)	2 to 4 (Grd 12/Std 10, certificate or diploma)	23	3.804	0.489	0.376	7 to 8 (Master's or PhD)	8.86	**0.0002**
	6 (Honours degree)	83	3.705	0.537	0.277	7 to 8 (Master's or PhD)		
	7 to 8 (Master's degree or PhD)	58	3.428	0.589	-0.376	2 to 4 (Grd12/Std 10, cert. or diploma)		
					-0.277	6 (Honours degree)		
E6 (Organisat-ional level)	1 (Senior management)	64	3.715	0.539		None	2.25	0.1091
	2 (Middle management)	75	3.586	0.571				
	3 to 4 (Supervisory or other)	25	3.485	0.602				
E8 (PM experience as team member)	11 to 15 years	57	3.734	0.449		None	0.7	0.4963
	16 years or more	28	3.639	0.625				
	1 to 10 years	79	3.532	0.610				
E9 (Experience as project manager)	11 years or more	21	3.706	0.640		None	0.86	0.424
	6 to 10 years	65	3.669	0.547				
	1 to 5 years	78	3.558	0.561				
Group	International	84	3.739	0.589		None	1.76	0.1872
	South African	80	3.497	0.516				

The same significant differences were found between the demographics of gender and qualifications. Marginal differences in the results of Tukey's *post hoc* HSD for the economic sector demographic were found for Section B – planning phase of the project, when compared to the results for Section A.

4.6.12.4 ANOVA on Section C with Tukey's post hoc studentised range (HSD) test

The Section C results for Tukey's *post hoc* studentised range test are given in Table 4.47 below.

Table 4.47: Section C ANOVA with Tukey's *post hoc* studentised range (HSD) test results

		SECTION C						
Source	**Level**	**N**	**Mean**	**Standard deviation**	**Difference between means**	**Statistically significant difference**	**F-value**	**P-value (Pr > F)**
E1 (Age)	< or = to 30 years	42	3.671	0.568		None	2.32	0.0782
	51 years or more	8	3.523	0.904				
	41 to 50 years	58	3.390	0.791				
	31 to 40 years	56	3.242	0.743				

E2 (Gender)	Female	30	3.712	0.689	0.360	1 (Male)	16.57	< **0.0001**
	Male	134	3.352	0.739	-0.360	2 (Female)		
E3 (Work history in the sector)	11 to 20 years	72	3.511	0.670		None	2.11	0.1245
	21 years or more	60	3.379	0.786				
	1 to 10 years	32	3.281	0.800				
E4 (Economic sector)	8 (Financial and business services)	21	3.680	0.601	0.592	4 (Elec., gas and water)	3.56	**0.0084**
	Other	57	3.566	0.666	0.478	4 (Elec., gas and water)		
	3 (Manufacturing)	25	3.549	0.625				
	7 (Logistics and communications)	30	3.185	1.030				
	4 (Electricity, gas and water)	31	3.088	0.553	-0.592	8 (Fin. & business services)		
					-0.478	Other		
E5 (Qualificat-ions)	2 to 4 (Grd12/Std 10, certificate or diploma)	23	3.581	0.614	0.426	7 to 8 (Master's or PhD)	7.23	**0.001**
	6 (Honours degree)	83	3.556	0.662	0.401	7 to 8 (Master's or PhD)		
	7 to 8 (Master's degree or PhD)	58	3.155	0.828	-0.426	2 to 4 (Grd12/Std 10, cert. or diploma)		
					-0.401	6 (Honours degree)		
E6 (Organisat-ional level)	1 (Senior management)	64	3.500	0.773		None	1.51	0.2237
	2 (Middle management)	75	3.398	0.715				
	3 to 4 (Supervisory or other)	25	3.269	0.734				
E8 (PM experience as team member)	11 to 15 years	57	3.635	0.498	0.377	1 to 10 years	3.77	**0.0253**
	16 years or more	28	3.429	0.771				
	1 to 10 years	79	3.258	0.838	-0.377	11 to 15 years		
E9 (Experience as project manager)	11 years or more	21	3.481	0.869		None	0.2	0.8183
	6 to 10 years	65	3.429	0.787				
	1 to 5 years	78	3.392	0.671				
Group	International	84	3.568	0.732		None	1.62	0.2052
	South African	80	3.260	0.721				

The results for Section C (implementation phase of the project) were identical to those for Section A, except in the case of the economic sector demographic, where the means of the respondents in the manufacturing and logistics and communications sector were not significantly different from those of the other group sub-levels.

4.6.12.5 ANOVA on Section D with Tukey's post hoc studentised range (HSD) test

The results of Tukey's *post hoc* studentised range test for Section D are summarised in Table 4.48 below.

Table 4.48: Section D ANOVA with Tukey's *post hoc* studentised range (HSD) test results

		SECTION D						
Source	**Level**	**N**	**Mean**	**Standard deviation**	**Difference between means**	**Statistically significant difference**	**F-value**	**P-value (Pr > F)**
E1 (Age)	< or = to 30 years	8	3.958	0.608	0.523	41 to 50 years	3.91	**0.0102**
	51 years or more	42	3.772	0.476	0.338	41 to 50 years		
					0.292	31 to 40 years		
	31 to 40 years	56	3.480	0.599	-0.292	51 years or more		
	41 to 50 years	58	3.435	0.689	-0.523	< or = to 30 years		
					-0.338	51 years or more		
E2 (Gender)	Female	30	3.796	0.671	0.286	1 (Male)	16.45	**< 0.0001**
	Male	134	3.510	0.601	-0.286	2 (Female)		
E3 (Work history in the sector)	11 to 20 years	72	3.617	0.592		None	0.25	0.7812
	1 to 10 years	60	3.550	0.638				
	21 years or more	32	3.462	0.663				
E4 (Economic sector)	8 (Financial and business services)	21	3.836	0.567	0.628	4 (Elec., gas and water)	3.96	**0.0044**
					0.429	7 (Log. and comms.)		
	Other	57	3.700	0.546	0.492	4 (Elec., gas and water)		
	3 (Manufacturing)	25	3.644	0.495	0.436	4 (Elec., gas and water)		
	7 (Logistics and communications)	30	3.407	0.748	-0.429	8 (Fin. and business services)		
	4 (Electricity, gas and water)	31	3.208	0.590	-0.628	8 (Fin. And business services)		
					-0.492	Other		
					-0.436	3 (Manufactur-ing)		
E5 (Qualificat-ions)	6 (Honours degree)	83	3.673	0.519	0.313	7 to 8 (Master's or PhD)	5.15	**0.0069**
	2 to 4 (Grd12/Std 10, certificate or diploma)	23	3.671	0.623	0.311	7 to 8 (Master's or PhD)		
	7 to 8 (Master's degree or PhD)	58	3.360	0.711	-0.313	2 to 4 (Grs12/Std 10, cert. or		

						diploma)		
					-0.311	6 (Honours degree)		
E6 (Organisat-ional level)	2 (Middle management)	75	3.600	0.635		None	0.09	0.912
	1 (Senior management)	64	3.535	0.617				
	3 to 4 (Supervisory or other)	25	3.520	0.618				
E8 (PM experience as team member) Group	11 to 15 years	57	3.735	0.439	0.290	1 to 10 years	7.55	**0.0008**
	16 years or more	28	3.544	0.643				
	1 to 10 years	79	3.444	0.701	-0.290	11 to 15 years		
E9 (Experience as project manager)	11 years or more	21	3.688	0.659		None	2.02	0.1368
	1 to 5 years	78	3.580	0.628				
	6 to 10 years	65	3.501	0.605				
Group	International	84	3.725	0.598		None	2.93	0.0891
	South African	80	3.392	0.605				

The most important difference between the Section D (post implementation phase) results and those of the previous three sections is that with regards to the demographic category of age. Here significant differences were observed between the following:

- the less than or equal to 30 years of age and the 41 to 51 years of age levels; and
- the 31 to 40 years, 41 to 50 and, 51 years or more groupings.

4.6.12.6 Summary of Tukey's post hoc studentised range (HSD) test results (all four sections)

A summary of the results for all four sections is given in Table 4.49 below for ease of reference.

