

# Conference Proceedings

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# AN EVALUATION OF THE STATUS OF RISK MANAGEMENT IN SOUTH AFRICAN CONSTRUCTION PROJECTS

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## ABSTRACT

*A review of existing theory and practice of Risk Management (RM) within the construction industry in South Africa and globally suggests that it is underutilised and generally not well understood. This finding results in construction projects experiencing time and cost overruns combined with inferior quality. The research results reported in this paper are based on a comprehensive study by Shunmugam (2013). The study carried out an evaluation of the status of RM in construction projects in South Africa. To achieve this, the following objectives were pursued: To identify the extent of use of RM in the SA construction industry and to assess what the current practices and barriers were of RM implementation. A survey questionnaire was the primary tool that was used to collect data from large contracting and consulting companies. The findings were similar to previous studies. Although RM is recognised as a knowledge base, RM practitioners mainly rely on subjective methods (such as judgement based on experience) rather than more sophisticated methods (such as mathematical techniques) to make decisions that affect the key project parameters. The main barriers to formal RM implementation were found to be ignorant attitudes, time and cost constraints and inadequate skills available to implement the processes appropriately. The study also makes recommendations to improve RM implementation for future endeavours. These included RM training / mentoring; implementation of a formal RM process within organisations and inculcating a change in attitude and perception. Whilst these suggestions are all useful, it was also observed that they cannot be implemented exclusively hence a systematic RM improvement process in the organisation which seeks to steadily overcome barriers to the implementation of RM is also discussed.*

## Key Words and Phrases

Risk, Risk Management, Risk Management Process, Construction Industry, South Africa, Barriers to Risk Management Implementation

## INTRODUCTION

According to the 'State of the South African Construction Industry Report' published in 2012, the value of the construction industry in South Africa was R34 billion which translated into a contribution of just over 3% to the GDP (Industry Insight, 2012). The industry was also found to be a major contributor to employment – it employed just under a million people in 2011 (Industry Insight, 2012). However the industry is experiencing a major decline - it was stated that the year 2012 was considered the worst yet when compared to the recent past (Williams, 2013).

The construction industry is, however, generally considered risk inclined due to its long, dynamic and complex project undertakings. There are also multiple stakeholders and investors who place immense pressure on the construction team to achieve project goals (Taroun, 2012; Mills, 2001). Traditionally risks are defined as uncertain future events, which if they materialise, results in an additional cost or delay to a project (Barnes, 1983; Perry, 1986). The perception is therefore that the consequences of risk are negative. According to Zou, *et al.* (2007) the process of Risk Management (RM) endeavours to pre-empt and minimise the effects of those uncertain future events. Mills (2001) aptly summarises RM as 'expecting the unexpected'.

In addition to only achieving project success, Skeen (2012) articulated that driving a culture of risk awareness and management adds value to the entire organisation resulting in overall improved project management ability. However, there is an assertion that although RM has been a topic of great interest, very little is actually practised or carried out correctly (Lyons and Skitmore, 2004; Taroun, 2012). For example, in 2008, a survey was undertaken

in the United Kingdom found that “the extent of application of systematic and rigorous probabilistic methods to contract risks in construction (was) very scant” and “the analytical methods currently used to manage risks do not adequately deal with subjectivity” (Adams, 2008). Lyons and Skitmore (2004) carried out a survey in Queensland with similar results – judgement, experience and intuition were stated as preferred assessment methods. A study by Chihuri and Pretorious (2010) found that in South Africa (SA), RM was also not widely used in the engineering and construction environment, and there was a lack of actual adoption and implementation of RM policies.

Now that the economy is under immense pressure and investments have become far and few between, RM has become a competitive advantage in an industry where there are many eager service providers and few investors. A review of literature highlights several benefits achieved from the practice of RM. Apart from an improved overall project management ability, employees are more conscientious of time usage and costs and the overall quality of the output of the entire organisation is improved (Skeen, 2012). When the RM process is inculcated in the organisation, there is an overriding sense of control and consistency hence there is lesser chance of having to “fire-fight” emergencies.

The research results reported in this paper are based on a comprehensive study by Shunmugam (2013). The study carried out an evaluation of the status of RM in construction projects in South Africa. To achieve this, the following objectives were pursued: To identify the extent of use of RM in the SA construction industry and to assess what the current practices and barriers were of RM and to act as a guide to improving service delivery.

The framework of the paper begins with a statement of the research problem following which the research questions that were pursued are designated. Thereafter the fundamental concepts related to RM and the RM process together with empirical research is reviewed to determine existing practices. The research methodology is then described, following which, the study’s results and findings are discussed. Lastly conclusions and recommendations are made.

## **PROBLEM STATEMENT AND RESEARCH QUESTIONS**

As mentioned earlier, the construction industry in SA is pivotal to turning the economy but recently its growth has stagnated. Some of the external difficulties facing the industry include the rand’s weakness against the major currencies such as the US Dollar. The rising cost of fuel, increasing cost of electricity together with a high level of inflation have contributed to the stagnation of the industry. Worse, there is a severe lack of skills available in the construction sector. According to the 2012 Infrastructure Sector Research, 74% of companies are hard pressed to find appropriate engineering skills (Network, 2013). One of the most severe setbacks facing the industry surfaced in 2011: that being anti-competitive behaviour by the country’s biggest construction companies. The Competition Commission in SA recently fined fifteen companies for participation in a cartel that fixed prices and received kickbacks from each other for doing so. Apart from the loss in investor confidence, the large fines will more than likely result in cash flow crises in an already declining market.

Furthermore, there have been a number of mega projects that have failed to meet baseline completion dates, costs and quality requirements. These include:

- The Gautrain project which was only ready two years after its baseline completion date and cost R14 billion over budget (South African Politics, 2013).
- The 2010 FIFA Soccer World Cup overshot its baseline budget by about R6 billion (Philips, 2008).
- A R2.5 billion contract for a multi-product pipeline between Durban and Gauteng for Transnet was estimated to cost R23.4 billion and the completion date is (to date) almost 3 years late (Guern Le, 2013).
- Medupi Power Station, the world’s 4th largest coal powered power-station, was 30 months delayed and the estimated cost to completion is approximated at R56 billion more than initial estimates (Donnelly, 2012).

### Research questions

The details outlined in the preceding section demonstrate a diffident depiction for an industry that is integral to the future of the country. This leads one to seek answers to the question of ‘Why?’. Have the managerial practices that govern risk of project failure in the construction industry been completely ignored? Or are they not well understood? To answer this, the study pursued the following theoretical and empirical research questions (RQs):

- RQI: Is RM recognised as a knowledge base among construction risk practitioners in South Africa?
- RQII: To what extent is RM applied currently in construction projects in South Africa?
- RQIII: What are the current practices regarding RM in the construction industry in South Africa?
- RQIV: What are the barriers to RM implementation in the construction industry in South Africa?

Finding answers to these questions and related issues constituted the primary thrust of the study and these are reported in the summary form in this paper.

## **THEORY AND PRACTICE - RISK MANAGEMENT IN THE CONSTRUCTION INDUSTRY**

### Key Definitions

**Risk:** Traditionally, construction risks are defined as uncertain, undesirable and unplanned future events – if they materialise it usually results in an additional cost or delay to a project hence the objectives of the project are not met (Barnes, 1983; Perry, 1986). The concept of risk varies amongst people according to viewpoint, attitudes and experience - engineers, designers and contractors view risk from the technical perspective, while finance and economics tend to affect the views of lenders and developers (KarimiAzari, Mousavi, Mousavi and Hosseini, 2011). Zou, *et al.* (2007) highlighted more recently that risk could either be a threat or an opportunity. For example, a realisation of a saving in cost or time by taking a risk would be considered the realisation of a benefit from taking a risk.

**Risk Management:** Edwards and Bowen (1998: 339) states that: “(RM) is a systematic approach to dealing with risk. A RM system should establish an appropriate context, set goals and objectives, identify and analyse risks, influence risk decision making and monitor and review risk response.” Some of the better known approaches to RM include: ISO 31000 – this is the standard from the International Organisation for Standardisation (ISO); RAMP – Risk Analysis and Management for Projects and PMBOK as articulated in the Project Management Book of Knowledge which was developed by the Project Management Institute.

**The Risk Management Process:** A survey of the available literature (Zhi, 1995; Mills, 2001) revealed that the process of RM comprises of the following steps essentially: risk management planning; risk identification and classification; risk analysis and assessment; risk response/treatment formulation and risk monitoring reporting or risk control. The key processes are elucidated below.

**Risk management planning:** Tah and Carr (2001) states that project success is dependent on the proper implementation of RM hence a plan for managing the risks effectively is required to ensure risks are measured, understood, reported, communicated and allocated within a standardised framework. The essential processes (techniques and models), resources (human, time and financial) and responsibilities must be identified.

**Risk identification and categorisation:** Risk identification is the process of determining which risks may impede the project’s success and the documentation thereof (Zou, *et al.*, 2007; Nieto-Morote and Ruz-Vila, 2011). Perry (1986) summarised the importance of this step by stating that the activity of risk identification is of considerable benefit, even if the next stage of risk analysis is not undertaken. Inherent to the various methods employed to identify risks is the key question of, ‘what can go wrong?’ (Mills, 2001; Adams, 2008). Group identification techniques include brainstorming, the Delphi Method and scenario planning. Other assessment techniques include the compilation of checklists, conducting expert interviews and review of historical risk data. The risks must also be categorised in a manner that renders it user orientated. There is no consensus regarding a universal categorisation method since every project has unique qualities and the risks generated from past experiences change (Fewings, 2013). Some commonly adopted methods are the use of the project stakeholder perspective and the General Systems Theory (Chapman, 2001).

**Risk analysis:** According to Mills (2001) risk analysis is the quantification of risk in terms of magnitude/impact and frequency or time frame of each event. It also aims to determine the probability of the risk occurring. Existing literature for reveals that there are various ways to analyse risks – both qualitatively (using intuition, experience and judgement) and quantitatively with the use of various mathematical models. The Probability-Impact Risk Model (P-I) is inherent to construction risk assessment where project risk is defined by way of the following formula (Taroun, 2012):

$R = P * I$  where *R*: Degree of Risk; *P*: Probability of the Risk occurring and *I*: Impact of the risk.

Williams (1996) points out that the proper consideration of risk requires consideration of Impact and Likelihood:

$Impact\ of\ risk = (Likelihood\ of\ risk) * (Consequence\ of\ risk)$

Other risk analysis methods include Monte Carlo simulation, the Fuzzy Sets Theory and Analytic Hierarchy Process (AHP) – these are all mathematical techniques.

Risk response: According to Aloini, *et al.* (2012), risk response/treatment deals with developing a mitigating strategy to effectively minimise the effects of the identified risks. There are 3 classic approaches to risk response. Risk retention or acceptance is the decision to acknowledge and manage the risk. Risk reduction entails activities that reduce the probability of the risk occurring or the severity of the impact if the risk does occur. Risk transfer is the shifting of risk to another party either by “selling” the risk or outsourcing to an appropriate specialist (Schatterman, *et al.*, 2008).

Risk monitoring and reporting: This ‘final’ stage of RM aims to ‘put the plan into action’ in order to improve project performance. The results of the previous steps are transferred onto a standardised framework such as a ‘risk register’ and then communicated to the project team for action (Chihuri and Pretorius, 2010).

At this stage of the process, RM becomes on-going or cyclical – the dynamic nature of the construction environment warrants continuous identification of new risks which spark off the entire process yet again. RM therefore does not end until the project draws to an end.

Relational risk management (RRM): Construction projects are usually ‘people’ intensive hence human nature, cultures and personalities are key variables to consider when discussing construction risk hence another significant concept that has emerged in RM literature is Relational Risk Management which relates to the humanistic side to project implementation. RRM is embedded in formal and informal communication channels in the project where the cultures’ of the participating organisations plays an integral role (Lehtiranta, 2011). This view is shared by Klemetti (2006) who stated that sharing of mutual objectives, adopting a no-blame culture and aiming for continuous improvement will result in increased project success.

## Empirical Research

Building on the perceptions detailed earlier, the trends from some other parts of the world regarding RM practices are summarised below.

Singapore: A survey carried out in 2001 found that projects had inadequate RM implementation: “lack of time”, “lack of budget”, “low profit margin”, and “not economical” were the most common barriers to RM implementation (Hwang, Zhao and Toh, 2013). However RM was perceived to be important for project success and it was found that it had a positive impact on the key parameters (Hwang, Zhao and Toh, 2013).

Hong Kong: A study that was carried out in Hong Kong found that formal RM processes were used minimally (Tummala, *et al.*, 1997). Deterministic and subjective methods were found to be used more commonly than quantitative methods. The time required and the difficulty in interpreting results of RM processes; lack of RM skill and human resistance to change were found to be the major barriers of RM implementation yet the majority of the participants believed that RM could positively contribute to project success (Tummala, *et al.*, 1997).

Ghana: Buertey, Abeere-Inga and Kumi (2012) found that the majority of professionals who participated in a survey related to RM in the construction industry had no knowledge regarding RM theories and techniques.

A review of previous studies by South African researchers regarding RM in the construction industry corroborates the findings from the global studies. Makombo (2011) carried out a study to identify the RM frameworks in the construction industry of SA – he stated that obstacles related to RM were found to be the skills gap amongst the professionals dealing with such issues, poor scope management and a lack of focus on RM in the project initiation phase – hence RM is almost always ‘crisis management’ endeavour. Most of the respondents stated that they had

not planned RM activities, there was no formal RM structure in place and intuition and experience were used for risk decision making.

