AN ASSESSMENT TOOL FOR CHANGE DYNAMICS WITHIN PROJECT MANAGEMENT

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Managing the change process throughout a project's life cycle is complex and should be understood, planned for, implemented and measured by the project manager, supported by organisational systems and processes for enhanced project success. The aim of this research was the development of an assessment tool to measure change dynamics across the four stages of a project life cycle, being: the conceptual/initiation-, the planning-, the implementation-, and the post-implementation stages. A triangulation method was followed inclusive of a three-phased research design including a thorough literature review, item development and scale development using the principles for scientific scale development and psychometric testing. A non-probability sample of 85 (49.4%) South African and 87 (50.6%) international project managers mainly working in the United Emirates were used. The assessment tool developed consisted of 103 items. Item-scale and reliability analysis, together with Tucker's phi results, confirmed the reliability, internal consistency and structure of the assessment tool for both the South African and international samples. Cronbach alpha coefficients of 0.937, 0.974, 0.931 and 0.875 were calculated for each of the four phases of a project life cycle respectively. This tool should be useful as both a measurement and a diagnostic instrument for organisations and project managers to improve change management in the project environment.

Key phrases: Assessment tool, change dynamics, change management, project, project management

INTRODUCTION

Organisations are currently confronted with progressive globalisation which challenges the capability to operate across time zones, geographical areas and organisational silos (Hill 2003:4). These challenges are increasingly drawing organisations to adopt formal project management methodologies to develop their capabilities to implement strategy and achieve their objectives successfully (Pennypacker & Grant 2003:5).

It is known that the management of change dynamics plays a significant role in project management and the successful completion of projects, as projects are change processes. Max Wideman of The Wideman Education Foundation (2007) has stated the importance of change management in projects as: "Every project needs and deserves to be properly managed. Therefore, change management as we have described it is one of the most critical elements of any project. In fact, a change is a project, and a project is a change". Managing the change process throughout a project's life cycle is complex and should be understood, planned for, implemented

and measured by the project manager, supported by organisational systems and processes for enhanced project success.

The concepts project management, projects and change management, as well as its relatedness needs some clarification to enable comprehension of the scope of this research. **Project management** as defined by the PMI PMBOK ® Guide is the application of knowledge, skills, tools and techniques to project activities to meet project requirements. Project management is accomplished through the application and integration of the project management processes along the project life cycle, such as initiating, planning, executing, monitoring and controlling, and closing. **Change management** is the process, tools and techniques to manage the people-side of change to achieve the required project outcomes. Change management incorporates the organisational tools that can be utilized to help project managers and project team members make successful personal transitions resulting in the adoption and realisation of change.

As far back as the 1970s, Bennis (quoted by Willemon & Gemmill 1971:315) asserted that the organisations of the future would be "adaptive, rapidly changing temporary systems organized around problems. Organizational charts will consist of project groups 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 teams" to enable organisations to keep up the required pace of technological and administrative innovation. 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.

This competitive environment requires a proactive strategy from 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".

The aim of this research was the development of an assessment tool to measure change dynamics across the four stages of a project life cycle, being: the conceptual/initiation-, the planning-, the implementation-, and the post-implementation stages. This tool should be useful as both a measurement and a diagnostic instrument for organisations and project managers to improve change management in their organisations whilst utilising project management methodology.

RELEVANT LITERATURE

Project management as a management configuration and catalyst to effect change or Business Process Re-engineering (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). The methodology of project management and its temporary matrix configuration makes it an attractive way of dealing with once-off organisational matters that 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) found a high failure rate when European companies adopted Total Quality Management (TQM) systems. Hougham, Boddy and Gunson (cited in Boddy & Macbeth, 2000) 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).