Table 4.49: Summary of ANOVA and Tukey's *post hoc* studentised range (HSD) test results

		Statistically significant difference			
Source	**Level**	**Section A**	**Section B**	**Section C**	**Section D**
E1 (Age)	< or = to 30 years	None	None	None	41 to 50 years
	31 to 40 years				51 years or more
	41 to 50 years				< or = to 30 years
					51 years or more
	51 years or more				41 to 50 years
					31 to 40 years
E2 (Gender)	Male	2 (Female)	2 (Female)	2 (Female)	2 (Female)
	Female	1 (Male)	1 (Male)	1 (Male)	1 (Male)

ee3 (Work history in the sector)	1 to 10 years	None	None	None	None
	11 to 20 years				
	21 years or more				
E4 (Economic sector)	Other	4 (Elec., gas and water)	4 (Elec., gas and water)	4 (Elec., gas and water)	4 (Elec., gas and water)
		7 (Log. and comms.)	7 (Log. and comms.)		
	3 (Manufacturing)	4 (Elec., gas and water)	4 (Elec., gas and water)		4 (Elec., gas and water)
	4 (Electricity, gas and water)	Other	Other	Other	Other
		3 (Manufacturing)	3 (Manufacturing)		3 (Manufacturing)
		8 (Fin./bus. serv.)	8 (Fin./bus. serv.)	8 (Fin./bus. serv.)	8 (Fin./bus. serv.)
	7 (Logistics and communications)	Other	Other		8 (Fin./bus. serv.)
		8 (Fin./bus. serv.)			
	8 (Financial and business services)	4 (Elec., gas and water)	4 (Elec., gas and water)	4 (Elec., gas and water)	4 (Elec., gas and water)
		7 (Log. and comms)			7 (Log. and comms.)
E5 (Qualificat-ions)	6 (Honours degree)	7 to 8 (M or PhD)	7 to 8 (M or PhD)	7 to 8 (M or PhD)	7 to 8 (M or PhD)
	2 to 4 (Grd12/Std 10, certificate or diploma)	7 to 8 (M or PhD)	7 to 8 (M or PhD)	7 to 8 (M or PhD)	7 to 8 (M or PhD)
	7 to 8 (Master's degree or PhD)	2 to 4 (Grd12/Std 10, cert. or diploma)	2 to 4 (Grd12/Std 10, cert. or diploma)	2 to 4 (Grd12/Std 10, cert. or diploma)	2 to 4 (Grd12/Std 10, cert. or diploma)
		6 (Hon. degree)	6 (Hon. degree)	6 (Hon. degree)	6 (Hon. degree)
E6 (Organisat-ional level)	1 (Senior management)	None	None	None	None
	2 (Middle Management)				
	3 to 4 (Supervisory or other)				
E8 (PM experience as team member)	1 to 10 years	11 to 15 years	None	11 to 15 years	11 to 15 years
	11 to 15 years	1 to 10 years		1 to 10 years	1 to 10 years
	16 years or more				
E9 (Experience as project manager)	1 to 5 years	None	None	None	None
	6 to 10 years				
	11 years or more				
Group	International	None	None	None	None
	South African				

It is evident from the results in Table 4.49 above that there were no significant differences between the means of the various categories, namely “work history in the sector”, “organizational level”, “experience in project management in a leadership role” and the combined South African and international group. As mentioned before, this can possibly be attributed to the fact that South Africans have been exposed to international business over the last few decades. Due to the exposure to project management methodology and related thinking, the South African community is likely to have a similar mindset to the international community in this regard.

The means of the responses from the two gender groupings are significantly different throughout. Moreover, the impact of different qualifications on the responses to the Phase 2 questionnaire is consistent across all four sections of the assessment tool. Differences between responses from the various age levels only appear in Section D. The "Economic sector" and "Experience as a member in a project management team" demographic categories only show slight differences between sections, most notably in Sections C and B.

Due to the relatively technical and mechanistic nature of traditional project management, it has largely been the domain of males worldwide, until recently, when more females began to embark on technical careers. This could be a possible explanation for the significantly different responses from the two gender groupings.

The differences between the responses from various sectors could potentially be ascribed to the different nature of the projects undertaken. Projects in the services sector which would be more process driven (such as end-to-end services provisioning and IT projects), are likely to require significant change management intervention whereas projects in the manufacturing and construction environment may involve change dynamics to a lesser extent.

The impact of age and years of relative project management experience on the data collected may be attributed to the level of involvement of the various groups in the operational and strategic aspects of any particular project.

4.7 SUMMARY AND CONCLUSION

Information on what constitutes change management in the project management domain was gathered using the Delphi technique. This data shaped the initial design of the questionnaire used during the first phase of the research design. The draft framework for the measurement instrument was then pre-tested through the application of Lawshe's content validity methodology. The results largely validated the measurement items included in each of the four project life cycle phases at the $\alpha = 0.05$ significance level. Based on the Lawshe results, 25 items were also excluded from the proposed assessment tool for the next phase of the research project.

The next phase of testing exposed the change management measurement instrument to the views and opinions of two target population groups, namely South African and international project managers of various experience levels and from different economic sectors. The data collected was analysed to determine the scale statistics for the groupings and to measure the internal consistency and reliability of the instrument, using Cronbach's alpha coefficient. The results indicated highly intercorrelated items in each of the four sections of the questionnaire.

Various iterations of exploratory factor analysis indicated the primary factors for each of the four phases of a project life cycle. The essence of each phase has been named or described as follows:

- Section A: Conceptual / initiation phase of the project - "ensuring alignment and organisational readiness after assessing and/or creating the need for change";
- Section B: Planning phase - "creation of an enabling environment for change through communication and engagement";
- Section C: Implementation phase - "executing to achieving the stated objectives and outcomes of the project"; and
- Section D: Post-implementation period - "embedding and institutionalising the changes effected through the project".

The most important change management elements of each have also been identified and highlighted in this chapter for retention in the final assessment tool.

A second round of item-scale and reliability analysis, together with Tucker's phi results confirmed the reliability, consistency and structure of the assessment tool when the number of measurement items was reduced from 118 to 103. The choice of measurement items that were eliminated was influenced by the outcome of the factor analysis.

Finally, the ANOVA and Tukey's *post hoc* HSD test results highlighted significant differences between the responses from various demographic groupings, particularly, between groupings defined in terms of gender, economic sector and various project management qualification levels.

CHAPTER 5: CONCLUSION

5.1 INTRODUCTION

Many projects either fail completely or are rendered less effective because the change management imperative is often overlooked and/or underestimated and is therefore not managed as an integral part of the planning and execution of the project(s) concerned. Projects are unique once-off change interventions aimed at effecting organisational change, but the overriding focus is often on so-called mechanistic or "hard" project deliverables. An emphasis on goal completion on time, cost containment and quality often leads to the exclusion or neglect of "softer" issues of organisational change and their related dimensions. The literature review done at the start of this study confirmed the importance of proper change management and revealed that the absence of such management can have a negative impact on a project's outcome (Burnes, 1996; Boddy & Macbeth, 2000; Grover *et al.*, 1995; Knutson, 1993; Wastell *et al.*, 1994). The importance of the appropriate management of change dynamics in projects was also stressed by Hebert (2002), Lanning (2001) and McElroy (1996).

This poses an interesting challenge to the project management profession, in that it is now essential for project managers consciously and deliberately to manage change, just as they manage other project deliverables. The management of all change dynamics facets throughout the project management life cycle is essential to ensure the successful achievement of project objectives.

It is therefore most important first to identify what constitutes change management in the project management domain and then consciously to manage these elements across the entire project life cycle to enhance project outcomes.

This final chapter of the study outlines the conclusions of the study and makes recommendations regarding future research.

5.2 ACHIEVEMENT OF THE STUDY OBJECTIVES

The **primary objective** of this study was to develop an assessment tool that contains all the relevant elements of change management across the project life cycle which can be used as both a measurement and a diagnostics tool to improve change management and the likelihood of success in the project implementation environment.

The pursuit of the primary objective of the study was supported by the pursuit of several content-related **secondary objectives**, namely

- to establish what constitutes change dynamics in the project management domain;
- to develop a framework of change dynamics applicable in the project management domain; and
- to determine which process should be used in developing a change dynamics assessment tool.

A comprehensive literature study was conducted to ascertain what could typically constitute change dynamics across a project life cycle. This review covered some contemporary models of change and the importance of change management in projects. The literature available reveals an abundance of information on both change and project management theories and models. So, for example, Grover *et al*. (1995:110) concluded that, based on empirical research on reengineering in 105 organisations, change management within Business Process Reengineering was of central importance in Business Process Reengineering implementation success. They added that project implementation is complex and that, in order to succeed, it is essential that change dynamics be managed and that balanced attention be paid to all identified factors, such as management support, technological competence and project management. Kotter (2002) found that large-scale organisational change can only be successful if aspects such as building the guiding team, getting the vision right, communicating for buy-in, empowering action, sustaining the effort and making the change stick are handled well.

In terms of a framework and process, this study was conducted within the realm of a social science paradigm, applying both inductive and deductive reasoning. The research design contained both exploratory and descriptive components which informed the use of both qualitative and quantitative information gathering methods. Primary data was obtained via applications of the Delphi technique and the DeVellis scale development methodology.

In conclusion, the secondary objectives were met during the literature study and the investigation into the appropriate research methodology, as reported on in Chapters 2 and 3 respectively.

The process of meeting the **primary objective**, in other words, the development of an assessment tool to measure change dynamics in the context of project management and the overall outcome, is summarized below.

5.3 VERIFICATION OF THE CHANGE DYNAMICS ASSESSMENT TOOL

Further information on what constitutes change dynamics in the project management domain was gathered using the Delphi technique. This data informed the design of the questionnaire used during the initial phase of the research design. The draft framework for the measurement instrument was then pre-tested by means of an application of Lawshe's content validity methodology. The results largely confirmed the measurement items included in each of the four project life cycle phases at an α = 0.05 significance level. Various items were also excluded from the proposed assessment tool for the next phase of the research project, based on the Lawshe results when content validity ratios of less than 0.31 for a sample of 37 were obtained.