The conclusions of a study carried out by Visser and Joubert (2008) revealed that over half of the South African organisations surveyed, lacked formal RM policies and procedures and there was a lack of RM training (Visser and Joubert, 2008). The most significant risks that plague the industry were found to be shortage of critical resources, poor business and project risk management, risk exposure during the tendering process and government interference risk (Visser and Joubert, 2008). These findings were also identified by Mbachu and Nkado (2007) in their study. The significant constraints were found to be the inability to meet quality requirements, labour and material shortages, time management challenges, technical and managerial incompetence, poor scoping ability, inept cost management, tendering irregularity, negative attitudes to work, labour union demands, exchange rate volatility, energy crises and political controls (Mbachu and Nkado, 2007).

From the foregoing review of literature, it is clear that project success is highly dependent on the ability of the project team to manage risks yet there is an overriding theme of inappropriate skills, apparent lack of understanding of and regard for the RM process.

## **RESEARCH METHOD**

The theoretical and practical framework established above had set the platform for the research questions to be answered. The mixed methodology research method was chosen for this study. A classic definition of mixed methods are that they harness the qualities of both qualitative and quantitative methods for a single research effort (Lee, 1999). It is believed that when carried out correctly, mixed methods are very powerful as they build on the strengths of both 'parent' methods (Lee, 1999).

### Data Collection

In order to fulfill the objectives of this study, the researcher would have to involve every single risk management professional within the construction industry across SA. This is not feasible in research, therefore a subset or sample is used with the ultimate aim of drawing general conclusions about the entire population (Leedy and Ormrod, 2010). The population is defined first and the sample is drawn thereafter. The construction industry consists mainly of consultants and contractors hence this study comprised of both groups. For contractors the population included large building contractors who are actively registered with the Construction Industry Development Board (CIDB). The three highest CIDB gradings were considered large. For consultants all the large consulting engineers who are registered with Consulting Engineers South Africa (CESA) were populated. Large was defined by those companies who owned four or more provincial offices (since this implied a national presence).

In order to choose the sample, probability sampling with the process of stratified sampling was used. Ultimately the sample size finally adopted was 181 members – 140 contractors and 41 consultants.

### Research instrument

The survey for this study was administered via email since (further to the reasons stated earlier), it is relatively straightforward and quick to complete and manage the returned data. The questionnaire comprised of various sections of questions and mutually exclusive responses that was limited to a five point scale. The main sections were: Recognition of Risk Management as a Knowledge Base, Extent of Use and Current Practices – Risk Identification, Extent of Use and Current Practices - Risk Analysis, Extent of Use and Current Practices – Risk Response and Monitoring and Barriers to Risk Management.

## **RESEARCH RESULTS**

A pilot study was carried out to test the practicality of the intended survey and the outcomes achieved were the removal of ambiguity and the survey was redesigned to be more engaging. Upon contacting sample members, it was found that 14 companies did not exist and 44 companies did not have valid email addresses. The revised

sample size was therefore 123 companies from which 84 responses were received. This translated into a 68.3% response rate which was considered suitable.

### Biographical Data

It was found that almost 92% of the respondents had a post graduate degree. About 70% of the respondents had worked in the construction industry for more than 10 years and almost all of the respondents were at the ‘Senior Management’ level. The highly experienced group of respondents combined with their educational credentials and level of authority held at their respective organisations indicated that the sample was a well-qualified and highly knowledgeable group. The responses could therefore be deemed to have been received from an informed viewpoint.

### Risk Management Recognised as a Knowledge Base

The first issue that findings were presented for was to determine if RM is recognised as a knowledge base amongst construction managers and project managers in SA. These questions dealt with determining the respondents understanding of: Risk; Risk Management; Risk Management Responsibility; The effects of RM on the key project constructs and General view of RM as a knowledge base in the organisation.

**Risk:** The respondents were requested to provide a definition of risk. The replies were received as statements. Table 1, presented overleaf, outlines the frequency of key words that were incorporated as responses to the question. Multiple responses were reported as frequency of occurrences. Risk was highly associated with negativity and undesired outcomes. A comparison of theory and the survey responses leads to the acceptance that the traditional view of ‘Risk’ was well understood by the respondents. The opportunistic view of risk was very weakly supported by respondents. This finding was probably due to the fact that positive outcomes resulting from risky actions are rare.

**Risk management:** The respondents were requested to provide a definition of risk management – these were received as statements. Table 2, presented overleaf, outlines the frequency of key words that were incorporated as responses to the question. RM was understood by the majority of the respondents as a formalised process which was used to reduce risks. The sub-process of ‘Risk Identification’ was frequently considered as the entire process of RM. RM is considered a systematic approach to dealing with risk which usually comprises the sub-processes of risk identification, risk analysis, risk response and risk monitoring. Although the outcome of the field study leads to the acceptance that respondents did have a good understanding of RM, they were less clear on the sub-processes that encompass a holistic RM plan. Later on, the barriers to RM implementation are discussed and a ‘formal/proper RM process not being in place as well as insufficient knowledge/understanding of the RM process were found to be significant obstacles in RM implementation – the shortfalls in the response to this section serve to reinforce that these barriers are in fact quite prevailing.

Table 1: Key words: Definition of risk

| <b>Word or Phrase</b>   | <b>Frequency of Occurrences</b> |
|---|---------------------------------|
| Constraint; Disruption; Danger; Detrimental; Error; Harm; Hazard; Negative; Disruption; Undesired; Accident; Injury; Loss of Life; Reputational harm and damage; Threat; Impede; Wastage; Litigation; Legal | 47                              |
| Event; Circumstance/ Outcome  | 12                              |
| Health and Safety   | 8                               |
| Positive; Opportunity; Good   | 6                               |
| Time; Duration; Time overrun; Cost; Cost Overrun; Quality; Financial; Budget; Loss; Non Recoverable Cost; Profitability   | 39                              |
| Uncertainty; Unanticipated; Uncontrolled; Unexpected; Unforeseen; Unknown; Unplanned; Possibility; Probability ; Potential; Predictability; Chance  | 56                              |

Table 2: Key words: Definition of risk management

| Word or Phrase   | Frequency of Occurrences |
|--|--------------------------|
| Mitigate; Minimise; Reduce; Constrain; Preventative Measure  | 52                       |
| Procedure; Process; Systematic; Formal Activity; Actions; Mechanism; Co-ordination; Plan; Framework; Structure ; Initiative; Application | 50                       |
| Identify; Profiling; Recognise; Predict; Categorise; Define; Investigate; Prioritisation   | 48                       |
| Probability; Possibility; Potential; Unforeseen; Unknown; Likelihood   | 27                       |
| Measure; Audit; Assess: Analysis; Evaluate; Estimate; Score; Quantify; Calculate   | 25                       |
| Management; Translation  | 23                       |
| Impact; Outcome  | 15                       |
| Loss; Failure; Negative; Threat  | 13                       |
| Magnitude; Severity  | 13                       |
| Time, Cost, Quality (Negative effect on)   | 12                       |
| Controls   | 10                       |

Risk management methodologies: The respondents were requested to provide a description of RM methodologies and replies were received as statements. Table 3, presented overleaf, outlines the frequency of key words that were incorporated as responses to the question. RM methodology was described by a significant number of respondents as a formalised process indicating it is given strategic attention. It is believed that South African risk practitioners are well aware of international standards since mainly documented, international standards such as the New Engineering Contract (NEC), General Conditions of Contract (GCC) and the Joint Building Contractors Committee Principal Building Agreement Series (JBCC) were mentioned. Whilst the high reliance on contracts to overcome risks may provide a safe haven for RM, the dynamic nature of construction projects requires that managers are well trained to apply these contracts rigorously. However, the lack of strong, well experienced human resources (which is highlighted as a barrier to RM further on) leads to the belief that perhaps the reliance on contracts generally, may not be the only solution. Only a small number of respondents articulated that they relied on informal methods (such as judgement and experience) – it is strongly believed that, when all things are considered (such as barriers, discussed later), this number of observations is not a true reflection and should have been much higher.

Formal risk management practices: It was observed that a little more than three-quarters of the respondents indicated that their organisations had organisations implemented some formal RM practices, policies, principles and procedures. This finding underpins the statement made in the previous section that although some respondents only mentioned one part of the process when they described RM methodologies, it is entirely possible that there is a full process in place. Although this finding is a strong indicator that RM is recognised as a knowledge base by the South African construction industry, it is in contrast to the findings establish further on when the barriers to RM implementation are discussed where it was found that the adoption of a formal RM process was one of the key barriers to RM implementation. This conflict could mean that formal processes may be in place but are not being practiced or implemented fastidiously which is a strong theme that emerges from the other areas of the data as well.

Table 3: Key words: Risk management methodologies

| Word or Phrase  | Frequency of Occurrences |
|---|--------------------------|
| Formal RM: Risk Management Plans (Identify, Analyse, Respond, Monitor, Report on an on-going basis) | 20                       |
| Formal RM: Internal Quality Management Processes; ISO Procedures                                    | 16                       |
| Progress Meetings; Risk Reduction Meetings, Scope Definition Meeting; Risk Workshops                | 10                       |

|   |   |
|---|---|
| Informal RM Procedures; Judgement based on experience   | 8 |
| Formal RM: Use of Contracts such as NEC, JBCC   | 7 |
| Formal RM: Internationally Recognised Standards: PMBOK ; Prince 2 Standards; SANS: Risk Management – Principles and guidelines (SANS 31000:2009); Risk Assessment techniques (SANS 31010:2010); Vocabulary (Guide 73:2009); King Code | 7 |
| Risk Reporting Tools: Checklists; Project Dashboards; Top 10 Tracking; Risk Register  | 7 |
| Risk Assessment Tools: Risk Assessments; Probability and Impact analyses; Risk Matrix   | 7 |

Risk management responsibility: It is a well-established management principle that team-based efforts yield greater rewards as the RM process is more comprehensive hence the value added to the overall outcome is increased. Respondents were required, by responding to the questionnaire, to indicate where the responsibility for project risk management lay. It was observed that in most instances (71.4%) 'Clients, Consultants and Contractors' formed the team that was responsible for managing risk. Thus it is deduced that RM practitioners in SA understand that RM is not entirely a scientific procedure but more the art of collective effort which should include the all the role players in the project. Yet, if this finding is actually being practised, it is a great concern that the objectives of RM are not being met – perhaps skills shortages is the key contributor.

The Chi Square Test performed revealed statistically significant relationships between the level of education of the respondent and whoever plays a role in the responsibility of RM (p value = 0.002) – this could mean that RM is most beneficial when the people involved understand the theoretical principles behind the process which is in agreement with findings discussed later (i.e. that RM training is one of the best ways to overcome barriers to RM implementation). Another statistically significant relationship was found between length of service at the organisation and responsibility of RM (p value = 0.004) which suggests that employees who have served at the organisation (and by extension, the industry) for a long time can provide insightful tacit knowledge for RM.

Risk management and project constructs: Respondents' views on how risk management affects the key project measurement dimensions: time, cost and quality were ascertained from the following questions:

- Does the implementation of project RM create a positive effect on the level of project quality?
- Does the lack of project RM affect the level of quality of the project?
- Does the implementation of project RM create a positive effect the project cost (such as cost savings)?
- Does the lack of project RM affect the project costs?
- Does the implementation of project RM create a positive effect the project schedule?
- Does the lack of project risk management affect the project schedule?

Whilst RM is considerably broader than *just* kerbing overruns on time, cost and quality, at the heart of all risks, these three dimensions are almost always affected either individually or together. Further, these dimensions are the yardstick by which most spectators (such as clients and competitors) measure project success. Approximately two thirds of the respondents on average indicated that RM 'Always' or 'Often' had a positive effect on the management of project time, cost and quality. This is reinforced by the fact that on average the 'No' option was 2.4%. The findings strongly suggest that the RM process had a positive effect on these project controls and by extension the success of the project itself. This finding leads to the belief that the practitioners of project risk in South Africa are well aware of the advantages of RM.

General view on risk management as a knowledge base: In order to ascertain an overall view of what the perceptions regarding RM were in the industry, respondents were asked three questions: Do you believe there is good value in RM? Do you believe RM can act as a business enabler or competitive advantage? Are there any plans for RM improvement in your organisation?

None of the respondents answered negatively for these questions. The responses to the first two questions indicate that there are indeed benefits associated with the proper implementation of RM (i.e. responses to 'Yes' were greater than 90%). This finding is an assertion of the findings reported above where it was stated that RM

bore positive outcomes for time, cost and quality management. However, the lower level of agreement (69%) regarding RM improvement indicates that respondents were unsure about the actual development of RM. This is expected since barriers to the implementation of RM are extensively stated (further on), indicating that the tangible execution of RM was found to be challenging. The Chi Squared test revealed a significant relationship between 'RM Improvements' and 'Length of Service in the Construction Industry' suggesting that more experienced respondents displayed support for the unequivocal implementation of RM since they perhaps better understand the repercussions of failed projects.

### Extent to which Risk Management is applied

The second issue addressed by the questionnaire was to determine: To what extent RM is applied in construction projects in South Africa. The questions in this section dealt with determining the respondents' extent of use of: Risk identification and analysis; Risk response; and Risk monitoring and communication. The findings and analysis are discussed below.

**Risk identification and analysis:** The participants were requested respond to a question related to how frequently they identify and analyse which risks were likely to affect their projects. It was found that only 50% of the respondents identified and analysed risks all of the time. Research holds that Risk Identification is the most important step in RM hence if it is only being carried out half the time, there is clear indication of a gap in the process. The findings from subsequent sections also cast doubt on the quality of the risk analysis process since it was found that mostly personal judgement was used to analyse risks.