The management of **change dynamics** is imperative in the context of the project management methodology. However, often the management of change dynamics is 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 the application of project management techniques can assist in the management of organisational change projects, but they also warn that the methodology will not in itself cope with situations where there are different views of what should be done, or where there is a conflict of interest. Boddy and Macbeth (2000) also add that even participative or consultative techniques are not sufficient if the change threatens the *status quo* and thus established practices. According to them, to a large extent, the difference between successful and unsuccessful change projects lies in the way in which the change is managed.

In their study of 105 organisations to establish problem areas surrounding Business Process Re-engineering implementation, Grover, Jeong, Kettinger and Teng (1995:121) found that 31.8 per cent of the respondents ranked the the 'need for managing change is not recognized' as the most severe problem. 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 re-engineering 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 re-engineering, 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 Re-engineering implementation and that an inability to manage organisational change in re-engineering 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 more often associated 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 Re-engineering in the financial services industry in the United Kingdom (McElroy 1996:328) were similar. This study listed the following variables related to change management as critical for project success:

- communication of a clear vision,
- staff participation,
- the creation of process ownership,
- the instilling of a Business Process Re-engineering culture, and
- staff organisation.

The studies mentioned make it abundantly clear that often inadequate attention is paid to the human dimension or 'people side' 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, largely because of 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'.

The literature review reported in this paper reveals 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; and it must be supported by organisational systems and processes for enhanced project success. It is 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.

RESEARCH APPROACH AND METHODOLOGY

Scope of the study

The study focuses on the development of an assessment tool or instrument to measure change dynamics in the context of project management using the principles for scientific scale development and psychometric testing.

Method

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

- defining the change management elements in the project management domain on the basis of a comprehensive literature study;
- administering the Delphi technique;
- calculating the relevance of the change elements by means of the content validity technique by Lawshe (Lawshe 1975); and
- developing the measurement according to the scale development methodology of DeVellis (1991) and Cooper and Schindler (2003).

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, and the objectives of the study were formulated.

Construction

The initial research design and the verification of the inclusiveness of the change dynamic elements selected for this study were established by administering the Delphi technique. An exercise involving 20 project management 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. The information gathered by administering the Delphi technique formed the proposed elements of change management within the project management context.

Testing

The information gathered by means of the Delphi technique resulted in the design of a draft questionnaire that contained multiple measurement items related to the elements of change dynamics in the different stages of project management. A group of 37 project management professionals registered with the Institute for Project Management of South Africa (IPMSA) assessed each item and its relevance to the constructs of the questionnaire. A construct validity rating scale developed by Lawshe (1975) was used to determine the extent to which the subject matter experts agree on the contributions of each item to the four constructs i.e. the stages of the project life cycle, the instrument is intended to measure. The subject matter experts' input was then used to compute the Content Validity Ratio (CVR) for each item. Items were eliminated if the CVR failed to meet the minimum required CVR value of 0.31 as determined by using Lawshe's technique (1975:568). The results indicate that the majority of the measurement items are valid, as the CVRs were higher than or equal to the $\alpha = 0.05$ significance level. Twenty-five items were eliminated and the remaining 118 items were included in a "second phase" questionnaire that was referred to as the "Change Management Assessment Tool" (CMAT).

Exploratory factor analysis (EFA) was used to explore the internal structure and validity of the constructs of the CMAT. First-order EFA was carried out by means of principal axis factoring and rotated using the Quartimax rotation procedure with Kaiser's Normalization. Two rounds of EFA were done to reduce the number of items and to validate the constructs by demonstrating that its items load on the same factor. To assess compliance with the distribution requirements, Bartlett's test of sphericity and the Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy were used. Kaiser's criterion (1961) and Cattell's (1966) scree-plot were used to estimate the number of significant item factors.

After the EFA was finalised, the distribution characteristics and reliability of each of the four constructs (scale) were assessed by means of descriptive and associational statistics. Cronbach alpha coefficients were calculated to examine the internal consistency of the factors and Pearson's correlation to estimate the relationships between the constructs of the CMAT. The software package used for the statistical analyses was the BioMeDical Programs (BMDP) Statistical Software (release 7.1).