The next phase of testing exposed the change management measurement instrument to the views and opinions of two target population groups, namely South African and selected international project managers of various experience levels and from different economic sectors. The data collected was analysed to determine the scale statistics for the groupings and to measure the internal consistency and reliability of the instrument, using Cronbach's alpha coefficient. Highly intercorrelated items in each of the four project life cycle sections of the assessment tool, namely the conceptual/initiation, planning, implementation and post-implementation phases were indicated by Cronbach alpha coefficients of 0.937, 0.974, 0.931 and 0.875 respectively, which are all substantially higher than the acceptable minimum level of 0.70.

Various iterations of exploratory factor analysis indicated the primary factors for each of the four phases of a project life cycle. These can be briefly summarised as follows:

- ensuring alignment and organisational readiness after assessing and/or creating the need for change during the conceptual/initiation phase of a project;

- creating an enabling environment for change through communication and engagement during the project planning phase;
- executing the necessary activities to achieve the stated objectives and outcomes of the project during the implementation phase of a project; and
- embedding and institutionalising the changes effected through the project during the final post-implementation period.

The most important change management elements of each project phase were also identified and highlighted for retention in the final assessment tool, which consisted of 103 items.

A second round of item-scale and reliability analysis, together with Tucker's phi results for the four sections of 0.976, 0.981, 0.992, 0.980 respectively (all greater than the acceptable level of 0.95), confirmed the reliability, consistency and structure of assessment tool with the reduced number of measurement items.

Finally, significant differences between the responses from various demographic groupings, in particular, between gender, different economic sectors, various project management qualifications and levels of experience groupings were identified from the ANOVA and Tukey's Post hoc HSD test results. Possible reasons for these differing responses were proposed, although they are not material in terms of the final composition of the assessment tool.

In conclusion, it is the opinion of the researcher that all the objectives mentioned above were met in the course of this research project, in that **a comprehensive assessment tool for the measurement of change in the project management domain has been developed**, using appropriate research, scale development and statistical analysis methodologies.

5.4 LIMITATIONS OF THE PRESENT STUDY

5.4.1 Sample size

In assessing the adequacy of the number of observations used in this study, it must be borne in mind that individual factor analysis was conducted for each of the four sections, A to D, of the measurement instrument questionnaire for the South African and international target population groups, and for both groups combined. This approach addressed the problem of the relatively small sample size to a large extent by reducing the effective number of items being analysed at any one time in relation to the respective observations available.

Applying the guidelines described in Chapter 3 above, it is concluded that the sample size as applied to Section C (11 items) and Section D (9 items) of the assessment tool is more than adequate, even in terms of the most onerous criterion mentioned. For the analysis of the South African and international responses as separate groups, the sample size is at least seven times the number of items being analysed, while for the combined group the sample size is greater than ten times the number of items under review.

Sample size shortcomings could potentially arise for Section A (25 items) and Section B (72 items) of the study. For Section A, the sample size is a minimum of 3.4 times the number of items being analysed for the separate South African and international population groups but still meets the stated minimum guideline level of five times when the combined groups were analysed (6.9 times). The underlying structure that emerged from the factor analysis for Section A is therefore considered to be valid. The potential shortcomings associated with the analysis results for Section B are more severe. The overall sample size is only 2.4 times the number of items analysed for the combined group. Nevertheless, the factor analysis results for Section B are still considered to be valid, especially when assessed in conjunction with the highly correlated and reliable scale statistics reported on before.

5.4.2 Measurement scales for each item

The aim of this particular study was to identify and confirm the change management aspects that the project management team must focus on and address at a strategic level to ensure overall project outcome success. The study did not include the development of an actual measurement scale or metric for each change management item in the assessment tool. This leaves room for potential follow-up research in this regard.

In addition, it may be possible to refine the number of change dynamic elements contained, in particular in Sections A and B, of the assessment tool to simplify the application of the tool during project management interventions.

5.4.3 Change management strategies and corrective actions

Applying the assessment tool in the course of a project life cycle can assist a project management team to determine whether or not change dynamics are being adequately addressed. If not, appropriate strategies and corrective interventions will need to be

implemented to ensure that the desired project outcome is achieved and is sustainable. Recommendations on the implementation of appropriate change management strategies and the corrective actions are not included in the scope of this research.

5.5 RECOMMENDATIONS FOR FUTURE RESEARCH

The measurement instrument presented in this research report addresses the strategic items that a project management team should focus on in any project management initiative ("**the what**"). Operationalisation of the instrument was not the focus of the study ("**the how**"). The recommendations for future research that flow from this observation are intended to address the two shortcomings mentioned above:

- the development of a measurement scale or metric for each change management item included in the assessment tool should deliver a reliable indicator that each change management item has been adequately covered in each of the project phases; and
- an analysis of the appropriate follow-up action based on the results of the aforementioned assessment would address the strategies to be put in place or the corrective actions to be taken if the application of the assessment tool was to indicate that the management of the change dynamics lagged behind more traditional project management activities and threatened the overall desired result of a project.

5.6 CLOSING REMARKS ON THE CONTRIBUTION MADE BY THE PRESENT STUDY

This study has contributed at various levels to the disciplines of project management, change management and organisational behaviour.

Firstly, the need to manage change dynamics during the project management life cycle has been confirmed.

Secondly, an overarching assessment tool has been developed to inform and guide the thinking, planning, focus and actions of project managers in the field of change dynamics. It can also be used as diagnostic tool to assess shortcomings in project management implementation and to identify areas for potential improvement to achieve project success and business improvement.

Finally, the research findings have contributed and are relevant to the change management and project management bodies of knowledge in that an assessment tool is presented which can be used to focus on and measure the management of change dynamics in the project domain. This is will hopefully contribute to the integration of these two constructs by assisting organisations and project managers in ensuring that all aspects of the project are adequately addressed and that the “softer” change dynamic elements are managed in conjunction with the more tangible project deliverables.

Elevating project management outcomes to the next level of excellence requires that all potential synergies between the various aspects of the project are leveraged to the fullest extent possible. Using the assessment tool developed during this research study to manage change dynamics will contribute towards aligning and leveraging the entire organisation’s human capital in the interest of common goals and enhanced project deliverables.

The management of change dynamics is not an optional extra. It is a business and organisational imperative for sustainable project success.

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APPENDICES

7.1 APPENDIX A: QUESTIONNAIRE (PHASE 1)

CHANGE DYNAMICS WITHIN PROJECT MANAGEMENT:

QUESTIONNAIRE ON CHANGE DYNAMICS CONSTRUCT RELEVANCE

Dear respondent

The purpose of this questionnaire is to establish the relevance of certain constructs around change dynamics in the domain of project management. This questionnaire forms part of the PhD study of Riana Smith at the University of Pretoria under the supervision of Dr Yvonne du Plessis.

The purpose of this study is to contribute to the existing body of knowledge around change dynamics in the context of managing projects.

The very nature of project management, i.e. the rigorous and structured management of the project performance framework, timelines, deliverables, quality criteria, costs and the temporary nature of the project configuration, does not always allow sufficient time in the process to apply sound change management philosophy, principles and methodology to manage and entrench the change effected by the project.

Therefore, more often than not, the management of the change dynamics imperative within the context of the project management methodology is overlooked, neglected or expedited to such an extent that it is rendered worthless.

By completing this questionnaire, you will contribute hugely to determining which of the dimensions mentioned below are applicable to reflect change dynamics in the context of project management. The relevance of the proposed change dynamics dimensions will be determined.

Completion of this questionnaire should take **no longer than 20 minutes** of your valuable time. Your responses and other detail will be considered highly confidential. Responses will be analysed and only consolidated results will be made available.

In order to ensure the integrity of the conclusions drawn from this survey, it is important that all questions are answered and returned to Riana Smith (PhD student in Organisational Behaviour) who can be reached at rianasmith@telkomsa.net or on tel. 083 444 0094 by no later than ……..

There is no right or wrong answer. Please consider each item individually based on your past experience. Indicate your answer with an ‘X’ in either the ‘Essential’, ‘Useful but not essential’ or ‘Not necessary’ box.

DEFINITIONS:

Project Management

A project has a single, definable purpose and result, and is usually specified in terms of cost, schedule and performance requirements. Every project is unique, is temporary in nature, cuts across organisational lines, involves unfamiliarity and is considered a process with distinct phases called the project life cycle.

Change dynamics

Change dynamics refers to change management aspects that form part of the effective implementation of planned change through a sequence of activities, processes and leadership that produce organisational improvements to enhance economic potential and the creation of competitive advantage.