**Risk response:** This section dealt with the response to "Do you, either individually or as a team, perform risk response measures in your project to mitigate (alleviate) the consequences caused by identified risks?" The responses were received as interval data. It was observed that only 27% of the respondents always responded to risks. This finding implies that risks are identified more often (see above) than they are responded to again indicating that the actual implementation of RM is not well supported by respondents. There may be some vigour for RM during the planning stages of a project but with time indicated as the most frequent constraint to RM implementation, it does stand to reason that the identified risks are not always mitigated against.

**Risk monitoring and communication:** This question was directed at ascertaining if risk information was monitored and communicated to the entire project team. The responses were received as interval data. It was observed that only 27% of respondents monitored and communicated risk information all the time. A lack of action regarding RM response was expected and is reminiscent of the findings related to the RM steps discussed above where it was found that risks were not responded to often enough. It therefore stands to reason that the sub-process following on from Risk Response from that (i.e. Risk Monitoring and Communication) would also be managed in a sub-optimised manner. The lack of implementation of the follow on processes from Risk Identification were reinforced by bivariate correlation through the use of inferential statistics.

### Current Practices Regarding Risk Management

This section of the questionnaire aimed to determine what the current practices regarding RM in the construction industry in South Africa were. These questions dealt with determining the respondents' extent of use of: Risk identification techniques, Risk analysis techniques, Risk response techniques and Risk monitoring and review techniques.

**Risk identification techniques:** Respondents were required to indicate their extent of use of various risk identification techniques. It was observed that the average level of "Know and Use" was 81.2%; 'Scenario Planning' was 'known and used' somewhat lesser than the rest of the techniques (Judgement based on experience and knowledge; Review of Historical Information; Brainstorming and Checklists). Reflecting on the discussion from above which established that the process of Risk Identification was carried out only half of the time but here the average level of "Know and Use" was 81.2%. There is conflicting data. It is surmised that Risk Identification is not used as frequently as stated by respondents here - they provided an answer based on what they perceived an acceptable response to the questions.

The techniques commonly employed by the South African managers to identify risk are the same as those that are widely suggested by literature - 'Judgement based on experience and knowledge' was found to be used 100%

of the time. This finding is reminiscent of various international studies. It is disconcerting, though, that one of the barriers to RM implementation was found to be the lack of adequate skills available to carry out RM. By extension there is a concern regarding the quality of decisions being made regarding risks if the personnel making them are not experienced enough. This issue will be discussed again further on.

**Risk analysis techniques:** Respondents were required to indicate their extent of use of various risk analysis techniques (Probability and Impact Model, Analytical Hierarchy Process, Fuzzy Sets Theory, Monte Carlo Simulation and Judgement based on Experience and Knowledge). It was observed that most of the time, decisions were made 'based on experience and knowledge' and a little less than half of the respondents use 'Probability and Impact' models, with lower levels of application for the mathematical and computer based models, even though these modern quality tools are available.

Whilst it can be generalised that mathematical and scientific applications are less favoured than more straight-forward approaches, here in SA, the problem is perpetuated by the insufficient supply of technically trained professionals. There is a continual outcry in the country for more engineering and science graduates. In the meantime it is very apparent that intuition is viewed as the chief decision making tool. However, as discussed earlier, this is also a concern since the current RM practitioners may also lack the necessary experience required to make the correct choices. Further to this, statistics showed that subjective methods were inversely correlated to improving the organisation's overall RM capability indicating that mathematical techniques may actually improve the level of RM sophistication.

**Risk response Techniques:** Respondents were required to indicate their extent of use of various risk response techniques: Risk Transfer; Risk Reduction and Risk Retention. It was observed that applications of 'Risk Reduction' and 'Risk Transfer' were more widely implemented than those for 'Risk Retention'.

This finding is the generally accepted practice in management as it supports the systematic view of risk minimisation. Only 27% of respondents held that they responded to risks always but a comparison to this section finds that a large number of respondents knew and used the various risk response techniques. This conflicting outcome may be because the respondent was not equipped to answer the question hence provided a random answer to give a perceived acceptable response to the questions. Whilst this implies the data is flawed, having compared findings to previous studies, it is strongly believed that Risk Response is (as found initially) not practised often enough but, if it were, then 'Risk Reduction' would be the technique of choice to respond to risk. Risk Response was significantly correlated to improving 'Overall RM capability' proving that there is much value in mitigating against risks.

**Risk monitoring and review techniques:** Respondents were required to indicate their extent of use of various risk review techniques: Top 10 tracking; Risk reassessment; Milestone tracking; and Corrective action. It was observed that the techniques were fairly well supported.

As it was found in the previous sub-section there appears to be conflicting data in this instance as well. Earlier above it was found that risks were monitored and reviewed quite infrequently yet the majority of respondents stated they knew and used the given techniques. Again, it is believed by researcher that 'Risk Monitoring' is (as found earlier) not practiced often, but if it were, then 'Corrective Action' and 'Risk Reassessment' would be the techniques of choice to monitors risk. This indicates that there is a favourable mind-set toward risk management but the shortfalls lay in the actual implementation process which are discussed next.

### Barriers to the Implementation of Risk Management

The barriers to the implementation of RM in the construction industry in South Africa were determined by the participants' response to: What are barriers to the implementation of Risk Management; and what can be done to overcome these barriers? The responses were received as statements. The statements were reviewed and categorised into similar themes. Table 4, presented overleaf, outlines the frequency of each theme. Multiple responses were reported as frequency of occurrences.

**Time constraints:** Time Constraints was one of the main barriers stated by respondents – there were elaborations maintaining that the 'highly pressured environment' within which a construction project takes place as well as the 'fast paced nature of projects' leads to there being little or no time for RM.

Cost constraints: The cost of implementing and administering a proper RM process was often found not to be budgeted for, making implementation near impossible. The extremely competitive nature of the industry compels organisations to ensure project costs are kept to a minimum by reducing the resource budget to key personnel only (who often also do not understand or have the time to carry out RM).

Table 4: Categorisation of themes for barriers to RM implementation

| Theme   | Number of Occurrences |
|---|-----------------------|
| Time Constraints  | 29                    |
| Attitude/ Perception is that RM is not considered necessary or beneficial | 27                    |
| Insufficient Knowledge/Understanding of the RM process                    | 17                    |
| Communication/Information Barriers  | 16                    |
| Lack of management/organisational/team support                            | 16                    |
| Cost Constraints  | 12                    |
| Insufficient attention given to Risk Identification Process               | 11                    |
| Lack of adequate skills to carry out process                              | 10                    |
| Resource Constraints  | 9                     |
| Formal/Proper RM Process not in place                                     | 7                     |
| Identified Risks are not responded to or monitored                        | 6                     |
| Unclear Roles and Responsibilities  | 3                     |

Attitude or perception is that RM is not considered necessary or beneficial: This issue was cited frequently by respondents in statements such as ‘Personnel not wanting to embrace risk management procedures’; or ‘Ignorance and general lack of appreciation of RM principles’. Earlier it was reported that RM was viewed as a ‘business enabler’ and ‘good value’. However, again, when the actual implementation of RM is investigated, role-players display a conflicting attitude in that they do not act in a manner that harnesses RM processes.

Insufficient Knowledge/Understanding: It was also found that there was ‘Insufficient Knowledge/Understanding of the RM processes and a ‘Lack of adequate skills’ to carry out processes. This barrier is consistent with earlier findings where it was established that the majority of processes were often not used. The skills shortage in South Africa is a well-known problem facing the country. This is one of the reasons why decisions based on ‘Judgement and experience’ are used more often than formal processes.

Communication/ Information barriers: Many respondents also stated that RM ‘received insufficient attention’ and ‘no formal processes were in place’. These findings are expected since the skills required to carry out the processes are in short supply. The fact that proper processes were not in place also results in barriers such as ‘communication/information barriers’ ‘Identified Risks are not responded to or monitored. There are also ‘unclear roles and responsibilities’ which further complicate the management process. This barrier is congruent with findings from the previous sections where it was established that the actual implementation of RM is flawed in the industry.

### Suggestions to Overcome the Barriers to the Implementation of Risk Management

The respondents were requested to provide suggestions to overcome barriers/difficulties to implement risk. The responses were received as statements. The statements were reviewed and categorised into similar themes. Table 5, presented overleaf, outlines the frequency of each theme.

RM training/mentoring: Whilst most participants simply suggested ‘Training’, specific suggestions included the use of simpler techniques such as ‘charts and pictures’- this can prove useful when dealing with small, medium and micro enterprises (SMME’s) where the contractors generally have little formal education. The introduction of RM courses at tertiary education level will most likely lead to an improved understanding of mathematical and scientific

approaches thus increasing their chances for adoption. A number of respondents suggested that senior members of the organisation must be made to attend RM training – this suggestion is quite powerful as it may help to underpin the suggestions made below.

Implementation of a formal RM process: If a formal process is adopted, this would overcome the challenges related to communication and roles and responsibilities. Further, suggestions related to accountability, time constraints and cost constraints would inevitably be integrated into the RM plan. Also, the implementation of a formalised process would imply that RM receives strategic attention hence overcoming the challenges of the lack of management, organisational and/or team support.

Change in attitude and perception / increased RM awareness: Whilst this suggestion was made quite often, upon reflection, it is felt that it cannot stand alone as a suggestion – a change in attitude can only result from undertaking the previously discussed suggestions – where training and organisational support sets up the required platform to embrace RM. The suggestion to incentivise RM will assist to motivate but the risk aware culture can only be sustained if there is an inherent belief in the value added by RM.

Suggestions are discussed further when the study is concluded.

Table 5: Categorisation of themes for suggestions to overcome barriers to RM implementation

| Theme  | Frequency of Occurrences |
|--|--------------------------|
| RM Training/ Mentoring   | 35                       |
| Formal/Proper RM Process to be put into place with a focus on Roles and Responsibilities | 25                       |
| Efficient Communication/Information Dissémination Structures                             | 20                       |
| Experienced Resources to be provided for RM  | 13                       |
| Insist on management/organisational/team support   | 11                       |
| Change in Attitude and Perception / Increase RM awareness                                | 9                        |
| Risk Identification Process to be given sufficient attention                             | 7                        |
| Make people accountable for RM   | 7                        |
| Incentivise RM   | 7                        |
| Time to be given to RM   | 4                        |
| Assign cost to RM  | 4                        |
| Use mathematical/computer models analyse risk  | 2                        |

## CONCLUSION

The premise of this study was to undertake an evaluation of the status of Risk Management within large construction companies in South Africa. It aimed to answer four Research Questions (RQs). The findings and responses to the research questions were established from the responses to a survey questionnaire. The conclusions are discussed next.

Research question I: Is Risk Management recognised as a knowledge base amongst Construction Risk Practitioners in South Africa? Every one of the constructs that was employed to the outcome to this issue was well supported. The answer to RQ I is, therefore, affirmative.

Research question II: To what extent is RM currently applied in construction projects in South Africa? 'Identification and Analysis of Risks' was found to be carried out more often than not but the ensuing sub-processes of 'Risk Response' and 'Monitoring and Communication' of risk information which were found to be poorly applied in the industry. These outcomes were echoed by previous local and international studies. A striking theme of 'all talk and no play' emerged from the data reinforcing that RM implementation is flawed in the industry hence the finding for RQ II is that RM is not applied to an acceptable extent.

Research question III: What are the current practices regarding RM in the construction industry in South Africa? Findings were consistent with previous research for the majority of constructs. It was established that apart from 'Risk Identification', the ensuing techniques employed to undertake risk analyses and responses were not well known or used. The mathematical models for 'Risk Analysis', specifically, were not well understood at all. Judgement based on intuition and experience was the commonly cited tool of choice for the sub-processes. These findings are largely reminiscent to previous local and international studies.

Research question IV: What are the barriers to the implementation of RM in the construction industry in South Africa? It was established that a lack of understanding of the RM process and a lack of funding for the process lead to the major barriers such as ignorant attitudes and shortcomings in the process's implementation. A fundamental barrier was found to be the quality and shortage of critical skills required to undertake efficient RM. Time restraints were also cited as a serious barrier since construction projects are so dynamic in nature. Findings were consistent with previous research for the all of the cited barriers.

## RECOMMENDATIONS

The following recommendations were made by participants in the field study to improve the implementation of RM in the construction industry in South Africa: RM training/mentoring, implementation of a formal RM process and change in attitude and perception to increase RM awareness. Whilst these suggestions are all useful, it was observed that they cannot be implemented individually – it is imperative that a strong leader spearheads a systematic RM improvement process in the organisation which seeks to steadily overcome barriers to the implementation of RM hence the researcher recommends a process, discussed below, to improve Risk Management implementation.

### Risk management improvement process

The framework from Graham and Englund (2004) are used as the foundation of the proposed Risk Management Improvement Process (RMIP).

Development of senior management support: When the senior managers of an organisation are open minded and receptive toward RM, it creates the correct platform to adopt a new business management tool. There are several ways to concretise senior management support such as:

- Giving RM strategic emphasis to be geared towards meeting RM objectives in the short and long term.
- Making senior managers' risk aware: In order to change the attitudes of the 'body', the attitude at the 'head' needs to be realigned.
- Engagement of outside help: If the senior managers are not sure how to proceed with the implementation, they could engage the help of external professionals who are trained to specialise in RM implementation.

Development of an implementation plan: Once senior managers have chartered their support toward RM, they would need to progress towards creating an implementation plan. This plan should:

- Comprise a cross functional team as this will result in a comprehensive plan that is easily conveyed.
- Ensure that adequate time and budget as well as the correct resources are accorded to RM at every step.
- Develop of metrics to measure and report on the progress.
- Institute a wide strategic campaign that drives the new RMIP.
- Be reviewed regularly in order to keep it relevant and to drive improvement.