Measuring Instrument

The "Change Management Assessment Tool" (CMAT) contains 118 statements relating to the characteristics of change management within the context of project management. The numbers of original statements for each section or stage in the project life cycle were as follow:

- Section A: statements related to the conceptual or initiation phase of the project - 25 items;
- Section B: statements regarding the planning phase of the project - 73 items;
- Section C: statements regarding the implementation of the project - 11 items;
- Section D: statements in relation to the post implementation phase of the project - 9 items;

Furthermore the CMAT also includes the following sections:

- 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.
- Section F: questions regarding relevant demographic and biographical information.

All the statements (except the demographic variables) were rated on a five-point Likert-type scale to measure the perceptions of participants at an approximate interval level. All the items that consisted of negative statements were reverse coded.

The CMAT was administered electronically and, in some instances, to maximise the response rate, in hard copy. 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. 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 and confidentiality was guaranteed.

Participants

In the second phase of testing the instrument, the 'change management measurement tool' the CMAT was exposed to the views and opinions of two target population groups, namely South African and international project managers with various experience levels from different economic sectors. 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 project managers from the United Arab Emirates and India. In all cases the target audience was members of the Project Management Institute (PMI) and project management profession (PMP) or respondents who aspire to be PMP members.

A total of 1200 questionnaires were sent out with a response rate of 172 unspoilt questionnaires. This represents a response rate of 14.33%. The research group represented a non-probability sample of 85 (49.4%) South African and 87 (50.6%) international project managers.

The South African sample consisted of 70 (82.4%) male and 15(16.6%) female participants. The average age of the sample was 43.31 years (SD=7.712), and their experience in project teams ranged between three year and 22 years, with an average of 11.04 years (SD=4.873). Seventy-three (85.8%) of the South African respondents had tertiary qualification(s), 10 (11.8%) a diploma, and 2 (2.5%) a high school certificate. The majority of the respondents 36 (42.4%) were senior managers and 32 (37.6%) middle managers. The remaining 17 (20%) were from supervisory and other positions.

The international sample consisted of 70 (80.5%) male and 17(19.5%) female participants of various nationalities, mainly working in the United Emirates. The average age of this sample was 43.39 years (SD=8.827), and their experience in project teams ranged between one year and 20 years, with an average of 11.00 years (SD=5.035). Seventy-six (87.4%) of the international respondents had tertiary qualification(s), 3 (3.4%) a diploma, and 8 (9.2%) a high school certificate. Thirty (34.5%) of this sample was senior managers, 43 (49.4%) middle managers and 14 (16.1%) were from supervisory and other positions.

RESULTS

Exploratory factor analysis

Before the second round EFA was undertaken, it was determined whether or not the data of the two samples were suitable for factor analysis. To assess compliance with the distribution requirements, Bartlett's test of sphericity and the Kaiser-Meyer-Olkin measure of sampling adequacy (MSA) were used, as suggested by Gorsuch (1983). The two diagnostic tests produced satisfactory results.

Bartlett's test of sphericity ($p<.001$) confirmed that the properties of the correlation matrixes of the item scores for the different constructs were suitable for factor analysis. Except for the MSA-value of O.665 for Section B of the South African sample, the KMO measure of sample adequacy for the other sections indicated that the size of the samples was adequate (MSA> 0.8).

Final factor solution and loadings (Section A)

The results of the principal factor extraction and the Quartimax rotation on the 23 items of Section A for the South African and the international respondents indicated one dominant factor with eigenvalues of 9.158 for the South African and 10.191 for the international group. The factor explained 39.8% of the variance of the South African data and 44.3% of the variance of the international data.

The factor loadings of the 23 items and the reliability coefficient of the total scale for the different samples are reported in Table 1.