DEMOGRAPHIC DETAIL

Name: _____

Years of project management experience:

0 – 2 years	☐
3 – 5 years	☐
6 – 10 years	☐
11 – 15 years	☐
16 years and more	☐

Industry:

Agriculture, hunting, forestry and fishing	☐
Mining and quarrying	☐
Manufacturing	☐
Electricity, gas and water supply	☐
Construction	☐
Wholesale and retail trade	☐
Transport, storage and communication	☐
Financial intermediation, insurance, real estate and business services	☐
Community, social and personal services	☐
Other (please specify)	☐

Project management involvement:

- ❖ project leader ☐
- ❖ member of team ☐

Functional area: _____

Highest qualification

- ❖ Matric ☐
- ❖ National Higher Certificate ☐
- ❖ Diploma ☐
- ❖ 3-year undergraduate degree ☐
- ❖ Post graduate degree ☐

Qualification in project management (if any):

How do you view your proficiency level in change management theories and dynamics?

- ❖ I have vast experience ☐
- ❖ I have moderate experience ☐
- ❖ I have limited experience ☐
- ❖ I have no experience ☐

Please qualify your response: _____

_____

_____

_____

_____

Do you wish to receive the results of the survey?

Yes	
No	

The purpose of this questionnaire is for you to indicate whether you consider the listed dimensions to be relevant to change dynamics. You therefore have to mark **one** of the 3 (three) boxes listed below. This information obtained will serve as input into an assessment tool for change dynamics,

If you mark 'Essential', you will indicate that you agree that the aspect is related to change dynamics within the project management context. Should you mark 'Useful, but not essential', you will indicate that you do consider the aspect to be advantageous to change dynamics within the project management context, but not essential. Should you mark 'Not necessary' you will indicate that you do not consider the construct to be related to change dynamics within project management.

Example of response options:

	Essential	Useful, but not essential	Not Essential
The price of gold impacts on staff morale			X
Visible leadership is essential for a successful change interventions	X		
Audio equipment in boardrooms		X	

DIMENSIONS OF CHANGE DYNAMICS WITHIN PROJECT MANAGEMENT

What is the relevance (if any) of the following dimensions and elements with regard to change dynamics within the context of project management?

A. CONCEPTUAL/INITIATION PHASE

(i.e. the pre-feasibility assessment of the project and its parameters/scope)

	CREATING THE NEED FOR CHANGE	Essential	Useful, but not essential	Not Essential
1	An awareness of the need to change should be created			
2	A compelling case for change should be made by leadership			
3	A burning platform should exist for the need to change			
4	Energy should be created around the need for change, i.e. role players should internalise the need for change.			
5	Comprehension by management of the complex nature of managing change dynamics within projects			
6	Communication of the new strategic issues, vision and corporate objectives is essential to ensure buy-in			
7	A sense of urgency needs to be created			
8	A guiding coalition of stakeholders should be formed			
9	Employee motivation for change needs to be encouraged			
10	A critical mass in support of the change should be developed			

	Please add any more dimension(s) you deem relevant:			

	ASSESSING READINESS FOR CHANGE	**Essential**	**Useful, but not essential**	**Not Essential**
11	Management competence and experience of change dynamics within a project management context should be assessed			
12	The organisational environment (internal and external) should be assessed, i.e. a comprehensive diagnosis should be conducted			
13	Problems and priorities should be identified			
14	The readiness for change should be assessed			
15	The barriers and resistance to change should be identified and planned for			
16	Level of change fatigue should be assessed.			
17	Change readiness / resilience should be developed.			
18	Criteria for success and performance indicators should be developed.			
19	Risk propensity should be assessed			
20	The potential implications of the change, such as costs, impact on morale, etc. should be assessed.			
21	The change intervention should be aligned with the overall business strategy			
22	Top management should have an adequate understanding of change management.			
	Please add any other dimension(s) you deem relevant:			

B. PLANNING PHASE

(i.e. planning the execution of the project scope, deliverables, timeframe and resource requirements)

	COMMUNICATION AND ENGAGEMENT	**Essential**	**Useful, but not essential**	**Not Essential**
1	Visible commitment and presence from leadership structures is essential			
2	Top management should champion and sponsor the change project			
3	Leadership should be aligned to potential project outcomes			
4	Appropriate and aligned leadership behaviour should be developed			
5	Leadership behaviour should be sustained			
6	Candid communication by leadership to staff around the project scope and potential changes			
7	Openly discuss planned changes and potential problems			
8	Synergy and open communication between project team and line management essential			
9	Encourage the use of an adequate variety of communication channels			
10	Messages around the vision from leadership should be consistent			
11	Staff should be aligned to potential project outcomes			

12	Engaging two-way communication should be a priority			
13	Stakeholders should be identified and focused engagement plans should be developed			
14	All employees are relevant and stakeholders such as line management and labour should be involved			
15	Meaningful participation is managed as an integral part of the process			
16	Decision-making processes should be transparent			
17	Consensus and shared vision should be developed			
18	Career expectations of project members should be managed			
19	Changes in business procedures due to project implementation should be communicated to ensure that people and infrastructure support it			
20	A dedicated team for change management and communication should be established			
21	The project team should ensure that they understand the company culture and conduct themselves in such a way not to alienate the organisation			
22	Project team members should be orientated with regard to change management and change dynamics			
23	'Quick wins' should be communicated and celebrated throughout the process			
	Please add any other dimension(s) you deem relevant:			

CREATION OF AN ENABLING ENVIRONMENT		**Essential**	**Useful, but not essential**	**Not Essential**
23	Leadership should be inspiring			
24	Organisational power and political dynamics should be addressed			
25	An enabling environment and project structures should be created			
26	The right people with the necessary credibility should be chosen for the project organisation			
27	It should be ensured that everyone involved in the change effort should understand his/her role			
28	A comprehensive risk analysis should be conducted to inform a strategy to mitigate these risks			
29	The business should be redefined			
30	Necessary tools and know-how required in the change project should be identified early			
31	Training needs concerning the use of new tools and technology should be evaluated			
32	Project members should be transitioned from a functional role to a project role through an on-boarding process			
33	Workload of project members should be managed, i.e. balance between functional and project duties should be facilitated			
34	Continuous stakeholder involvement should take place to ensure alignment to both organisational and political agendas			
35	A systems engineering approach is advisable, i.e. people, systems and processes affected by the project should be included in the design and planning of the project			
36	Training on new requirements should happen early in the			

	process to ensure that capacity is built and fear is reduced						
37	A learning project environment should be created						
38	Difference(s) in organisational cultures between contractors, suppliers, project team and operations should be managed						
39	Capacity should be built for the changes through both generic and job-specific training						
40	A learning environment should be promoted and facilitated						
41	Credible change agents should be identified and oriented						
42	There should be alignment between corporate strategy and the project outcomes						
43	Adequate budget and resources determination and allocation by leadership is important						
44	An internal team comprising of senior executives should be set up to manage and monitor progress at a strategic level						
45	Multi-disciplinary teams comprising of all stakeholders should be formed.						
46	A change management expert should be part of the project team						
47	Measurement of project success should include both quantitative and qualitative measures						
48	Co-operation across function areas is essential						
49	Potential competing issues should be removed through a process of prioritisation						
50	A supportive infrastructure around the change agents should be built						
51	A clear migration plan should be developed						
52	Capacity building – including “softer” skills should be a focus area						
53	Organisational values, e.g. collaboration, openness, trust, supportiveness & involvement, should be harnessed						
54	An environment supportive of innovation should be created						
55	Quick remedial action should be taken to solve emerging problems						
56	Continuous co-operation between line and project management should be fostered						
57	Maintaining enthusiasm and comprehension for the project						
58	Managed risk taking, i.e. a degree to risk propensity should be allowed						
59	Resistance to change should be identified and managed						
60	The understanding of project objectives and quality of communication during the change project should receive attention						
61	Alternatives and establishing action plans should be investigated						
62	Data collection and data feedback are important						
63	The future state should be determined						
64	Top management should have a medium to long term focus and not have a ‘quick-fix’ mentality						
65	Unreasonable expectations attributed to the project as a solution to all organisational problems should be avoided						
66	Appropriate change management methodology should be used						

67	Fears around potential job losses should be addressed to minimise resistance to change			
68	The project needs to be considered within the context of the organisational system, i.e. the impact on systems, structures and processes			
	Please add any other dimension(s) you deem relevant:			

C. IMPLEMENTATION
(i.e. executing the stated outcome and objectives)

		Essential	Useful, but not essential	Not Essential
69	Silo mentality and fragmented departmental interests should be identified and dealt with			
70	Organisational integration should be fostered			
71	A transparent decision-making process should be instituted			
72	Proper management of change should be done throughout			
73	New values should be promoted			
74	Striving for 'quick wins' as tangible short-term results			
75	Perception management should receive adequate focus			
76	Continuous staff motivation should be a priority			
77	Communication should focus on mindset and cultural shift of all involved			
78	Anxiety around potential and/or perceived job loss, loss of autonomy and/or authority should be identified and managed			
79	Behaviour patterns and feelings should be closely monitored			
80	Employees should be empowered to act on the new vision			
81	New symbols should be created to further embed the change			
82	Multiple interventions to entrench new organisational culture and values should be undertaken			
83	Continuous measurement and feedback on progress should be done rigorously			
84	Changes effected during the project should be consolidated			
85	Continuously emphasise the systems nature of the organization			
86	The necessary changes in HR and other policies should be made to sustain the change			
87	Rigid hierarchical structures should be replaced by more appropriate organisational structures			
88	Line managers should be receptive to change and innovation			

	Please add any other dimension(s) you deem relevant:						

D. POST IMPLEMENTATION
(i.e. embedding and institutionalising the changes effected through the project)

		Essential		**Useful, but not essential**		**Not Essential**
1	Change(s) should be institutionalised through structures, systems and procedures						
2	New culture and behaviour should be reinforced through appropriate incentive schemes						
3	Performance management should be designed to reward new required behaviour and organisational outputs						
4	The impact of change should be measured						
5	Continuous training and refreshers in the newly required behaviour/outputs should be done						
6	The organization should be stabilised						
7	The new state should be formalised						
8	Monitoring to adherence of the new state should be ongoing						
9	Attempts to revert to old practices should be discouraged						
	Please add any other dimension(s) you deem relevant:						

THANK YOU - YOUR PARTICIPATION IN THIS SURVEY IS HIGHLY VALUED

7.2 APPENDIX B: QUESTIONNAIRE (PHASE 2)

University of Pretoria

CHANGE MANAGEMENT WITHIN THE GENERAL CONTEXT OF PROJECT MANAGEMENT

Dear participant

You have been selected to participate in this study due to your specialisation in project management.