Establish a risk manager's development programme: Upper managers need to determine the attributes they deem essential for potential risk managers and contributors to the RM process and inculcate them through training. The training must incorporate: RM techniques, behavioural aspects, inter-organisational management and make a strong business case for the successful implementation of RM.

Make risk management a career position: If the company is serious about RM, it must be prepared to make RM a career position and aim to have a dedicated risk manager on every project.

The premise of this paper was to state the findings of a larger study that evaluated the status of RM within the construction industry in SA. To this end, a survey was carried out in order to provide answers to the pertinent research questions. Summarily the findings indicated that whilst RM is recognised as a knowledge base in SA, it is not practiced and understood adequately. Barriers to implementation were found to include insufficient skills, time and budget to front the process. It was also strongly indicated that there exists an ignorant attitude towards RM. In order to counteract this and improve the situation going forward, an RM improvement process was described.

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# A method to determine the capacity for release in a large organisation

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## 1 Background

One of the challenges some very large organisations with more than one IT development team and multiple business units face, is a way to determine if a particular solution will be able to deploy on a specific date within a specific release window. One of the other challenges is to determine how many projects can actually deploy on a specific day. The scale of the organisation in this context is around 250 concurrent projects, a 1000 development and maintenance engineers, 150 applications and 4500 configuration changes per month. To resolve this challenge involves significant skill. (Rana et al., 2005).

## 2 Problem Statement

Release Management involves the people, functions, systems and activities to package functionality for release into production (Lahtela et al, 2011). A constraint in most organisations is the number of release windows available to deploy to production. When there are mission critical systems the downtime needs to be kept to a minimum to ensure that operations are not impacted. A major improvement to project throughput in an organisation is to optimise the use of these deployment windows (Vermeulen et al, 2012). This is a much neglected discipline in Information Technology Project Management as well as Software Engineering. In very large organisations with more than one business group, each having more than one business unit and at the same time having more than one IT department with various development and testing platforms but only one production system, it is very difficult to determine if all of the solutions that was built and tested could deploy on a specific day or more accurately on a specific time on a date within a predefined deployment window. During the course of our research, we spent some time searching for estimation models that can assist in the calculation of the size of a solution in order to determine if it would fit into a deployment window based on the committed scope of work. Apart from very complex mathematical models that assume a very mature organisation in terms of capability and maturity, very few models actually exist to suit a large enterprise. We had to find a simpler way of improving release management.

This paper is aiming to provide an insight to an approach that was developed to answer the following questions:

- How does one measure the release capacity in an organisation to enable predictable release?
- What is the size of the release window on a specific date measured in possible release units (PRU)?
- Which available release window would suit a solution based on its calculated PRU?
- How to use the calculated PRU combined with the delivery probability based on quality and progress to feed back into the integrated release and delivery planning in order to manage the business expectations its date and quality of delivery and to arrive at realistic timelines to develop, test and deploy whilst increasing the predictability of delivery.

### 3 Solution

In this paper we introduce the notion of a Possible Release Unit (PRU). A PRU is influenced by a range of variables which include the number of databases, complexity of the solution, the number of resources needed for deployment, the number of systems involved, the number of installations, etc. The constraints are the hours available for release, which in turn are influenced by freeze periods, availability of weekends and public holidays, deployment specialists, etc. Consideration must also be given to ensure that there is enough of a safety margin if installations need to be rolled back.

The PRU metric is instrumental in predicting delivery and calculating the probability of deploying the solution during the selected release window, therefore providing a method to determine the capacity for release in a large organisation.

### 4 Benefits

Improved planning around Release Management will ensure that more projects can be delivered quicker to the end customer. This has huge monetary gain to the organisation. By implementing this approach we brought the average deployment time down from around 6 months to 3 months for roughly 250 projects across 150 applications.

Even more important than the increased throughput has been the improved predictability to the internal customer as the planning capability improved radically. In the past the planning was not elegant which caused projects to be removed from the release window days before deployment.

The contribution to the discipline of Information Technology Project and Portfolio Management is significant as our solution improves the schedule predictability and it reduces the lag time to deployment across a portfolio of Information Technology projects.

### 5 Literature Review

The aim of this section is to outline previous studies conducted in the context of this paper. Academic journals has very little to say about release management and it seems that it is a very neglected part / topic of Software Engineering.

Software release management and its significance are often overlooked by many organisations. A software release can be defined as an entirely assembled version of a software product that is ready to be released and used by a specific target audience (Kerkhoff, 2002). The management component of software release describes the techniques required for accumulating the complete release, and having its components defined clearly and exclusively.

Release management is the relatively new but rapidly growing discipline within software engineering of management software releases. As software systems, software development processes and resources become more distributed, they invariably become more specialised and complex (Blokdijk, 2008).

Release management conducts management and distribution of software and hardware versions in use, which are supported by IT service provision in order to comply to the agreed level of service (Blokdijk & Menken, 2008)

Release management is a core function in configuration management that focuses on packaging a system for promotion from development to quality assurance to production (Aiello & Sachs, 2010).

Research describes a release as a new version of an evolving product or anything that can usually be related to some sort of intermittent development corresponding to an annual or quarterly timeframe (Günther, n.d).

Release planning is put into practice so that features are assigned to certain releases so that risks, technical, resource and economical restrictions are met. Features may be described as a logical unit of behaviour defined by a set of functional requirements.

Release planning is a significant task within any software specific development project. Research states that the accuracy of time in releasing software will result in higher market profile and the frequency will minimise cost (Krishnan, 1994). Release management can also be used to improve throughput, where throughput is defined as discreet functionality to be delivered within a given timeframe (Langerman et al, 2012).

The purpose of the release and deployment management process is to plan, schedule and control the movement of several releases between a number of test, pre-production and production environments (Bann et al, 2010). This release and deployment management process also establishes an effective use of newly implemented changes (Cartlidge et al, 2001).

One of the issues with Release Management is the measurement of the release capacity of an organisation to enable predictable release (Ferreira et al, 2014). Research has taken us to review costing models to try and gain an insight into determining the size of releases (Software Development Cost Estimating Guide Book 2010). This did not provide any useable approach as it mostly concerns budget to complete the development. A mathematically-stated, metric-based model exists in a release planning framework that is tuned from commercial release cycles of a vendor and their specific development organisation (Penny, 2003). The framework also suggests a non-traditional approach to future estimation research that hopes to improve the accuracy of estimates.

## **6 Possible Release Unit (PRU) Methodology**

This paper examines the method used to determine and define the size of a release on a particular day in a specific deployment window. The unit of measure is referred to as Possible Release Units (PRU). In order to arrive at the calculation of possible release units (PRU), some analytical work was undertaken as known methods and practices could only be applied to some, but not all of the IT departments in the organisation. The people, process and technology aspects had to be considered and understood due to varying levels of maturity of the technology stacks in use since the early nineteen sixties as well as varying levels of process maturity and developer discipline as well as different development methods and standards. It soon became apparent that the skill level of staff involved, the complexity of the solution, the number of application areas involved, the number of times similar solutions were implemented and other important aspects play a major role in the delivery of solutions on a specific date. In order to predict if a specific solution would fit into the available release window, all of the know variables are factored in.

### **6.1 Definition of a possible release unit**

What is a possible release unit (PRU)? It is an empirical value that is calculated based on a number of variable and fixed variables in order to arrive at a value on whether to deploy / implement within a specific release window. This calculation is done before development starts and is described in detail below.

### **6.2 Release Principles**

The following release principles are applied during the calculation of the possible release units:

- A release calendar must coexist with the forward schedule of change as an acceptable mechanism to display the content of the change on the day of deployment.
- The description of configuration items that will be under change must be at a level that makes it possible to repeat the process for different projects and arrive at the same outcome / calculation. This is typically documented in a release note.
- An integrated project plan for the organisation must exist and must provide information at a useable level in order to determine the impact of a proposed change on a specific date.
- The release calendar, integrated project plan and forward schedule of change must be 100% aligned. This implies that the impact of changes on one could be translated in terms of the other.

### **6.3 Considerations**

In order to arrive at calculating possible release units, all of the following aspects and variables are considered as it impacts the calculation of the PRU and the allocation of a release window:

#### **6.3.1 Size of the organisation**

The bigger the organisation, the higher the probability that there will be a high rate of change. In order to get the calculation as reliable as possible, the number of changes per business unit needs to be established. The more business units per organisation sharing applications, the higher the probability of change to a code component. The more applications used in a multi-departmental organisation the more challenging the release management becomes. The more interfaces between various applications with a high coupling, the more complex the solution and the associated release. What is relevant to the calculation? Are the development areas managed individually or are they all part of an integrated management system for business: i.e. are they using a federated model that is centrally controlled or are they working in isolation? The more they work in isolation (outside central management and control) the

more inaccurate the possible release unit calculation would be, unless they share their possible release unit information. Is the Enterprise Service Bus (ESB) effectively used or is the organisation still in a transition phase where some direct interfaces still exist between applications?

### **6.3.2 Number of projects planned *per annum*.**

The higher the number of projects planned annually, the higher the probability that more than one solution will have to be deployed during the same release window. The potential overlap of these deployments will also have to be properly analysed in order to determine if there are conflicting timelines; e.g. the power supply being serviced that requires an orderly shutdown of servers for 2 hours whilst someone else was planning an operating system (OS) upgrade at the same time.

### **6.3.3 Number of development areas**

For each development area, the technology stack(s) / component(s) under change need(s) to be considered:

- Back end (mainframe)
- Mid-tier
- Number and type of interfaces
- Enterprise service bus (ESB)
- Front end components and channel (browser based, tablet, phone, PC screen, graphical user interface (GUI))
- Business process management rules
- System rules
- Reference data such as master data (product data), system data and other catalogue data (in some cases this is referred to as parameter information).

The reason why we have to go to this level is simply that each component might require a different type of deployment with different level of complexity and therefore different release method that influence the PRU calculation. Combining the mentioned components influence the calculated PRU value.

In some cases resources are shared across development areas for example, an ESB resource might be required to make changes to different services for different interfacing applications on a particular day during deployment.

### **6.3.4 Number of environments available for development and testing before deployment (path to production)**

The only reason why this is considered is for the purpose of understanding the probability of missing the release window. Should the number of environments through which a solution has to be promoted / propagated be high, the potential to discover more environment related bugs is higher than in a landscape with few environments. Obviously the more bugs, the slower the progress, the higher the probability that target dates might be missed.

### **6.3.5 The time in environment**

Apart from the path to production, the time in environment is crucial in terms of the delivery plan in order to arrive at the implementation date.

### **6.3.6 Maintenance calendar**

The maintenance calendar influences the release calendar and therefore the available number of release slots / windows. If the maintenance of infrastructure and the networks are not kept up to date, or if the business drive favours new feature delivery and overrides maintenance, it may influence the available number of release windows negatively at a later stage as you might have to allow for unplanned maintenance to be carried out for emergency repairs.

### **6.3.7 Quality of solutions built**

As in the case of the number of available environments, the quality of the solutions is only monitored to ensure we maintain a view on the progress of the solutions through the environments. It has an impact on the time in environments. Bad quality might delay the throughput and co-existence of other solutions in the same environment.

### **6.3.8 Planning maturity**

If the organisation allows scope creep or date changes or is not committed to consequence management, traction on delivery might not be optimal and will result in replanning and therefore recalculation. If the level of planning is also at too high a level, the required information will not be available to do the calculations properly.

### **6.3.9 Deployment method**

Each organisation has its own preferred deployment approach and associated tools. If it is a manual process as a result of the tools in use or due to the complexity of the solution, it will impact on the implementation and therefore the release window.

### **6.3.10 Freeze periods**

In some organisations, specific times are set aside for financial reconciliation periods or periods of high trading during which no software changes are allowed such as Christmas or national holidays. This could be at the end of each month, during end of the financial year or during the vacations when a high availability of stable applications is required. This is referred to as freeze periods in this paper. These periods typically repeat each year depending on the type of business. The freeze periods are blocked out on the release calendar and are not considered for releasing software.

### **6.3.11 Iterations / continuous review**

One of the outstanding factors for consideration is that in an evolutionary environment related to or driven by competition, change is a constant. This could mean that solutions might be subject to scope changes and therefore, the PRU calculation will have to be continually reviewed along with the target release window. If an iterative approach is used it therefore require regular iterations of the release calendar. One important lesson learnt is that the longer you take to build, test and release the solution, the more likely changes will affect it and therefore more rework and iterations.

### **6.3.12 Number of sites to be distributed to**

It would be possible to expand the PRU calculation to include the number of times a solution needs to be deployed based on the number of sites and the number of people involved every time. It is ignored for now. In the reference site, all code is managed centrally and the deployment is done once. If the front-ends are versioned, the distribution could be managed in different ways.

## **6.4 Expected Outcomes**

The expected outcome of a PRU calculation is a number for a solution that will be added to the existing values for a target release window reflected in a release calendar.

Some of the other expected outcomes of the PRU calculations are to assist the organisation with a way in which they can reliably plan and schedule releases on regular basis with a high level of predictability. The PRU calculation should be augmented and supported by other project management tools such as the schedule performance index (SPI) that will also assist the release manager along with the project manager in understanding what the probability of rework is.

## **6.5 Critical Success Factors**

In order to do the PRU calculation for a particular day, a number of supporting functions and processes must be in place to provide the answers and information. These are described below in some detail.

### **6.5.1 Integrated Project Plan**

In order to determine the demand for release, you have to have a roadmap view of at least 12 to 18 months forward looking. An integrated program view based on the functional and technical areas involved is required.