Table 1: Section A - sorted rotated factor loadings for the South African, international and combined respondents

	SECTION A					
	South African n=85		International n=87		Combined group n-172	
	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
	A8	0.438	A21	0.469	A20	0.484
	A12	0.426	A20	0.367	A12	0.481
Variance	39.8%		44.3%		42.31%	
Alpha	0.929		0.941		0.937	

Scale naming / description (Section A)

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.

Final factor solution and loadings (Section B)

After the exclusion of 13 of the original items included in Section B of the CMAT a final round of factor analysis was performed. Eigenvalues of 20.054 (explaining 33.42% of the total variance) and 25.890 (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 samples were 4.323 and 3.595 (each accounting for 7.20% and 5.99% of total variance respectively). However, when the relevance of two or more factors was analysed, it was determined that the identified primary factor was sufficiently dominant and that a single factor was the best descriptor of the construct.

Table 2 below gives a summary of the sorted rotated factor loadings and reliability coefficients for the two target samples and the combined group in relation to the construct underpinning Section B.

Table 2: Section B - sorted rotated factor loadings for the South African, international and combined respondents

	SECTION B					
	South African n=85		International n=87		Combined group n=172	
	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

	SECTION B					
	South African n=85		International n=87		Combined group n=172	
	Question	Factor loadings	Question	Factor loadings	Question	Factor loadings
	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	0.480
	B70	0.386	B51	0.383	B58	0.463
	B62	0.375	B58	0.371	B95	0.457
Variance	33.42%		43.15%		38.60%	
Alpha	0.965		0.977		0.974	

Scale naming / description (Section B)

The underlying factor for Section B can best be described as the "**creation of an enabling environment for change through communication and engagement**". 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.

Final factor solution and loadings (Section C)

In accordance with Kaiser's (1961) criterion (eigenvalues larger than unity), only one factor was postulated for both samples with eigenvalues of 6.535 and 6.501 for the South African and international samples respectively. The scree-plots confirmed that the 11 items represented a single factor. This one-factor structure explained more than 59% of the total variance in the factor space and no rotation of the axes was possible. The factor loadings and reliability coefficients of the unrotated single solution for the two target samples and the combined group is reported in Table 3.

Table 3: Section C - sorted unrotated factor loadings for the South African, international and combined respondents

	SECTION C					
	South African n=85		International n=87		Combined group n=172	
	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
Variance	59.41%		59.10%		59.41%	
Alpha	0.930		0.929		0.931	

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.

Final factor solution and 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 4.255, 1.193 and 1.024. These factors account for 47.28%, 13.25% and 11.37% of the total variance. One unrotated factor was extracted for the international sample with an eigenvalue of 4.678, which explained 51.97% of the total variance of the international data. The combined data of the two samples also generated only one factor that explained

50.37% of the total variance of the data. Based on this results it was decided to use the one-factor solutions since it was best suited for the purposes of this study and was consistent with the theoretical construct. The factor analysis with the South African data was consequently constrained to produce a single factor solution.

Table 4 gives a summary of the factor loadings and reliability coefficients of the one-factor solutions for the data of the South African and international samples and the combined sample with regard to the items supporting Section D.

Table 4: Section D - sorted unrotated factor loadings for the South African, international and combined respondents

	SECTION D					
	South African n=85		International n=87		Combined group n=172	
	Question	Factor loadings	Question	Factor loadings	Question	Factor loadings
	D113	0.794	D111	0.782	D113	0.749
	D114	0.727	D114	0.727	D114	0.745
	D116	0.717	D113	0.697	D111	0.727
	D118	0.666	D110	0.686	D116	0.711
	D111	0.665	D115	0.674	D112	0.656
	D112	0.645	D116	0.664	D118	0.652
	D115	0.584	D112	0.657	D115	0.644
	D110	0.550	D117	0.628	D110	0.591
	D117	0.312	D118	0.577	D117	0.479
Variance	47.28%		51.97%		50.37%	
Alpha	0.854		0.884		0.875	

Scale naming / description (Section D)

Section D measures the change dynamics during the post-implementation phase of the project. Section D is best described as "**embedding and institutionalising the changes effected through 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.