The purpose of the study is to contribute to the existing body of knowledge on change dynamics within the general context of managing projects.

The very nature of project management, i.e. the rigorous and structured management of the project performance framework, timelines, deliverables, quality criteria and costs, and the temporary nature of the project configuration, do not always allow sufficient time in the process to apply sound change management philosophy, principles and methodology in managing and entrenching the change effected by the project.

Therefore, more often than not, the management of the change dynamics imperative within the context of the project management methodology is overlooked, neglected or expedited to such an extent that it is rendered worthless.

This study forms part of a PhD thesis in Organisational Behaviour conducted by Riana Smith under the supervision of Dr Yvonne du Plessis at the University of Pretoria.

You are kindly requested to complete the following questionnaire, which should not take longer than 20 minutes. Your responses and other detail will be considered as highly confidential. Responses will be analysed, and only consolidated results will be made available. Please forward the completed questionnaire electronically to Riana Smith by **10 June 2006** at the following e-mail address**:** **vanessabezuidenhout@flysaa.com**

Should you have any questions, please contact me at 083 254 1754 or on my e-mail (RSmith@etihad.ae).

Thank you very much for your support.

Kind regards

Riana Smith

CHANGE MANAGEMENT WITHIN THE GENERAL CONTEXT OF PROJECT MANAGEMENT

QUESTIONNAIRE:

This questionnaire contains statements relating to the characteristics of "change management within the context of project management", i.e. "the way change management/dynamics are managed in project environments to facilitate project success and sustainability". Please complete the questionnaire, indicating to which extent you agree with each statement. **Each item must be rated, based on your personal experience and perception as member or manager of a project team.** Use the following five-point rating scale.

1 = strongly disagree
2 = disagree
3 = neither disagree nor agree
4 = agree
5 = strongly agree

						For office use only
	Respondent number					

Please rate each of the following statements as per rating scale:

	Section A: **During the conceptual / initiation phase of the project……**		
1	Each project team member is aware of the theory/principles of change management.		**A1**
2	Each project team member is aware of the importance of the management of change within the project management domain.		**A2**
3	Top management initiates a business case for change.		**A3**
4	Relevant stakeholders have internalised the need for change.		**A4**
5	The complex nature of change is acknowledged and understood by top management.		**A5**
6	Communication of the new strategy and objectives ensures buy-in by all relevant stakeholders.		**A6**
7	A sense of urgency is communicated, and understood by each stakeholder.		**A7**
8	The importance of stakeholder coalition is established.		**A8**
9	All key stakeholders are motivated throughout the project.		**A9**
10	All stakeholders support the need for change.		**A10**
11	Management is competent to manage change dynamics during projects.		**A11**
12	Management has experience in dealing with change.		**A12**
13	A comprehensive diagnosis of the organisational environment, both internal and external, has been conducted.		**A13**
14	Potential problems are identified and discussed by all stakeholders and the project team.		**A14**
15	Priorities are identified and discussed by all stakeholders and the project team.		**A15**
16	The readiness for change in the organisation has been assessed.		**A16**
17	The project team has identified possible barriers and resistance to change.		**A17**
18	The project team has put corrective action plans in place for all the identified barriers and resistance to change.		**A18**
19	The project team has developed change-readiness capacity and resilience within the organisation.		**A19**
20	Criteria for project success and related performance indicators have been developed.		**A20**
21	Project team members have identified and assessed potential project risk factors.		**A21**
22	The project team has assessed the potential implications of change, such		**A22**

	as costs, impact on morale, etc.		
23	Commitment from top management is visible.		**A23**
24	Top management aligns the change intervention with the overall business strategy.		**A24**
25	Top management has an adequate understanding of change management.		**A25**
	Section B: **During the planning phase of the project……..**		
26	Top management supports the project team members.		**B26**
27	Top management's presence is experienced by the project team.		**B27**
28	The project outcome is sponsored and championed by top management.		**B28**
29	Top management is held accountable for the project outcome.		**B29**
30	Top management is aligned to potential project outcomes.		**B30**
31	Top management's behaviour is aligned and appropriate to the goals of the project.		**B31**
32	Top management candidly communicates the project scope to the organisation.		**B32**
33	Top management communicates all potential changes to the organisation.		**B33**
34	There is a synergy between top management and the project team.		**B34**
35	There is open communication between top management and the project team.		**B35**
36	Top management encourages the use of an adequate variety of communication channels between the project team and the organisation.		**B36**
37	The messages around the vision of top management are consistent.		**B37**
38	The messages around the vision of the top management are reliable.		**B38**
39	Stakeholders, including labour unions, have been identified.		**B39**
40	Focused engagement plans have been developed for all stakeholders (including labour unions).		**B40**
41	Stakeholders, together with all in the project team, are involved in bringing about change management.		**B41**
42	All project members enjoy meaningful participation.		**B42**
43	The project manager manages the participation of all project team members and stakeholders as an integral part of the project plan.		**B43**
44	The decision-making processes are transparent to all team members.		**B44**
45	Team members all reach consensus on the vision of the project.		**B45**
46	Project team members understand the company culture.		**B46**
47	Project team members conduct themselves in such a way as not to alienate the organisation.		**B47**
48	Project team members are orientated with regards to change management and change dynamics.		**B48**
49	Project teams communicate and celebrate early gains ("quick wins")		**B49**
50	Project team members positively identify the organisational power and political dynamics.		**B50**
51	Project team members create an enabling environment.		**B51**
52	Project team members create an appropriate project structure.		**B52**
53	The project manager selects competent people to become part of the project team.		**B53**
54	Each project team member clearly understands his/her role.		**B54**
55	Project team conducts a comprehensive risk analysis, which informs a strategy to mitigate these risks.		**B55**
56	Project team timeously identifies the necessary tools and know-how required for the project.		**B56**
57	Project team assesses training needs with regard to the use of new tools and technology, envisaged for the success of the project.		**B57**
58	Project team members are transitioned from a functional role to a project role through a structured orientation process.		**B58**
59	Project managers with dual roles and responsibilities, i.e. functional and project duties, manage their workload.		**B59**
60	Stakeholders are continuously involved to ensure that the project is aligned		**B60**

	to both organisational and political agendas		
61	Training of all affected employees on new requirements takes place, ensuring that capacity is built.		**B61**
62	A project environment conducive to exploring and making mistakes is fostered.		**B62**
63	Organisational culture differences between contractors, suppliers, project team and operations are managed appropriately.		**B63**
64	Capacity building of affected employees takes place through customised training.		**B64**
65	A learning environment for project team members is promoted.		**B65**
66	A learning environment for project team members is facilitated accordingly.		**B66**
67	Credible change agents within the project team are identified.		**B67**
68	Orientation of identified change agents within the project team takes place.		**B68**
69	Project outcomes are aligned to corporate strategy.		**B69**
70	Top management ensures that an adequate budget is made available to the project team.		**B70**
71	Top management ensures that sufficient resources are made available to the project team.		**B71**
72	Project success factors for change are identified and measured.		**B72**
73	A multi-disciplinary team comprising all stakeholders is put together for the project.		**B73**
74	The project success is measured quantitatively.		**B74**
75	The project success is measured qualitatively.		**B75**
76	There is co-operation across all functional areas.		**B76**
77	Competing issues within the project are prioritised and dealt with accordingly.		**B77**
78	A supportive infrastructure around the change agents is carefully considered and initiated.		**B78**
79	A clear migration plan is in place.		**B79**
80	A key focus area of the project is capacity building, which includes “softer” skills such as change resilience.		**B80**
81	Organisational values such as collaboration, openness, trust, supportiveness and involvement between key role players are fostered.		**B81**
82	The environment supports innovation.		**B82**
83	Emerging problems are resolved by quick remedial action.		**B83**
84	There is continuous co-operation between line and project management.		**B84**
85	Enthusiasm and comprehension for the project is maintained at all times by all project team members.		**B85**
86	Risk factors are continually identified.		**B86**
87	Risk taking is managed accordingly.		**B87**
88	Resistance to change is identified and managed at all times.		**B88**
89	Project team members understand the project objectives.		**B89**
90	Project team members understand importance of the quality of communication during the change project.		**B90**
91	Responsible project team members take ownership of data collection and data feedback.		**B91**
92	The future state of the project is determined on a continuous basis.		**B92**
93	Top management has a medium- to long-term focus.		**B93**
94	Top management does not place emphasis on a “quick-fix” mentality.		**B94**
95	There are no unreasonable expectations of the project as a medium to solve all organisational problems.		**B95**
96	An appropriate change management methodology is used and maintained.		**B96**
97	Fears around potential job losses are addressed appropriately to minimise the resistance to change.		**B97**
98	Project needs, i.e. the impact on systems, structures and process, are considered within the context of the organisational system.		**B98**