As the PRU is based mostly on the technical impact derived from the functional change, the detailed systemic impact analysis is required.

### **6.5.2 Systemic impact assessment information**

In order to do a systemic impact assessment, the architects, designers and technical specialists have to document the technical specification on which the solution will be built. The testers use the same specifications to derive their test cases. It is the job of the systemic impact assessment team to unpack the proposed changes into the software and infrastructure components that will undergo change.

### **6.5.3 Environments utilisation plan**

The time spent in an environment is dependent on the time it will take to determine the quality of the solution that was deployed for validation and verification / testing. The testing and debugging time will determine the speed at which the solution can proceed to production. The environments utilisation plan also provides a “path to production” as it provides a predicted code baseline on which to build in order to go live with a specific solution.

### **6.5.4 Business Involvement**

The way in which the solutions get deployed / released as well as the frequency, should be agreeable to business. If a decision is to deploy a solution to a part of a country or a specific customer segment, the release should be built around that. The impact of business involvement to the PRU calculation is negligible as the PRU is mostly based on the technical components and not the number of physical business sites in which these components will be activated.

### **6.5.5 Discipline**

As with many things related to IT, the diligence and discipline of the applicable staff determines the re-use pattern and to what extent the estimation process improves the calculation. The more unpredictable or the more unstable the environment, the less accurate these calculations will be.

## **6.6 Calculation**

The calculation of a solution's PRU can start as soon as sufficient technical information is available. The high level process to get to the desired level of detail could follow the following steps:

1. Complete the functional specifications and have them signed off by business.
2. Based on the functional specifications, develop and compile the technical specifications.
3. From the technical specifications, determine the number of affected application areas.
4. From the affected application areas, determine the number and type of software configuration items / code components that will undergo change to enable the solution.
5. Complete the estimation for the effort to build, test and implement the solution in aid of the SPI and the target date for completion.
6. Complete the PRU calculator by providing the values.
7. Overlay the PRU values on the release calendar for the intended date.
8. Update the allocation graphs to show whether the solution will be able to fit in the release window or not.
9. Adjust the date of the project to fit into a suitable release window considering the input / feedback from the systemic impact assessment team and the agreed date and time with business.
10. Agree delivery date with sponsors via the project manager.
11. Once date is fixed, firm up delivery slot and execute on delivery plan to meet implementation date.

### **6.6.1 Variables**

In the calculation of the PRU, a number of variables were identified that are used in the calculation. These variables will differ from organisation to organisation and is largely dependent on the type of organisation, the

industry it is competing in, the number of application areas it is supporting, the scale of operations, the transactional volumes, value, and other aspects.

- **Number of previous installations**

Experience and available skill play a very important role when it comes to a repeatable process. If this is combined with a knowledge base of lessons learnt, then the accuracy of the estimated time to deploy increases by a significant number.

- **Database changes required**

In most cases where database changes are required, additional time is required to first make a back-up and do some housekeeping, before the new database changes can be performed. Other factors that will add time could be: whether or not new table structures need to be created, if scripts need to be run to populate the tables, if indexes need to be created, if workspaces need to be added, if database table extends need to be managed, if a re-org is required and the list goes on and on. If a simple front-end change to change a label on a HTML form is compared to a database change, then it should be clear that the database change will require much more time than the simple screen change.

- **Number of application areas involved**

The more application areas involved, the more complex the installation as timing and sequence is important. The post implementation and verification is therefore also more time-consuming. In the case where a number of front-end, middle tier and backend changes are required for a solution, the coupling and number of interfaces will contribute to the complexity.

- **Number of people required to deploy**

The assumption is that the more people the solution requires to deploy, the more time it will take to deploy and in case of an unsuccessful implementation to roll back to the previous stable state. This is also related to the number of application areas above. It is not uncommon for a very large organisation to have a senior developer, test manager, release manager, configuration manager, database administrator, network support technician, architect, business analyst, SOA expert and server administrator all working together to implement a change. This also points to complexity and skill requirements. Very few organisations use their most junior staff to deploy mission critical solutions in a manual way. In most mature organisations, automated code deployment tools are used.

- **Complexity of the solution**

Needless to say: the more complex the solution is, the more time it will consume to implement especially if there are a number of interfaces and databases involved. The complexity is determined by the number of technologies involved, the number of interfaces, the number of database changes, if it impacts on front-end, mid-tier and back-end simultaneously, shared code, common components, etc.

## 6.6.2 Constants

There are some constants that can't be controlled such as the number of hours in a day. Time can't be created, so the number of hours in a week can't be increased (read: the hours in a release window cannot be magically increased). The decision should be how to optimally make use of the available time and not to waste any.

- **Hours available for deployment**

As stated above, every organisation has a set rhythm and delivery schedule associated with that. It is the release manager's responsibility to uncover this and discuss this with the production support and maintenance teams to ensure the understanding is sound, agreed to and can be used to base the deployment windows on. There are only 52 weekends in a year. If we use every weekend for deployments, it would be possible to deliver a lot of change into production. However, finding the sweet spot between change and stability is one of the arts of release management. In our example, we are going to use the following as an illustration of number of available release slots in a financial institution having month end periods for reconciliation and invoicing etc:

Number of available weekends in a year = 52

Number of weekends required per month for billing, reporting and reconciliation = 2 (first and last weekend of every month)

Effectively remaining = 2 weekends per month for months that do not fall in yearend freeze.

Yearend freeze = 2 months (typically when most people take leave in the southern hemisphere + when transactional volumes in a retail business is at its highest = from mid-November to mid-January)

Allocation of maintenance slot = 1 weekend per month.

Remaining time for code releases = 1 weekend per month + agreed time on a weekday depending on the technology involved.

From this it should be clear that the organisation only has 9 weekends to deploy software and 9 weekends for maintenance and infrastructure upgrades.

The possibility of deploying after or before normal working hours on a weekday could also be investigated and in the examples below, it will be clear that some technologies lend themselves for quick upgrades before the normal day starts, i.e. before normal trading starts. In the case of a 24/7 business, things can become a little more tricky and this is where the use of the business readiness site (BR) / standby site plays an important role. Obviously, the business' risk appetite and profile plays an equal role in the determination of the release calendar and whether it would allow for the BR site to be used.

- **Contingency / Safety margin**

In most implementations, the validation and verification of the implementation is seen as either part of the implementation or as post-implementation activities. Whatever the case may be, it is always a good idea to leave time for roll back should an implementation be unsuccessful. The roll-back should be described and practised during the testing phase. The previous stable state should be documented in the configuration management system as the previous stable baseline before the upgrade / code promotion / deployment starts. The impact of a roll-back to business and more specifically the clients / customers should be minimal if not zero. The safety margin is dictated by the organisation's risk appetite and maturity.

- **Stabilisation period**

In some organisations, a stabilisation period might be enforced after a major release / implementation to allow for specific tasks to run. Few organisations have a pre-production environment that is a duplicate of production as it requires a considerable layout to maintain and support such a venture over and above the BR site(s). In this lies the shortfall where testing might not reveal the exceptional cases that is only revealed when a specific task is run at a specific phase and time in production. This could lead to production fixes and hence the call for a stabilisation period.

### 6.6.3 Process of PRU calculation

This section describes the PRU calculator in detail by supplying the possible values that are considered in the calculation. A screenshot of the Excel based calculator is shown below.

| Inputs per implementation window of each initiative          |          |
|--|----------|
| Select from the dropdown ->                                  | Select   |
| Number of Application Areas affected?                        | 1        |
| Simple or complex implementation?                            | Simple   |
| Number of resources required to implement?                   | 1        |
| Projected number of hours required to implement the solution | ≤ 1      |
| Number of similar implementations? (Deployment risk)         | >3       |
| Deploy on which day?   | Saturday |
| Database changes?  | No       |
| Implementation Classification                                | 4        |

Figure 1: Screenshot of PRU Calculator input screen

- **Inputs required**

Number of Application Areas affected (AA). All the areas involved in providing the single solution are added together. The possible values and associated weights are:

| Application Areas | Weight |
|-------------------|--------|
| 1                 | 1      |
| 2                 | 2      |
| 3                 | 3      |
| 4                 | 4      |
| >4                | 5      |

Simple or complex (C). The possible values and associated weights are:

| Complexity | Weight |
|------------|--------|
| Simple     | 1      |
| Complex    | 5      |

Number of resources required to implement (RR). The total number of all resources required to implement the change across all the application areas is required. The possible values and associated weights are:

| Number of resources | Weight |
|---------------------|--------|
| 1                   | 1      |
| 2                   | 2      |
| 3                   | 4      |
| >3                  | 5      |

Projected number of hours required to implement the solution (IH). The time to implement this for a specific solution is calculated and provided. The possible values and associated weights are:

| Hours to implement | Weight |
|--------------------|--------|
| $\leq 1$           | 1      |
| $> 1 \leq 2.5$     | 3      |
| $> 2.5 \leq 5$     | 4      |
| $> 5$              | 5      |

Number of similar implementations (deployment risk [DR]). How many similar deployments have the organisation undertaken with the same resources. The possible values and associated weights are:

| Number of similar implementations | Weight |
|-----------------------------------|--------|
| 0                                 | 5      |
| 1                                 | 4      |
| 2                                 | 3      |
| 3                                 | 2      |
| > 3                               | 1      |

Deploy on which day (DW). There is usually more time available on a weekend than during the week. However, it would be unwise to wait for a weekend if a deployment can be done on a Monday morning as 02h00 for example. The possible values and associated weights are:

| Day in week | Weight |
|-------------|--------|
| Saturday    | 4      |
| Sunday      | 5      |
| Weekday     | 3      |

Database changes (DC). Having to make database changes will add time as backups, restores, indexing, table administration, profiling etc. adds time. The possible values and associated weights are:

| Database changes | Weight |
|------------------|--------|
| Yes              | 5      |
| No               | 1      |

- Algorithm**

The PRU is then calculated using the following very simple formula:

$$PRU = AA * C * RR * IH * DR * DW * DC$$

### 6.7 Analysis

Once all the various solutions' PRU values are calculated, the values for a particular day are added and consolidated. The maximum PRU for a weekday is 4 496, for a Saturday 10 000 and for a Sunday 18 750. It must however be noted that there is another factor that needs to be considered in this and that is if two or more deployments share resources. This could mean that we then have to recalculate the window as a single solution and then determine if everything will fit. It was discovered that in doing so, many solutions can be deployed more cost effective as the resource cost could be shared between projects. A combined implementation plan follows.

These calculated values can then be capture in a table for a specific deployment window as depicted below:

| Jun-13      | 2013/06/10 | 2013/06/11 | 2013/06/12 | 2013/06/13 | 2013/06/14 | 2013/06/15 | 2013/06/16 | 2013/06/17 |            |
|-------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|
|             | Monday     | Tuesday    | Wednesday  | Thursday   | Friday     | Saturday   | Sunday     | Monday     | Allocation |
| Contingency | 2248       | 2248       | 2248       | 2248       | 2248       | 3000       | 5625       | 2248       | 22113      |
| Projects    | 15000      | 0          | 0          | 0          | 0          | 340        | 25405      | 0          | 40745      |
| Available   | -12752     | 2248       | 2248       | 2248       | 2248       | 6660       | -12280     | 2248       | -7132      |
| MAX PRU     | 4496       | 4496       | 4496       | 4496       | 4496       | 10000      | 18750      | 4496       | 55726      |
|             | Over       |            |            |            |            |            | Over       |            | 113%       |

and then plotted on a graph:

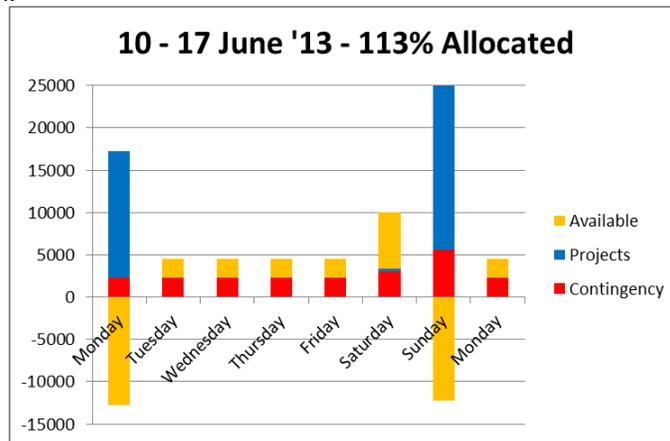


Figure 2: Graph of allocation on a release calendar

## 7 Conclusions and implications

In the organisation where a variant of the PRU is used, the simplicity of the calculations has enabled the technical specialists of their Systemic Impact Assessment team to calculate the PRU values whilst doing their

impact assessments. It has aided them in understanding which questions to ask whilst at the same time understanding the scope and impact of the change. This in turn has helped the Integrated Project Planning team to provide feedback to the project managers who in turn could liaise better with their business sponsors in terms of the possible release date.

The release management team in turn can provide a view of the allocation of timeslots to projects and like in the case above, can assist the organisation to decide on which date a solution will fit in and therefore will be able to deploy. Once a suitable slot is found, the release date can be set and marketing can then start their drive where applicable.

The PRU metric is instrumental in predicting delivery and calculating the probability of deploying the solution during the selected release window, therefore providing a method to determine the capacity for release in a large organisation.

The contribution to the discipline of Information Technology Project and Portfolio Management is significant as our solution improves the schedule predictability and it reduces the lag time to deployment across a portfolio of Information Technology projects.