Construct equivalence of the sections of the CMAT

The results of the principal axis factor analysis performed on the CMAT indicated that the factor loadings for the South African and the international samples were very similar and that the four constructs had been properly determined for both groups.

Van de Vijver and Leung (1997b) have, however, suggested that Procrustean target rotation should be used rather than visual assessment to determine the agreement between sets of factor loadings and to test for the stability of factor structures. Accordingly, target rotation was used to determine the correspondence of the constructs of the CMAT for the different samples. The factor loadings for the South African and the international samples were rotated to one target group. After the target rotation, factorial agreement was estimated using Tucker's coefficient of agreement. The Tucker's phi coefficients for the two samples are set out in Table 5.

Table 5 shows that the Tucker's phi coefficients for the South African and the international samples were all acceptable. Values of .95 and higher are seen as evidence for factorial similarity (Van de Vijver & Poortinga 1994). It can be deduced from the high Tucker's phi coefficients that the factor structures for all four sections of the CMAT were equivalent for the two samples. 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 5: Construct equivalence of the sections of the CMAT for the two samples

	Section A	Section B	Section C	Section D
	Concept/ initiation Phase	Planning phase	Implementation phase	Post implementation phase
Proportionality coefficients	0.98	0.98	0.99	0.98
Identity coefficient per factor	0.98	0.97	0.99	0.98

Item and reliability analysis

Based on the results of the exploratory factor analysis and the test for construct equivalence it was decided to pool the responses of the South African an international samples for each construct separately and to determine the reliability, distributive characteristics of each factor (scale) and the inter-correlations between

the factors. Refer to Table 6 for the distribution and reliability results and Table 7 for the inter-correlations coefficients of the four constructs.

From Table 6 it is evident that the summated scores of the combined sample on the four constructs are approximately normally distributed, with a slight tendency towards negative skewness. The assumption of normality requires that the key statistics, skewness and kurtosis be less than 2.5 times the standard error (Morgan & Griego 1998). The reliability of the four constructs of the CMAT was highly satisfactory, with Cronbach alpha coefficients varying between .87 and .97. The alpha coefficients surpassed the minimum level of .70 recommended by Morgan and Griego (1998).

From Tables 7 it is also clear that the scale inter-correlations were relatively high ($p<0.001$). This was not unexpected, since strong links exists between the respective project management life cycle phases. This result was congruent with the theoretical construct.

Table 6: Descriptive Statistics and Reliability of the sections of the CMAT (n=172)

Descriptive Statistics	Section A	Section B	Section C	Section D
	Concept/ initiation phase	Planning phase	Implementation phase	Post implementation phase
Mean	82.959	215.837	37.413	31.971
SD	14.631	34.217	8.120	5.601
Skewness	-0.342	-0.131	-0.680	-0.594
Sk Error	0.185	0.185	0.185	0.185
Kurtosis	-0.615	-0.596	0.185	0.100
Ku Error	0.368	0.368	0.368	0.368
Alpha	0.937	0.974	0.931	0.875

Table 7: Scale intercorrelation statistics (n=172)

		Section			
		A	B	C	D
Section	A	1.000			
	B	0.903	1.000		
	C	0.782	0.780	1.000	
	D	0.729	0.705	0.830	1.000

SUMMARY AND CONCLUSION

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 approach 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 as phenomenon of change.

It was therefore important to identify what the elements of change dynamics in the project management domain are, specifically 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 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 that 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.

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 technique and DeVellis scale development methodology.

The different analysis, including exploratory factor analysis, identified the following primary change management factors for each of the four phases of the project life cycle:

- ensuring alignment and organisational readiness after assessing and/or creating the need for change during the cconceptual/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 of the project phase were also identified and highlighted for retention in the final assessment tool that consisted of 103 items.