	Section C: **During the implementation of the project……**		
99	There is no silo mentality, and fragmented departmental interests are not entertained.		**C99**
100	Team members and top management ensure that organisational integration is fostered.		**C100**
101	Top management involves the project team members in the decision-making process to ensure that the process is transparent.		**C101**
102	Top management ensures that change is properly managed throughout the process.		**C102**
103	Top management and project team members promote new values continuously.		**C103**
104	Adequate focus is placed on perception management.		**C104**
105	Staff is continuously motivated according to their needs.		**C105**
106	Communication is focused on mindset and culture of all relevant stakeholders.		**C106**
107	Top management identifies and manages anxiety around potential and/or perceived job losses, loss of autonomy and/or authority.		**C107**
108	Top management closely monitors behaviour patterns and feelings of all relevant stakeholders.		**C108**
109	Employees are empowered to act on the new vision.		**C109**
	Section D: **During the post-implementation phase of the project**		
110	Changes are institutionalised through structures, systems and procedures.		**D110**
111	Appropriate incentive schemes ensure that the new culture and behaviour is reinforced throughout the organisation.		**D111**
112	Performance management systems are designed to reward new required behaviour and organisational outputs.		**D112**
113	The impact of the change on the organisational culture is measured and monitored on a continual basis.		**D113**
114	Provision is made for continuous training and refreshers for the newly acquired behaviour, and outputs are monitored accordingly.		**D114**
115	The organisation is sensitised continuously about the change.		**D115**
116	The new state is formalised, implemented and monitored on a continuous basis.		**D116**
117	Employees are discouraged to revert to old practices.		**D117**
118	Employees are encouraged and facilitated to accept and comply with the new change environment.		**D118**
	Section E: **General**		
	Please mention any other aspects that you consider to be relevant to the measurement of change dynamics within the project management domain THAT RUNS CONTINUOUSLY THROUGHOUT ALL THE PROJECT PHASES, e.g. communication, risk management, etc. :		**E119**

BIOGRAPHICAL INFORMATION

Please provide the following information about yourself by marking the relevant number or block									**For office use only**
1. Age	..... years								**E1**
2. Gender	Male	*1*		Female	2				**E2**
3. Work history									**E3**
How long have you worked in this sector? ..... years									
4. The economic sector in which you are working: *(Mark one sector only)*									**E4**

Agriculture, forestry and fishing		01	
Mining and quarrying		02	
Manufacturing		03	
Electricity, gas and water		04	
Construction (contractors)		05	
Wholesale and retail trade, catering and accommodation		06	
Transport, storage and communication		07	
Financial intermediation, insurance, real estate and business services		08	
Community, social and personal services		09	
General government services		10	
Others (please name)		11	
Other producers (please name)		12	

5. Qualifications (*highest qualification only*)							**E5**
Secondary school		1	Std. 10 or equivalent		2		
Post-school certificate/diploma		3	National Diploma/National Higher Diploma		4		
Bachelor's degree or equivalent		5	Honours degree or equivalent		6		
Master's degree or equivalent		7	Doctoral degree or equivalent		8		

6. Organisational Level							**E6**
Senior management	1	Middle management	2	Supervisory	3		

Other	4	**Please specify:**	…….					
7. Home language: *(Mark one language only)*								**E7**
Afrikaans	01	IsiZulu	05	Xitsonga	09			
English	02	IsiNdebele	06	Setswana	10			
IsiXhosa	03	Southern Sotho	07	Siswati	11			
Tshivenda	04	Northern Sotho	08	*Sign Language*	12			
Others:	13	**Please specify……**						
8. How many years of project management experience do you have as a **team member**? _____								**E8**
9. How many years of project management experience do you have as a **project manager**? _____								**E9**

PLEASE SAVE YOUR INPUTS IF YOU ARE COMPLETING THIS ELECTRONICALLY

Thank you for taking the time to complete this questionnaire.

All information will be treated as confidential.
Please e-mail completed questionnaire to:

vanessabezuidenhout@flysaa.com

7.3 APPENDIX C: ITEMAN™ (Conventional Item and Test Analysis Program) STATISTICS FOR THE COMBINED GROUP (South African and international responses)

Section A question number (items)	Percentage endorsements					Mean	Variance	Item to section correl-ation
	Strongly disagree	Disagree	Neither disagree nor agree	Agree	Strongly agree			
A1	2.3%	22.7%	21.5%	41.3%	12.2%	3.384	1.074	0.63
A2	1.2%	17.4%	22.1%	43.6%	15.7%	3.552	0.980	0.66
A3	1.7%	8.7%	22.7%	48.8%	18.0%	3.727	0.838	0.55
A4	3.6%	7.7%	21.9%	42.0%	24.9%	3.769	1.041	0.63
A5	0.6%	10.5%	23.8%	45.9%	19.2%	3.727	0.826	0.65
A6	1.7%	10.5%	9.9%	45.9%	32.0%	3.959	0.993	0.58
A7	2.3%	26.2%	34.3%	27.9%	9.3%	3.157	0.981	0.58
A8	1.7%	9.9%	21.5%	48.3%	18.6%	3.721	0.876	0.56
A9	4.1%	15.7%	36.6%	34.9%	8.7%	3.285	0.936	0.73
A10	1.2%	24.4%	22.1%	33.1%	19.2%	3.448	1.189	0.67
A11	3.5%	11.0%	29.1%	43.6%	12.8%	3.512	0.936	0.69
A12	1.7%	16.3%	32.6%	42.4%	7.0%	3.366	0.802	0.51
A13	4.1%	17.4%	31.4%	34.3%	12.8%	3.343	1.074	0.73
A14	0.6%	16.9%	19.2%	49.4%	14.0%	3.593	0.893	0.60
A15	0.6%	7.6%	24.4%	52.9%	14.5%	3.733	0.673	0.52
A16	9.3%	19.8%	22.1%	37.8%	11.0%	3.215	1.343	0.74
A17	0.6%	20.9%	21.5%	47.1%	9.9%	3.448	0.898	0.63
A18	2.9%	22.1%	24.4%	40.7%	9.9%	3.326	1.034	0.79
A19	2.9%	18.6%	24.4%	38.4%	15.7%	3.453	1.108	0.73
A20	0.6%	4.1%	9.3%	52.3%	33.7%	4.145	0.624	0.51
A21	0.0%	5.2%	20.3%	59.3%	15.1%	3.843	0.539	0.52
A22	0.0%	10.5%	25.0%	47.1%	17.4%	3.715	0.762	0.62
A23	3.5%	3.5%	18.0%	32.0%	43.0%	4.076	1.058	0.68
A24	4.1%	11.6%	12.2%	43.6%	28.5%	3.808	1.202	0.69
A25	3.5%	10.5%	28.5%	41.3%	16.3%	3.564	0.990	0.70
Section A Averages	**2.33%**	**13.98%**	**23.15%**	**42.96%**	**17.58%**	**3.594**	**0.386**	**0.64**

Section B question number (items)	Percentage endorsements					Mean	Variance	Item to section correl-ation
	Strongly disagree	Disagree	Neither disagree nor agree	Agree	Strongly agree			
B26	0.0%	4.1%	10.5%	50.0%	35.5%	4.169	0.594	0.55
B27	0.6%	12.8%	50.0%	33.7%	2.9%	3.256	0.539	0.55
B28	1.7%	8.1%	12.8%	38.4%	39.0%	4.047	0.998	0.54
B29	2.3%	7.6%	24.4%	43.6%	22.1%	3.756	0.917	0.55
B30	0.6%	9.3%	21.5%	55.8%	12.8%	3.709	0.683	0.63
B31	1.2%	12.2%	25.6%	50.6%	10.5%	3.570	0.768	0.63
B32	2.3%	11.6%	12.8%	50.6%	22.7%	3.797	0.988	0.62
B33	4.1%	16.3%	19.8%	33.1%	26.7%	3.622	1.340	0.74