The PRU methodology was implemented in a very large South African financial institution during 2013 and 2014. The scale of the organisation in this context is around 250 concurrent projects, around 1000 development and maintenance engineers, 150 applications and 4500 configuration changes per month. Qualitative feedback from the business and project management community is that schedule predictability has improved dramatically and as a rule of thumb figure the Business Community and the CIO community feels that throughput has increased with over 10%. By implementing this approach we brought the average deployment time down from around 6 months to 3. These are all estimates. Quantitative feedback is hard to come by as function point baselines (necessary for throughput calculation) and consolidated schedules (necessary for predictability) were not available for such a large portfolio of projects and changes. The deployment of the PRU methodology was hailed as a success and will continue to be used at this financial institution.

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## 9 Figures

Figure 1: Screenshot of PRU Calculator input screen

Figure 2: Graph of PRU allocation on a release calendar.

# TOWARDS A FRAMEWORK FOR PROJECT MANAGEMENT INTELLIGENCE (PMInt)

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## Abstract

*Project management as a discipline needs project management intelligence (PMInt), which enables software project managers to make informed and sound project related decisions. The basis of this claim is on the premise that projects are business constructs, and as businesses depend on business intelligence (BI) to drive excellence so are projects in terms of project management intelligence.*

*The concept of project management intelligence is a new one and therefore there is a need for development of sound frameworks and models to support PMInt. The extension of business intelligence to projects presents an opportunity in that business intelligence models and frameworks may be extended to develop frameworks for project management intelligence. It is on the basis of the above discussion that this research paper proposes the development of a conceptual PMInt framework which has its foundation on business intelligence frameworks and models, such as Text-driven BI framework, BI-driven Data Mining framework, etc.*

*This research paper argues that the proposed PMInt framework will, amongst other things, serve as a useful guide for developing much needed intelligence tools in the field of project management.*

Keywords - framework; project management intelligence; intelligence; business intelligence

## INTRODUCTION

Software project management environment is as challenging and complex as the business environment and this warrants that the project management discipline should use tools which are similar to business intelligence tools in order to improve projects performance. That is, the project management discipline needs project management intelligence (PMInt) tools which should enable software project managers to make effective and timeous project related decisions [1]. This requirement is partly premised on the fact that projects are business constructs and thus need project management intelligence just like business needs business intelligence (BI). Reference [1] states:

*“Project management intelligence is to project management what business intelligence is to business.”*

The same authors went on to propose a PMInt tool which is modeled on business intelligence.

Given that project management intelligence is a new ‘concept’, there are no frameworks and models on which to base the development of project management intelligence tools. It is therefore on the basis of this gap that this research paper proposes a project management intelligence framework. The word framework is defined as “a real or conceptual structure intended to serve as a support or guide for the building of something that expands the structure into something useful” [2]. In the context of this research paper, the proposed framework would serve as guidance in the development of project management intelligence tools.

The approach taken in developing the proposed novel conceptual PMInt framework has its basis on the business intelligence framework which has its foundation on text-driven framework, data-mining framework and data analysis framework. As a form of testing and validating this framework the authors used some practical real-world scenarios.

The remainder of this research paper proceeds as follows: Section II discusses business intelligence. Section III presents the proposed PM/Int framework. Sections IV discusses benefits which are derived from the use of the proposed PM/Int framework, while Section V presents conclusions of this research study.

## BUSINESS INTELLIGENCE FRAMEWORK

The use of intelligence in business is based on the transformation of organizational data into useful information which is then used to make informed business decisions with the aim of improving business performance. The tool that is used to do all the abovementioned process is called business intelligence tool [3] [4]. Organizations use business intelligence as a decision support tool for improving decision making process [5] in strategic and operational levels of the organization. Reference [6] says the following about BI:

*“First, the core of BI is the gathering, analysis and distribution of information. Second, the objective of BI is to support the strategic decision-making process”.*

Many researchers have predicted that BI will be one of the tools on which management of many businesses will rely on for effective business decision making [7] [8] and for improving business value and performance [9]. A BI system consists of decision support capabilities, query and reporting, online analytical processing (OLAP), statistical analysis, knowledge management capabilities, forecasting and data mining [10]. This is also confirmed by [9] who posits that BI framework has two primary activities: data warehousing (getting data in – Extract, Transform and Load data (ETL), and Getting data out. Fig. 1 illustrates typical business intelligence architecture which depicts the components of a BI system.

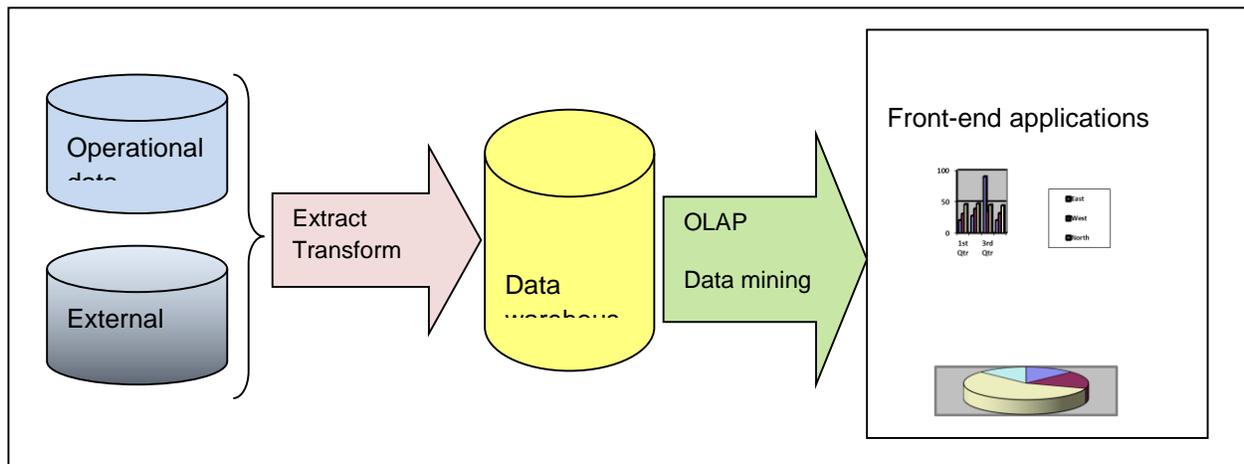


Figure 1 – Typical Business Intelligence Architecture. Adapted from [12].

BI is a data-centric approach [13] (the power of BI is based on business data) and Fig. 1 confirms this assertion. Also in support of this assertion, [14] states that business data is the breeding soil for BI. It is therefore important that the data which BI receives as input be as accurate as possible in order to provide correct insightful information when the input data is analysed by BI tools.

### **BI data sources**

According to Fig. 1, BI may have several sources of data which may be from various departments of the organization and from different external organizational partners. The data may also vary in quality, and in format. This then calls for the data to be reconciled and standardized for BI usage. Data extraction, transformation and loading tools which are discussed in the next section are used for this very purpose.

### **Extract, Transform and Load**

In order for the data to be in a usable form for accurate and quality reporting, it needs to be cleansed, reconciled, standardized and integrated into a data warehouse through data Extraction, Transformation and Loading (ETL) tools. ETL tools ensure that the data stored in the data warehouse is accurate, of high quality and consistent.

### **BI data warehouse**

Data warehouse is an electronic data repository of an organization which is used by BI tools for reporting and data analysis [15]. Relational database management systems (RDBMS) are popular choice used for storing and managing data in the warehouse [12].

### **Data manipulation tools**

Users may apply various tools on the data stored on the data warehouse and these include online analytical processing tools, data mining tools, reporting tools, text analysis tools.

Online analytical processing (OLAP): OLAP tools provide operations such as filtering, aggregation and drill-down on the multi-dimensional (numeric measures) view of the data. Numeric measures (e.g. sales, budget, revenue, etc.) are objects of analysis. For each measure there is a set of dimensions associated with it. For example, sales amount is associated with product, city and date. On the other hand the product dimension is associated with category, industry, model number attributes[12].

Data mining: Through data mining technology decision makers in an organization are able to gain insight about certain behaviors, trends and relationships on the stored data [16]. For example, in the hospitality industry, hotel management might want to know who of their clients are likely to take up a long weekend special offer based on previous behavior of these clients. The tools used for data mining make use of various popular data mining algorithms, such as, C4.5, K-means, Support Vector Machine, etc [13].

Reporting tools: These tools enable users to extract business reports, for example, a sales manager might want to see a sales report organized by town, region, province or even country.

Text analysis tools: These tools extract useful information from unstructured or semi-structured data such as emails, social network sites, web sites, etc. Text analytics are actively utilized in areas such as information extraction (extracting information from documents), question-answering (designed to answer factual questions, such as who, where, when, and what type of questions) and opinion mining (extracting information/opinion expressed in online media) [13].

Other front-end applications may also be used to gain insight from the data in the data warehouse. These tools include spreadsheet, performance management applications and ad hoc query (e.g. decision support query) tools [13].

The need for quick and instant response to business issues have prompted for business managers to demand near real-time or just-in-time BI [12]. Just-in-time BI reduces the delay between data acquisition and data analysis. Instant response to a client need may be the difference between keeping such a client and losing it to a competitor.

## THE PMInt FRAMEWORK

As mentioned earlier, the lack of existence of project management intelligence frameworks has propelled the authors of this research paper to close this gap. The previous discussion highlights the connection between business and projects, and a detailed discussion on this issue can be found in the research work by Hans and Mnkandla (2013) - see [1].

Fig. 2 illustrates a mapping/adaptation of the business intelligence architecture, as depicted in Fig. 1, into project management intelligence architecture.

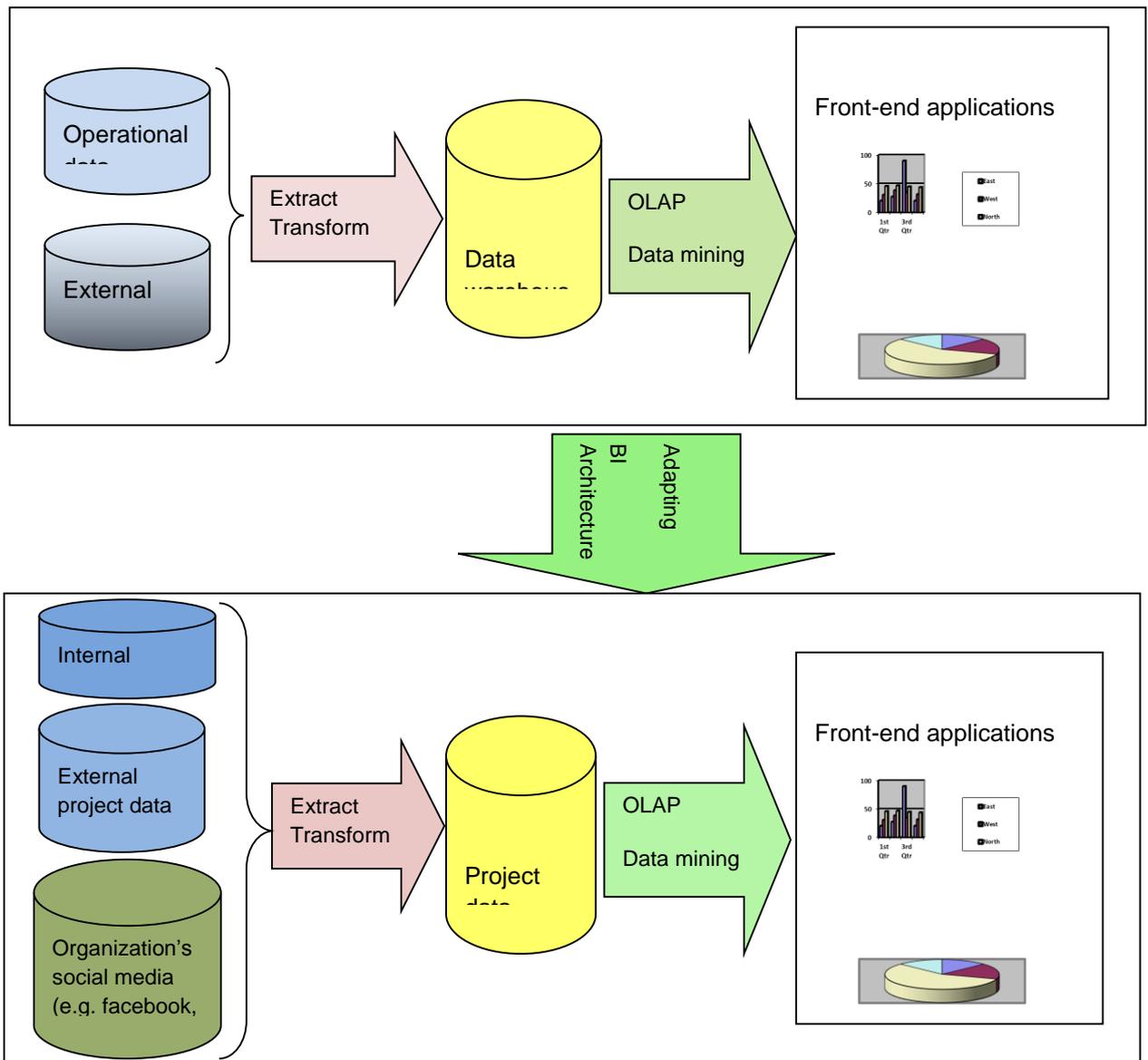


Figure 2 – Project Management Intelligence (PMInt) Architecture.

### PMInt data sources

Project data sources in Fig. 2 serve as input for PM intelligence tools and these sources might not be as many as those found in BI because projects might not necessarily need data from all data sources of the business. For example, projects that an organization might be running may not need data from the sales department database. On the other hand, business intelligence requires data from all business data sources for it to provide insight to management on all business operations.