Item-scale and reliability analysis, together with Tucker's phi results, confirmed the reliability, internal consistency and structure of the assessment tool fore both the South African and international samples. Cronbach alpha coefficients of 0.937, 0.974, 0.931 and 0.875 were calculated for each of the four phases of a project life cycle respectively.

This assessment tool can be applied as a measurement instrument, and it can also serve as a diagnostic tool (checklist) 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.

Although the instrument can be applied as it is, it is recommended that further research is done regarding the possibility of refining the number of change dynamic elements contained in Sections A and B, in order to simplify the application of the CMAT as an assessment tool in project management. A limitation of the instrument is that it has not been cross- validated and tested for external validity, which is further recommended.

Despite its limitations, the study has made a promising contribution towards the development of a measure to assess change in the execution of project work, as well as contributing to both the body of knowledge in the fields of Project Management and Organisational Behaviour.

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APPENDIX 1

Change management in Projects- Assessment tool with variables

Section A: Conceptual or initiation phase of the project

Item no.	Assessment item description
A1	A comprehensive diagnosis of the organisational environment, both internal and external, has been conducted.
A2	The readiness for change in the organisation has been assessed.
A3	Top management initiates a business case for change.
A4	The project team has developed change-readiness capacity and resilience within the organization.
A5	The project team has identified possible barriers and resistance to change.
A6	The project team has put corrective action plans in place for all the identified barriers and resistance to change.
A7	All key stakeholders are motivated throughout the project.
A8	Top management has an adequate understanding of change management.
A9	Top management aligns the change intervention with the overall business strategy.
A10	Management is competent to manage change dynamics during projects.
A11	Commitment from top management is visible.
A12	The importance of stakeholder coalition is established.
A13	Communication of the new strategy and objectives ensures buy-in by all relevant stakeholders.
A14	Relevant stakeholders have internalised the need for change.
A15	All stakeholders support the need for change.
A16	Each project team member is aware of the importance of the management of change within the project management domain.
A17	The complex nature of change is acknowledged and understood by top management.
A18	Each project team member is aware of the theory/principles of change management.
A19	The project team has assessed the potential implications of change, such as costs and impact on morale.
A20	Potential problems are identified and discussed by all stakeholders and the project team.
A21	Project team members have identified and assessed potential project risk factors.
A22	Criteria for project success and related performance indicators have been developed.
A23	Management has experience in dealing with change.

Section B: Planning phase of the project

Item no.	Assessment item description
B24	The messages around the vision of the top management are reliable.
B25	The messages around the vision of top management are consistent.
B26	Top management communicates all potential changes to the organization.
B27	Risk factors are continually identified.
B28	The project team conducts a comprehensive risk analysis, which informs a strategy to mitigate these risks.
B29	Risk taking is managed according to strategy.
B30	Competing issues within the project are prioritised and dealt with accordingly.
B31	Enthusiasm and comprehension for the project is maintained at all times by all project team members.
B32	Top management encourages the use of an adequate variety of communication channels between the project team and the organisation.
B33	There is open communication between top management and the project team.
B34	Top management candidly communicates the project scope to the organisation.
B35	There is continuous cooperation between line and project management.
B36	An appropriate change management methodology is used and maintained.
B37	There is cooperation across all functional areas.
B38	A supportive infrastructure around the change agents is carefully considered and initiated.
B39	Emerging problems are resolved by quick remedial action.
B40	Training of all affected employees regarding new requirements takes place, ensuring that capacity is built.
B41	Organisational values such as collaboration, openness, trust, supportiveness and involvement are fostered between key role players.
B42	Fears around potential job losses are addressed appropriately to minimise the resistance to change.
B43	A clear migration plan is in place.
B44	Resistance to change is identified and managed at all times.
B45	Project team assesses training needs with regard to the use of new tools and technology envisaged for the success of the project.
B46	Top management is aligned to potential project outcomes.
B47	Top management's behaviour is aligned and appropriate to the goals of the project.
B48	There is a synergy between top management and the project team.
B49	Each project team member clearly understands his/her role.
B50	Capacity building of affected employees takes place through customised training.
B51	Top management ensures that sufficient resources are made available to the project team.
B52	Top management ensures that an adequate budget is made available to the project team.
B53	The Project team timeously identifies the necessary tools and know-how required for the project.
B54	Project team members understand the importance of the quality of communication during the change project.
B55	Focused engagement plans have been developed for all stakeholders (including labour unions).