B34	3.5%	9.9%	30.2%	44.2%	12.2%	3.517	0.901	0.64
B35	0.0%	14.5%	25.0%	47.1%	13.4%	3.593	0.799	0.67
B36	0.6%	7.6%	28.5%	35.5%	27.9%	3.826	0.888	0.68
B37	0.6%	7.0%	20.9%	45.9%	25.6%	3.890	0.784	0.72
B38	2.3%	8.7%	25.0%	44.8%	19.2%	3.698	0.909	0.75
B39	1.7%	8.7%	20.9%	41.3%	27.3%	3.837	0.962	0.57
B40	4.7%	15.1%	15.1%	43.0%	22.1%	3.628	1.257	0.62
B41	6.4%	24.4%	41.3%	22.1%	5.8%	2.965	0.952	0.45
B42	1.7%	13.4%	39.0%	39.5%	6.4%	3.355	0.729	0.59
B43	0.6%	6.4%	26.7%	59.3%	7.0%	3.657	0.528	0.37
B44	0.0%	12.2%	37.2%	41.3%	9.3%	3.477	0.680	0.49
B45	1.2%	20.6%	15.3%	42.9%	20.0%	3.600	1.122	0.54
B46	1.8%	5.9%	27.6%	56.5%	8.2%	3.635	0.620	0.40
B47	0.0%	10.5%	35.5%	47.1%	7.0%	3.506	0.599	0.44
B48	2.9%	7.6%	21.6%	50.9%	17.0%	3.713	0.871	0.55
B49	4.1%	17.4%	42.4%	30.2%	5.8%	3.163	0.846	0.26
B50	2.9%	10.5%	31.4%	48.8%	6.4%	3.453	0.759	0.62
B51	1.2%	8.1%	34.9%	48.8%	7.0%	3.523	0.622	0.54
B52	1.7%	4.1%	16.9%	53.5%	23.8%	3.936	0.723	0.61
B53	1.7%	7.6%	14.0%	54.1%	22.7%	3.884	0.812	0.46
B54	0.6%	7.6%	13.4%	34.9%	43.6%	4.134	0.907	0.62
B55	1.2%	14.0%	24.4%	50.6%	9.9%	3.541	0.795	0.67
B56	0.0%	8.1%	21.5%	49.4%	20.9%	3.831	0.722	0.63
B57	0.6%	12.8%	23.3%	45.3%	18.0%	3.674	0.871	0.66
B58	2.9%	20.3%	43.0%	32.0%	1.7%	3.093	0.701	0.49
B59	4.7%	26.2%	29.1%	31.4%	8.7%	3.134	1.093	0.53
B60	1.7%	16.9%	36.0%	35.5%	9.9%	3.349	0.867	0.47
B61	2.9%	11.6%	27.3%	47.7%	10.5%	3.512	0.866	0.65
B62	5.2%	32.6%	30.2%	28.5%	3.5%	2.924	0.954	0.54
B63	7.6%	23.8%	37.8%	26.2%	4.7%	2.965	0.987	0.54
B64	2.3%	14.5%	24.4%	48.8%	9.9%	3.494	0.878	0.62
B65	1.2%	16.3%	29.7%	44.2%	8.7%	3.430	0.815	0.53
B66	1.7%	16.9%	35.5%	40.1%	5.8%	3.314	0.774	0.61
B67	4.1%	18.6%	35.5%	37.8%	4.1%	3.192	0.853	0.61
B68	1.2%	25.0%	27.3%	40.7%	5.8%	3.250	0.874	0.62
B69	0.6%	5.2%	8.7%	50.6%	34.9%	4.140	0.678	0.56
B70	1.7%	9.9%	11.6%	51.2%	25.6%	3.890	0.912	0.62
B71	2.9%	11.0%	15.7%	38.4%	32.0%	3.855	1.159	0.63
B72	0.6%	12.8%	18.0%	39.5%	29.1%	3.837	1.008	0.57
B73	1.2%	10.5%	37.8%	43.6%	7.0%	3.448	0.666	0.25
B74	1.2%	11.6%	3.5%	55.2%	28.5%	3.983	0.889	0.42
B75	0.0%	11.0%	23.8%	48.3%	16.9%	3.709	0.764	0.45
B76	1.2%	11.6%	34.3%	44.2%	8.7%	3.477	0.726	0.67
B77	0.0%	3.5%	29.7%	54.7%	12.2%	3.756	0.499	0.72
B78	1.7%	23.8%	25.6%	44.2%	4.7%	3.262	0.868	0.69
B79	1.2%	14.0%	15.2%	43.3%	26.3%	3.795	1.040	0.67
B80	1.8%	13.1%	40.5%	33.9%	10.7%	3.387	0.821	0.54
B81	2.9%	9.9%	39.0%	35.5%	12.8%	3.453	0.876	0.68
B82	0.6%	15.7%	28.5%	45.3%	9.9%	3.483	0.796	0.54
B83	0.0%	13.4%	18.0%	52.9%	15.7%	3.709	0.788	0.67
B84	1.7%	14.5%	29.7%	35.5%	18.6%	3.547	1.015	0.67
B85	1.2%	9.3%	29.1%	44.2%	16.3%	3.651	0.809	0.71
B86	0.6%	15.7%	26.2%	47.7%	9.9%	3.506	0.796	0.65
B87	2.9%	20.9%	20.3%	44.2%	11.6%	3.407	1.067	0.74

B88	4.1%	17.5%	39.2%	33.3%	5.8%	3.193	0.869	0.66
B89	0.0%	2.9%	9.3%	41.9%	45.9%	4.308	0.574	0.60
B90	0.0%	5.8%	16.3%	50.6%	27.3%	3.994	0.669	0.61
B91	0.6%	5.2%	44.2%	44.2%	5.8%	3.494	0.506	0.21
B92	0.0%	12.8%	22.7%	58.1%	6.4%	3.581	0.627	0.55
B93	1.2%	9.3%	22.1%	51.2%	16.3%	3.721	0.783	0.45
B94	4.1%	19.8%	28.5%	34.9%	12.8%	3.326	1.115	0.48
B95	2.3%	18.6%	32.0%	36.6%	10.5%	3.343	0.946	0.46
B96	2.9%	15.7%	17.4%	48.3%	15.7%	3.581	1.046	0.66
B97	4.7%	15.7%	25.0%	44.2%	10.5%	3.401	1.043	0.66
B98	0.0%	7.6%	18.6%	55.2%	18.6%	3.849	0.652	0.60
Section B Averages	**1.83%**	**12.82%**	**25.97%**	**43.78%**	**15.60%**	**3.585**	**0.278**	**0.59**

Section C question number (items)	**Percentage endorsements**					**Mean**	**Variance**	**Item to section correl-ation**
	Strongly disagree	**Disagree**	**Neither disagree nor agree**	**Agree**	**Strongly agree**			
C99	7.6%	13.4%	18.6%	49.4%	11.0%	3.430	1.187	0.79
C100	1.8%	8.8%	19.9%	52.0%	17.5%	3.749	0.820	0.83
C101	2.3%	20.9%	43.0%	27.9%	5.8%	3.140	0.794	0.68
C102	3.5%	11.6%	25.6%	43.0%	16.3%	3.570	1.013	0.86
C103	3.5%	10.5%	37.8%	40.7%	7.6%	3.384	0.806	0.73
C104	4.1%	17.4%	20.9%	42.4%	15.1%	3.471	1.145	0.81
C105	4.7%	16.6%	40.8%	34.3%	3.6%	3.154	0.817	0.76
C106	3.5%	6.4%	22.7%	50.6%	16.9%	3.709	0.881	0.78
C107	3.5%	17.4%	34.3%	38.4%	6.4%	3.267	0.882	0.83
C108	7.6%	25.0%	36.0%	27.9%	3.5%	2.948	0.968	0.73
C109	0.6%	12.3%	25.7%	48.5%	12.9%	3.608	0.776	0.64
Section C averages	**3.87%**	**14.57%**	**29.58%**	**41.39%**	**10.59%**	**3.399**	**0.547**	**0.66**

Section D question number (items)	**Percentage endorsements**					**Mean**	**Variance**	**Item to section correl-ation**
	Strongly disagree	**Disagree**	**Neither disagree nor agree**	**Agree**	**Strongly agree**			
D110	0.0%	4.7%	11.0%	51.7%	32.6%	4.122	0.607	0.65
D111	4.1%	14.0%	18.0%	47.7%	16.3%	3.581	1.092	0.78
D112	2.3%	13.4%	25.6%	47.7%	11.0%	3.517	0.878	0.71
D113	3.5%	19.8%	48.3%	25.0%	3.5%	3.052	0.724	0.77
D114	2.9%	11.6%	34.9%	40.7%	9.9%	3.430	0.850	0.77
D115	2.9%	10.5%	55.8%	27.3%	3.5%	3.180	0.601	0.68
D116	0.6%	10.5%	23.3%	44.8%	20.9%	3.750	0.850	0.75
D117	2.9%	9.4%	37.4%	44.4%	5.8%	3.409	0.721	0.57
D118	0.6%	5.2%	15.7%	57.6%	20.9%	3.930	0.623	0.69
Section D averages	**2.20%**	**10.99%**	**30.00%**	**42.99%**	**13.83%**	**3.552**	**0.386**	**0.72**

Overall scale statistics (n = 172):

	Section			
	A	**B**	**C**	**D**
Number of items	25	69	11	9
Number of examinees	172	172	172	172
Mean	3.594	3.585	3.399	3.552
Variance	0.386	0.278	0.547	0.386
Standard deviation	0.622	0.527	0.739	0.622
Skewness	-0.290	-0.046	-0.695	-0.598
Kurtosis	-0.619	-0.495	0.224	0.105
Minimum	2.000	2.397	1.200	1.667
Maximum	5.000	4.959	5.000	5.000
Median	3.600	3.630	3.500	3.667

Scale intercorrelation statistics (n = 172):

		Section			
		A	**B**	**C**	**D**
Section	**A**	1.000	0.904	0.790	0.730
	B	0.904	1.000	0.775	0.704
	C	0.790	0.775	1.000	0.831
	D	0.730	0.704	0.831	1.000

7.4 APPENDIX D: ASSESSMENT TOOL FOR CHANGE MANAGEMENT IN PROJECT MANAGEMENT

In the course of the study, the items included in the initial draft change management measurement instrument were subjected to several rounds of validation. Furthermore, the reliability of the instrument was tested and has been confirmed by means of rigorous statistical analysis. Various changes were effected as a result of this process. This process culminated in the final assessment tool set out in this Appendix D.