PMInt will also need data from key external project stakeholders, such as suppliers and sponsors. An organization's online social media are critical data sources as it might want to establish opinions/feelings of some of its project stakeholders with regard to certain project aspects. A project manager might want to establish through the use of PMInt tools as to who of the project team members is not happy with the way a project is carried out. Such information might be very important in enabling a project manager averting a resignation of a key project team member and thus ensuring the project succeeds.

### **Extract, Transform and Load**

The extraction, transformation and loading processes of data from different sources into a data warehouse are still needed under PM intelligence for the same reason of ensuring that the data stored in the data warehouse is credible for accurate and quality analysis as well as reporting. As indicated before, ETL tools will be receiving data from three sets of data sources, namely, internal project data sources, organizational online social media and external project data sources.

### **Project data warehouse**

Project data warehouse is an electronic data repository of an organizational project. Its content serves as input for PMInt tools which perform reporting and data analysis processes.

### **Data manipulation**

As is the case with BI tools' users, project managers need online analytical processing, data mining, project progress and performance reporting and text analysis tools to gain insight on various project aspects. The discussion below explains how these tools will be of assistance to project managers.

1) Online analytical processing: A project manager may also want to perform some of the OLAP operations such as filtering and drill-down on the project data which include budget, expenditure, etc. For example, a project manager may be interested in establishing how much money has been spent on a particular supply in a given month on the project.

2) Data mining: As explained before, data mining tools provide one with information which pertains to certain behaviors, trends and relationships on the stored data. Project managers are interested in such issues as they may prove critical to the successful delivery of a project. A project manager may be interested in a particular trend which might be developing in the project and such a trend could have positive or negative implications for the project. Analytical information or trends provided by the earned value management (EVM) technique is limited to cost, scope and time data of a project and does not provide any other useful information on other aspects (e.g. assessing project member's behavior) of a project that might be of interest to a project manager. Therefore the use of data mining tools to provide more useful information on these aspects will close this void.

3) Reporting tools: Reporting is one of the key requirements of communicating project progress and performance to project stakeholders both internally as well as externally and therefore the use of these reporting tools will assist project managers in fulfilling this important task. A project manager is expected to collect information, format reports and deliver these to key project stakeholders timeously [17].

4) Text analysis tools: Communication in project management is one of the important areas which should be given top priority by project managers [18]. Communication carried out in electronic media such as emails, social network sites, blogs, etc. is mostly in unstructured or semi-structured form. Project managers may want to extract information from some of the communication that took place amongst project stakeholders in order to answer some important project related questions, see section B – PMInt in action, as an example on this. Mining opinions of project team members from the abovementioned electronic media tools about certain issues on the project might be important for a project manager. Through the information provided by text analysis tools project managers are able to forecast project status and progress.

The abovementioned data manipulation tools would make the task of creating lessons-learned reports much easier. In fact the creation of such reports would be based on demand as long as the data exists. Moreover, performing what-if analysis reports would also be performed much more easier through the use of these tools.

## PMInt in action – A scenario on turnover of project members

A project manager is faced with a situation where there is constant turnover of project team members. He/she then wants to establish the trend and behaviour which are associated with the team members who left the project and the organization in the last twelve (12) months. Knowing the behaviour would assist the project manager take appropriate decisions which might help curb the problem. He/she also wants to have a behavioural prediction model of the team members who are likely to quit his/her project. The project has blogs and social network sites on which team members are encouraged to deposit their comments on the organization's operations, as well their comments and concerns on the project. Furthermore, the organization has the database of exit interview data for all its former employees.

Using text mining and text analytics would be crucial in unravelling the mystery of project members' turnover. The historic data from the blogs, social sites and the exit interview database will then be used to extract structured data into categories, concepts and sentiments/opinions. For example, the use of emotional words such as "frustrated", "demotivated", "demoralized", "sad", "angry", etc. by team members in comments may be important in this scenario for the project manager. The extracted data from the online media and exit interview database is stored in the data warehouse or data mart for further data analysis, such as data mining.

Once the text analysis has been performed, the project manager then uses data mining techniques to perform in-depth analysis on the data. The results from this analysis will then provide the project manager with a common behavioural pattern of the team members who have left the project in the last 12 months. For, example, the analysis might show that three (3) of the five (5) project members who resigned in the past 12 months used words such as: frustrated, demotivated and angry. This type of analysis will also enable the project manager to create a prediction model on the behaviour of the current project team members. The use of such a model might then reveal that there are current project members who have used similar words and are therefore resignation candidates. Furthermore, the use of the prediction model will help in the project manager's decision making process which is aimed at addressing personnel turnover problem in the project. Fig. 3 illustrates the processes involved in achieving the project manager's objectives.

The preceding discussion shows how project managers would use project management intelligence in improving their decisions on issues pertaining to human resources of a project.

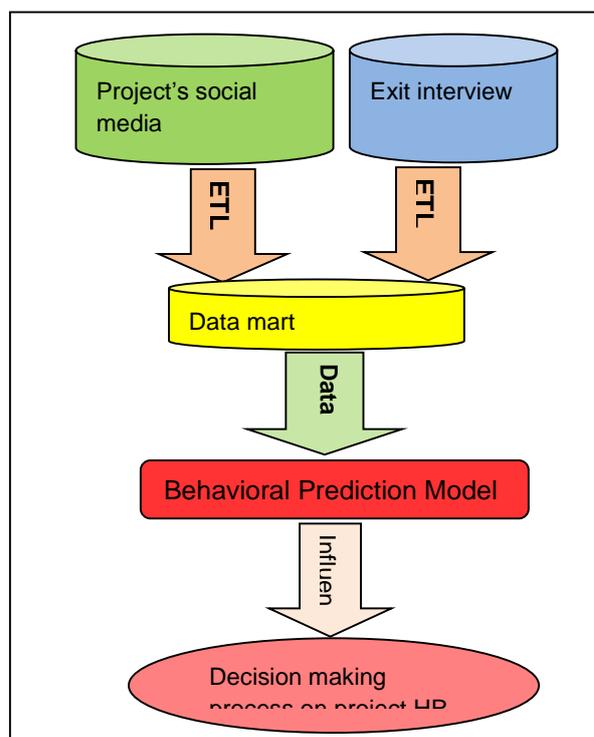


Figure 3 – A scenario on project members'

## THE BENEFITS OF THE PM/Int FRAMEWORK

Firstly, one of the key benefits which accrue from the above discussed PM/Int framework is the provision of guidelines which will assist in the development of project management intelligence tools. Secondly, the framework is an attempt to advance the theories for practice in the project management discipline. Thirdly, the framework also highlights some of the intelligent tools which project managers need in order to improve their decision-making process and deliver successful projects.

## CONCLUSION

Just like business intelligence on which project management intelligence is modeled has a framework so should PM/Int. Many of the components of the BI architecture presented above were adapted to the PM/Int architecture with minor modifications on some of them. This 'natural' mapping and adaptation should not be a surprise given that ICT projects are business constructs and their environments are also similar as discussed by Hans and Mnkandla (2013). The importance of the proposed framework and its benefits has been discussed in this research paper.

This research paper forms part of the PhD research work of the first author of this research paper. The author intends to develop real-time interactive project management intelligence (PM/Int) tool which is modelled after business intelligent tools [1]. The PM/Int tool is intended for project managers in order to assist them improve their decision-making process on human resources project management related issues.

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# THE EFFECT OF SELF-EFFICACY IMPROVEMENT ON THE EFFECTIVENESS OF PROJECT MANAGERS IN CONTEMPORARY ORGANISATIONS

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## ABSTRACT

*Recent studies on the success rates of modern day projects have shown that the project management fraternity needs to go beyond merely achieving the current levels of excellence and become more relevant to the needs of the modern business environment. These modern, dynamic environments are characterised by high levels of pressure to perform, as well as rapid changes caused by advances in technology such as the internet. Factors such as globalisation and recessions are also playing a role in the increasingly intense cost-cutting contemporary organisation.*

*Hence, the current project manager effectiveness factors previously researched like methodology, people-skills and leadership have brought project practice only so far and will not be all-encompassing in future. These refer to how the project manager relates externally during project practise, in terms of how the project manager relates to the project itself, the resources and stakeholders; but what of the project manager's own, internal self-assessment of his or her abilities in particular projects? How does the project manager handle him or herself, intrinsically and does this have an impact on the project manager's effectiveness in high-pressure contemporary business environments? If so, the awareness of this can create an improved project manager better equipped to handle him or herself in the new era.*

*By means of meta-ethnography and qualitative research, it was found that a concept called self-efficacy is extremely relevant to project management in this regard, and also enhances a number of personal attributes required for the project manager to thrive in these modern environments. The term 'self-efficacy' is defined as a person's own judgment of his or her capabilities to organise and execute the courses of action required to attain predetermined goals - hence the relevance to project managers. It is not concerned with the skills one has, but rather with the estimation of what one can attain with the skills one possesses. The researcher found that project managers who can manage their self-assessment with regards to their projects will be more effective in these turbulent times. The researcher's work also showed self-efficacy having a significant improvement in 5 specific personal competencies sorely needed in contemporary organisations - Adaptability\flexibility, Ability to handle ambiguity, Persistence\perseverance, Emotional Intelligence and Resilience.*

*Ultimately, the paper shows these 5 competencies being important in contemporary environments and that self-efficacy significantly improves or enhances these for project managers in modern companies. In so doing, the researcher gives a clear indication of the effect of self-efficacy improvement on the effectiveness of project managers in contemporary organisations.*

## INTRODUCTION

Neuhauser (2007) alluded to the increased significance of project managers in the modern era by stating that they are now, more than ever, being relied upon as the people who are implementing corporate strategies and objectives rather than merely reporting status on a disaster. Muller (2009) stated that up to 30% of the world's economy is based on projects, and projects are the building blocks to the sustainable growth of businesses. Binde and Saulite (2013) stated that just 20% of the success of a project depends on the approach to the actual management of the work involved in the project, while the remaining 80% depends on the role of the project manager and how successfully he or she performs. It is evident from these researchers that projects, and project managers, are playing a significant role in the success of organisations and the implementation of strategies. Hence it is vital to continually consider the evolution of the project manager and his or her competencies as a key factor in the success rate of these strategic organisational projects.

Recent research is showing that project managers in the contemporary era of fast-paced, dynamic business decision-making; require a whole new set of additional attributes over and above mere methodology improvements to thrive. Product life-cycles appear to be shorter and shorter; meaning the timelines for implementing strategic initiatives is shorter. Coetzee, Visagie and Ukpere (2012) stated that competitive pressures in markets have forced the rate of change and innovation to skyrocket, with the results often being turbulence in organisations. They claimed that economic conditions, labour markets, demographics, consumer preferences and technological changes are affecting how business is being conducted. More flexibility is required, which results in time-pressure and stress on project managers, as the cycle of business value of projects is shorter. Are modern project managers equipped with the awareness, understanding and skills, to deal with the challenges of the dynamic era of this new-age business environment?

According to Gul (2011:13571), "the recent re-examination of projects has consequently rendered the static and non-reactionary project environments of the Bodies of Knowledge less useful and immediately replaced it with a world that is both complex and dynamic". Arain and Tipu (2009:149) stated that "there is a need that business schools strive to improve the course offerings that incorporate the issues of complex, dynamic environments". This re-iterates that mere methodology or technical industry focus will not suffice. The intention of this research paper is to raise awareness of self-efficacy as an aspect of a project manager that could improve the intrinsic qualities needed.

The following literature review examines the evolution of project manager competencies through the years. It is a step through time leading to where the project manager skills focus areas are currently. It concludes with a suggestion on a new competency for the project fraternity to consider, called self-efficacy, to equip project managers for this dynamic and turbulent business environment. The literature review presents an explanation of self-efficacy, how to improve and maintain it, and the possible benefits to project managers.

## **LITERATURE REVIEW**

### Project Management Effectiveness Factors Evolution

The competencies needed by project managers have evolved significantly over the years, as can be seen in academic literature. In the early days of the profession, authors like Pinto and Kharbanda (1995) made reference to "accidental project managers", stating that project managers of that particular era were often appointed due to their technical competency in industries like civil engineering, banking and IT. This appeared to be acceptable in that era.

Fisk (1997) then pointed out that project management was later found to be very similar to professional construction management. The need to see construction programmes completed timeously and within budget led to the classic notion that project manager effectiveness should be measured around the ability to manage projects within time, cost and quality constraints. Themistocleous and Wearne (2000) found that the emphasis at the turn of the century remained largely on factors like project planning,

monitoring and control and risk analysis, as well as related classical project problems of execution. It is evident that during this period it was perceived that project managers abiding by project management life cycle and methodologies were a main determinant of effectiveness.

After the early 2000s the project management fraternity experienced a shift towards leadership focus, when the global trend moved towards separating the concepts of leadership and management. Project management has traditionally been seen as a good fit with the planning, organising, leading and controlling aspects of the typical management framework, where management implements processes in order to drive a project towards successful completion. Leadership, however, is more concerned with motivating and helping people to realise their potential and achieve tough and challenging company goals. Accomplished project management researchers like Turner and Muller (2005) studied the link between project managers' effectiveness and their leadership competencies, finding that effective project managers need both management and leadership competencies. Neuhauser (2007) highlighted that one of the core elements of managing successful projects is the ability to manage project teams. He also stated that organisational effectiveness requires project managers to combine their technical competency of project methodology with an effective display of leadership. The work of Geoghegan and Dulewicz (2008) on the correlation between project managers' leadership competencies and project success further highlighted the conclusion that leadership has an impact on project manager effectiveness. Besides these major themes, other general attributes and competencies were also shown through the years, like political acumen for instance, to increase the effectiveness of project managers. Many of these are considered aspects of leadership.