Item no.	Assessment item description
B56	Orientation of identified change agents within the project team takes place
B57	Project team members understand the project objectives
B58	Project team members create an appropriate project structure
B59	Project team members positively identify with the organisational power and political dynamics.
B60	Credible change agents within the project team are identified.
B61	Project needs, such as the impact on systems, structures and process, are considered within the context of the organisational system.
B62	All project members enjoy meaningful participation.
B63	Project success factors for change are identified and measured.
B64	Project outcomes are aligned to corporate strategy.
B65	The environment supports innovation.
B66	A learning environment for project team members is promoted
B67	A learning environment for project team members is facilitated.
B68	A project environment conducive to exploring is fostered and making mistakes is tolerated.
B69	Stakeholders, including labour unions, have been identified.
B70	Top management supports the project team members.
B71	Project team members are orientated with regards to change management and change dynamics.
B72	Top management is held accountable for the project outcome.
B73	A key focus area of the project is capacity building, which includes “softer” skills such as change resilience.
B74	The future state of the project is determined on a continuous basis.
B75	The project outcome is sponsored and championed by top management.
B76	Team members all reach consensus on the vision of the project.
B77	Project managers with dual roles and responsibilities, such as functional and project duties, manage their workload.
B78	Organisational culture differences between contractors, suppliers, project team and operations are managed appropriately.
B79	Top management’s presence is experienced by the project team.
B80	Project team members create an enabling environment.
B81	The decision-making processes are transparent to all team members.
B82	Project team members are transitioned from a functional role to a project role through a structured orientation process.
B83	There are no unreasonable expectations of the project to be a medium to solve all organisational problems.

Section C: Implementation phase of the project

Item no.	Assessment item description
C84	Top management ensures that change is properly managed throughout the process.
C85	Team members and top management ensure that organisational integration is fostered.
C86	There is no silo mentality and, fragmented departmental interests are not entertained.
C87	Top management identifies and manages anxiety around potential and/or perceived job losses, loss of autonomy and/or authority.
C88	Adequate focus is placed on perception management.
C89	Communication is focused on the mindsets and cultures of all relevant stakeholders.
C90	Staff is continuously motivated according to their needs.
C91	Top management and project team members continuously promote new values.
C92	Top management closely monitors behaviour patterns and feelings of all relevant stakeholders.
C93	Top management involves project team members in the decision-making process to ensure that the process is transparent.
C94	Employees are empowered to act on the new vision.

Section D: Post implementation phase of the project

Item no.	Assessment item description
D95	The impact of the change on the organisational culture is measured and monitored on a continual basis.
D96	The new state is formalised, implemented and monitored on a continuous basis.
D97	Changes are institutionalised through structures, systems and procedures.
D98	Provision is made for continuous training and refresher courses to reinforce the newly acquired behaviour, and outputs are monitored accordingly.
D99	Employees are encouraged and facilitated to accept and comply with the new changed environment.
D100	Appropriate incentive schemes ensure that the new culture and behaviour is reinforced throughout the organization.
D101	Performance management systems are designed to reward new required behaviour and organisational outputs.
D102	Employees are discouraged from reverting to old practices.
D103	The organisation is sensitised continuously about the change.