The four tables below set out the measurement items included in the final change management assessment tool for the four phases of a project life cycle. The assessment items for each phase have been arranged primarily according to their respective factor loadings, in descending order. This criterion was used as a proxy to rank items in terms of their level of importance, but the criterion has been modified in minor instances in order to group items that are related or that reflect a similar theme, or to group items that reflect a chronological sequence in the project management process.

Section A of the final assessment tool – the conceptual or initiation phase of the project

Item No.	Original Question No.	Assessment Item Description
A1	A13	A comprehensive diagnosis of the organisational environment, both internal and external, has been conducted
A2	A16	The readiness for change in the organisation has been assessed
A3	A3	Top management initiates a business case for change
A4	A19	The project team has developed change-readiness capacity and resilience within the organisation
A5	A17	The project team has identified possible barriers and resistance to change
A6	A18	The project team has put corrective action plans in place for all the identified barriers and resistance to change
A7	A9	All key stakeholders are motivated throughout the project
A8	A25	Top management has an adequate understanding of change management
A9	A24	Top management aligns the change intervention with the overall business strategy
A10	A11	Management is competent to manage change dynamics during projects
A11	A23	Commitment from top management is visible
A12	A8	The importance of stakeholder coalition is established
A13	A6	Communication of the new strategy and objectives ensures buy-in by all relevant stakeholders

A14	A4	The relevant stakeholders have internalized the need for change
A15	A10	All stakeholders support the need for change
A16	A2	Each project team member is aware of the importance of the management of change in the project management domain
A17	A5	The complex nature of change is acknowledged and understood by top management
A18	A1	Each project team member is aware of the theory / principles of change management
A19	A22	The project team has assessed the potential implications of change, such as costs, impact on morale, etc.
A20	A14	Potential problems are identified and discussed by all the stakeholders and the project team
A21	A21	Project team members have identified and assessed potential project risk factors
A22	A20	Criteria for project success and related performance indicators have been developed
A23	A12	Management has experience in dealing with change

Section B of the final assessment tool – the planning phase of the project

Item No.	Original Question No.	Assessment Item Description
B24	B38	The messages around the vision of the top management are reliable
B25	B37	The messages around the vision of top management are consistent
B26	B33	Top management communicates all potential changes to the organisation
B27	B86	Risk factors are continually identified
B28	B55	The project team conducts a comprehensive risk analysis which informs a strategy to mitigate these risks
B29	B87	Risk-taking is managed according to the risk mitigation strategy
B30	B77	Competing issues within the project are prioritized and dealt with according to their relative importance
B31	B85	Enthusiasm and comprehension for the project is maintained by all project team members at all times
B32	B36	Top management encourages the use of an adequate variety of communication channels between the project team and the organisation
B33	B35	There is open communication between top management and the project team
B34	B32	Top management candidly communicates the project scope to the organisation
B35	B84	There is continuous co-operation between line management and project management
B36	B96	An appropriate change management methodology is utilized and maintained
B37	B76	There is co-operation across all functional areas
B38	B78	A supportive infrastructure around the change agents has been carefully considered and initiated
B39	B83	Emerging problems are resolved by quick remedial action
B40	B61	All affected employees are trained on new requirements ensuring that capacity is built
B41	B81	Organisational values such as collaboration, openness, trust, supportiveness and involvement between key role players are fostered

B42	B97	Fears around potential job losses are addressed appropriately to minimize resistance to change
B43	B79	A clear migration plan is in place
B44	B88	Resistance to change is identified and managed at all times
B45	B57	The project team assesses training needs with regard to the use of any new tools and technology envisaged for the success of the project
B46	B30	Top management is aligned to potential project outcomes
B47	B31	Top management's behaviour is aligned and appropriate to the goals of the project
B48	B34	There is synergy between top management and the project team
B49	B54	Each project team member clearly understands his/her role
B50	B64	Capacity building of affected employees takes place through customized training
B51	B71	Top management ensures that sufficient resources are made available to the project team
B52	B70	Top management ensures that an adequate budget is made available to the project team
B53	B56	The project team identifies the necessary tools and know-how required for the project timeously
B54	B90	Project team members understand the importance of the quality of communication during the change project
B55	B40	Focused engagement plans have been developed for all stakeholders (including labour unions)
B56	B68	Orientation of identified change agents within the project team takes place
B57	B89	Project team members understand the project objectives
B58	B52	Project team members create an appropriate project structure
B59	B50	Project team members proactively identify the organisational power and political dynamics
B60	B67	Credible change agents within the project team are identified
B61	B98	Project deliverable requirements, such as the impact on systems, structures and processes, are considered within the context of the organisational system
B62	B42	All project members enjoy meaningful participation
B63	B72	Project success factors for change are identified and measured
B64	B69	Project outcomes are aligned to corporate strategy
B65	B82	The environment supports innovation
B66	B65	A learning environment for project team members is promoted
B67	B66	A learning environment for project team members is facilitated accordingly
B68	B62	A project environment conducive to exploring and making mistakes is fostered
B69	B39	Stakeholders, including labour unions, have been identified
B70	B26	Top management supports the project team members
B71	B48	Project team members are oriented with regard to change management and change dynamics
B72	B29	Top management is held accountable for the project outcome
B73	B80	A key focus area of the project is capacity building, which includes "softer" skills such as change resilience
B74	B92	The future state of the project is determined on a continuous basis
B75	B28	The project outcome is sponsored and championed by top management
B76	B45	Team members all reach consensus on the vision of the project

B77	B59	Project managers with dual roles and responsibilities, i.e. functional and project duties, manage their workload
B78	B63	Organisational culture differences between contractors, suppliers, project team and operations are managed appropriately
B79	B27	Top management's presence is experienced by the project team
B80	B51	Project team members create an enabling environment
B81	B44	The decision-making processes are transparent to all team members
B82	B58	Project team members are guided through the transition from a functional role to a project role through a structured orientation process
B83	B95	There are no unreasonable expectations that the project as a medium will solve all the organisation's problems

Section C of the final assessment tool – the implementation phase of the project

Item No.	Original Question No.	Assessment Item Description
C84	C102	Top management ensures that change is properly managed throughout the process
C85	C100	Team members and top management ensure that organisational integration is fostered
C86	C99	There is no silo mentality; and fragmented departmental interests are not entertained
C87	C107	Top management identifies and manages anxiety around potential and/or perceived job losses, loss of autonomy and/or authority
C88	C104	Adequate focus is placed on perception management
C89	C106	Communication is focused on the mindset(s) and culture(s) of all the relevant stakeholders
C90	C105	Staff is continuously motivated according to their needs
C91	C103	Top management and project team members continuously promote new values
C92	C108	Top management monitors closely the behavioural patterns and feelings of all the relevant stakeholders
C93	C101	Top management involves the project team members in the decision-making process to ensure that the process is transparent
C94	C109	Employees are empowered to act on the new vision

Section D of the final assessment tool – the post-implementation phase of the project

Item No.	Original Question No.	Assessment Item Description
D95	D113	The impact of the change on the organisational culture is measured and monitored on a continual basis
D96	D116	The new state is formalised, implemented and monitored on a continuous basis
D97	D110	Changes are institutionalised through structures, systems and procedures
D98	D114	Provision is made for continuous training and refresher courses to reinforce the newly acquired behaviour, and outputs are monitored accordingly
D99	D118	Employees are encouraged to accept and comply with the new changed environment and such acceptance and compliance is facilitated

D100	D111	Appropriate incentive schemes ensure that the new culture and behaviour are reinforced throughout the organisation
D101	D112	Performance management systems are designed to reward the newly acquired behaviour and new organisational outputs
D102	D117	Employees are discouraged from reverting to old practices
D103	D115	The organisation is sensitised continuously to the change

The final assessment tool measuring change management within the project management domain consists out of a total of 103 elements.