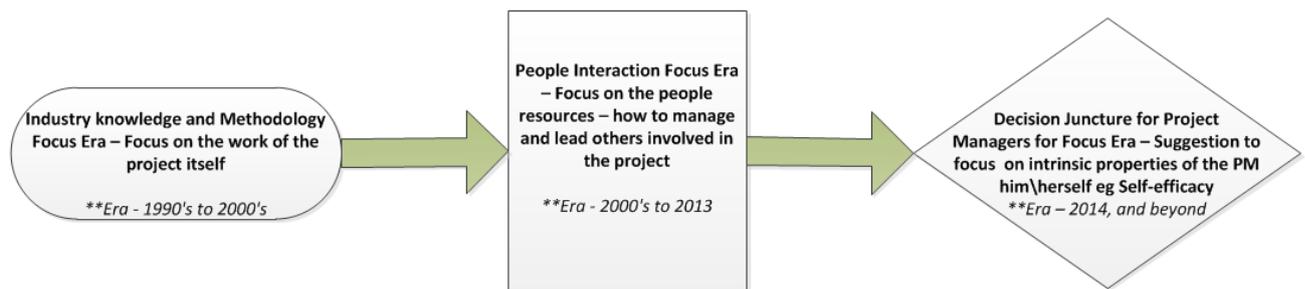
Some recent studies though, have shown a much greater emphasis needed on more personal, intrinsic attributes of project managers. Meredith and Mantel (2010) explored project management capabilities such as being able to deal with failure and stress as being important, as project personnel of the current era often need to operate in turbulent and ever-changing environments. The work of Muller (2009) showed that project management involves much more than tools and techniques. He emphasised factors like matching projects to the psychological profile of the project manager, the importance of combining "emotional competence" with IQ and management intelligence and personal traits of project managers as significant success factors. Muller concluded his paper by stating that his work is merely a first step from leadership towards personality theory of project success, and studies on project manager personal traits and project success needs to be expanded.

These researchers are showing that project managers in modern organisations are being challenged like never before, in a personal sense, and require additional competencies to the more traditional ones. They are implementing the strategic intentions in companies that are extremely dynamic, fast-paced and ever-changing, and the expectations on project managers have changed. The latter researchers allude to competencies required that are more intrinsic to the project manager him or herself – whereas previous focus areas were on technical knowledge and methodology (relating to the project itself) and politics or leadership (relating to dealing with others). The following table summarises this evolution.

Table 1: The evolution of Project Management effectiveness factors through the years (Approximate)

| Project Management Era (approximate) | Project Management Effectiveness Factor - main focus area   | Examples of Researchers   |
|--------------------------------------|---|---|
| 1995 - 1997                          | Industry competence eg Civil Engineers or Architects becoming project managers for construction projects.   | Pinto and Kharbanda (1995)  |
| 1997-2001                            | Knowledge and implementation of Project Management lifecycle and methodologies.   | Fisk (1997), Themistocleous and Wearne (2000)                             |
| 2002-2008                            | Leadership ability.   | Turner and Muller (2005), Neuhauser (2007), Geoghegan and Dulewicz (2008) |
| 2009-2013                            | Personal attributes of the Project Manager (PM) eg psycholological profile matching of PM to a project, emotional competence of the PM, ability of the PM to deal with failure and stress, personal traits and personality focus. | Muller (2009), Meredith and Mantel (2010)                                 |

The researcher will now introduce a concept, or competency, that can significantly equip the Project Manager, or enhance, personal attributes needed for thriving in the modern organisation. The researcher will show that this concept, called self-efficacy, is necessary for the modern project manager to consider and could well provide input into the next level of evolution of the project manager – where focus needs to be placed on the intrinsic thoughts and attitudes of the project manager him or herself.



*\*\* The researcher suggests that all competency focus areas are still required, but should never be considered all encompassing, as environmental conditions of industry keeps changing, hence project practice and competencies must continue to evolve (eg post-recession attitudes).*

Figure 1: Process flow chart of project manager competency emphasis areas and the next area for focus

### Introducing Self-Efficacy

Various modern-day self-efficacy researchers like Ugwu, Onyishi and Tyoyima (2013) still regularly refer to the researcher who pioneered the concept of self-efficacy, Albert Bandura, and his self-efficacy definitions. The term 'self-efficacy' is defined by these researchers as a person's own judgment of their capabilities to organise and execute the courses of action required to attain predetermined goals - hence the relevance to project managers. It is not concerned with the skills one has, but rather with the estimation of what one can attain with the skills one possesses. Further to this, the researchers explain self-efficacy as the beliefs in one's capabilities to activate the motivation, cognitive resources, and courses of action needed to meet given situational demands. By definition alone, the study of self-efficacy already appears to be relevant to project management practise. Where previous research focusses on knowledge or application of product, industry or project methodology, and knowledge and application of leadership and people-skills when relating to others, self-efficacy talks to how the project manager relates to him or herself in given projects or situations.

Kihlstrom and Harackiewicz (1990), in their review of Bandura's work, stated that efficacy expectations are self-judgements of how well someone can execute courses of action required to deal with prospective situations. Hence, efficacy expectations are future oriented, rather than retrospective, and they are specific to a particular situation and action. The same researchers believed that self-efficacy should be seen as a property of a person, but is not a personality trait. Hence a person can be high on self-efficacy in one domain but low in another, and self-efficacy can be developed in a domain regardless of the personality of an individual. Locke (2009) highlighted self-efficacy's merits in stating that human behaviour is significantly motivated and controlled through self-influence, and that self-efficacy is a significant mechanism for self-influence.

Self-efficacy impacts have been studied in an array of fields and practices, as will be shown in the next section.

### Effects of Self-Efficacy, Self-Efficacy Improvement and Relevance to Project Management

Miles and Maurer (2010) stated that self-efficacy predicts performance and motivation across a wide variety of tasks in corporate environments. The more confidence one has in one's ability to perform a particular task, the more the likelihood that one will participate in the activity, set higher goals than normal, persist through difficulties and ultimately be successful. Locke (2009:180) stated that "efficacy beliefs affect self-motivation and action through their impact on goals and aspirations. It is partly on the basis of efficacy beliefs that people choose what goal challenges to undertake, how much effort to invest in the endeavour, and how long to persevere in the face of difficulties. When faced with obstacles, setbacks and failures, those who doubt their capabilities slacken their efforts, give up prematurely, or settle for poorer solutions. Those who have a strong belief in their capabilities redouble their effort to master the challenges".

Bandura (1997) pointed out that because individuals have the capability to alter their own thinking, self-efficacy beliefs tend to influence physiological states including anxiety, stress and fatigue. Mulki, Lassk and Jaramillo (2008) stated that people who are high in self-efficacy believe in their ability to handle their work well and are more likely to become successful in their careers. Self-efficacy enhances employees' willingness to invest additional effort and master a challenge, and thus plays a significant role in increasing work effectiveness, job satisfaction, and productivity. The work of Bresó, Schaufeli and Salanova (2010) on self-efficacy impacts on university students showed that the students with higher self-efficacy than their peers appear to generate and test alternative courses of action when they do not initially achieve success in their studies. They tend to generally cope better with stress and are less likely to suffer burnout. Additionally, the same study showed higher levels of engagement (a positive, fulfilling, and motivational state of mind related to students' tasks that is characterised by vigour, dedication and absorption) amongst students with higher self-efficacy. Chowdhury and Lanis (1999) showed that the factors for the development of self-efficacy are mastery experiences, modelling, social persuasion, and judgments of own physiological states.

Mastery experiences refer to repeated cases of success in a particular task that enhances efficacy, while negative experiences are likely to have the opposite effect. Modelling refers to people judging their efficacy on a task based on the abilities of others similar to themselves completing a similar task through sustained effort. Social persuasion refers to realistic, credible encouragement being given. Lastly, people's judgement of their own psychological states has an impact on their self-efficacy. For instance, sweaty palms before making a speech is not necessarily an indication of being a poor public speaker; or a little anxiety before a big exam is normal for most students, and should not be misinterpreted as an indication of being unprepared for the exam.

The work of researchers on self-efficacy impacts on these areas has clearly made a difference in these fields. Self-efficacy effects on the delivery capability of project managers have not been formally studied up to now. The researcher endeavours to raise awareness of the likely effects of self-efficacy on project managers in contemporary business environments.

## RESEARCH METHODOLOGY

In the Literature Review, the researcher displayed a substantial amount of previous research on the effects of self-efficacy on various fields and industries. The researcher envisages that many of the self-efficacy effects already found in previous research on other industries or sectors may actually apply to project managers, so extensive field research starting from scratch may not be necessary. Hence, the researcher chose a methodology that can utilise the work of these previous researchers on self-efficacy, while creating new knowledge for project practise.

Self-efficacy and its effects however, are not being researched in isolation and it is not the sole intention of this paper to do a mere literature review on the general effects of self-efficacy across all fields. The paper aims to determine the effects of self-efficacy particularly on project managers, and specifically under the pressure of modern organisations. Hence the paper aims to synthesise the research up to now on 3 separate concepts – self-efficacy effects, competencies that make project managers effective and competencies needed in the modern, post-recession dynamic organisation. To achieve this, the researcher uses a meta-synthesis research method called meta-ethnography.

Meta-ethnography can be seen as a more in-depth form of literature review, as it synthesises into one another, and then translates, separate qualitative studies to form new findings. A straightforward literature review, by its nature, simply presents the literature in a raw format on a single concept, either reaching a pervasive conclusion on a topic or critically understanding the gaps in research on the topic. According to Campbell, Pound, Morgan, Daker-White, Britten, Pill, Yardley, Pope and Donovan (2011), the goal of synthesis is to go beyond a normal, narrative literature review, and should involve some degree of conceptual innovation. This is relevant for this current study, as the researcher needed to take results or concepts from different fields that were not previously studied together, like project management, self-efficacy and contemporary organisation effectiveness factors, and synthesise them to show if self-efficacy could make project managers more effective in contemporary companies. Gewurtz and Kirsh (2009) stated that meta-synthesis is a general approach to synthesizing findings across qualitative studies on a particular topic or subject, using methods consistent with qualitative research. They state that the idea of meta-synthesis is to produce findings that offer new insights and deeper conceptualizations than can be achieved through separate investigations and that these high-level concepts are designed to cross contextual boundaries and capture findings from multiple qualitative studies.

Hence, the researcher used a condensed and simplified, “lite” meta-ethnography to synthesise the qualitative findings in academia of the 3 separate concepts of self-efficacy effects, the competencies that make project managers effective and personal competencies required to thrive in the modern organisation. A formal academic filtering tool called the Critical Appraisal Skills Programme (CASP), as well as using traditional academic writing principles, was used to ensure that only existing qualitative research of proper academic standard was used in the meta-ethnography. The researcher then conducted his own qualitative research via e-interviews, on a sample of 12 project managers from diverse industry backgrounds and levels of experience, to determine if the results of the meta-ethnography can be verified by actual project managers in the real world. In so doing, the researcher will show the effect of self-efficacy on project managers in modern organisations, using 2 separate, tried and tested methodologies.

## DATA ANALYSIS AND INTERPRETATION OF THE RESEARCH FINDINGS

The meta-ethnography commenced with finding any academic work of previous researchers on the three individual concepts of self-efficacy effects, project manager personal effectiveness factors as well as contemporary organisation personal competencies required. This initial “raw data” was extracted between September 2013 and November 2013. The academic sources consulted were EBSCO, the Directory of Open Access Journals (DOAJ), AcademicJournals.org and Google Scholar.

Even though the main focus of meta-ethnographic studies is on the synthesis of qualitative studies, the researcher included studies that used quantitative and qualitative data if a subset of the research used or included elements of, but was not limited to, quantitative data. The researcher also used his own discretion while reading through the articles to ensure as much relevance as possible to the aims and context of the research topic. Research that was too far removed from the context of this current research was excluded. The researcher then used the CASP tool to filter articles, to ensure the quality of the studies “fed” into the meta-ethnography process.

This filtering process led the researcher to the reading of titles and abstracts of altogether 75 articles in academia on the topics of self-efficacy effects, project manager effectiveness competencies and competencies required of contemporary leaders and employees. Thirty worthwhile articles from these were read in full, but eventually four articles on self-efficacy effects, one credible source on personal competencies needed for project managers and two articles on contemporary organisation competencies and characteristics were chosen for the meta-ethnography.

From this “pool” of previous research, 36 self-efficacy effects were found. 32 contemporary organisation competencies required were collected along with 28 project manager personal competencies needed. The synthesis then led to searching, amongst these, for only competencies and effects that were commonly found amongst the 3 concepts of self-efficacy effects, personal competencies needed for project managers and contemporary organisation competencies required.

This meta-synthesis led to 5 competencies that were found common to all the combined studies of the 3 concepts. These are Adaptability\flexibility, Ability to handle ambiguity, Persistence\perseverance, Emotional Intelligence and Resilience. Hence the meta-ethnography portion of the research showed that self-efficacy effects project managers in contemporary organisations particularly improving their competencies in these areas.

Table 2: Meta-ethnography final results of competencies or attributes found to be effects of self-efficacy that make project managers more effective in contemporary environments

| Attributes\Competencies found | Self-efficacy Effects Researcher 1 | Self-efficacy Effects Researcher 2 | Self-efficacy Effects Researcher 3 | Self-efficacy Effects Researcher 4 | Contemporary Competencies Researcher 1 | Contemporary Competencies Researcher 2 | PM Personal Competencies Researcher |
|-------------------------------|------------------------------------|------------------------------------|------------------------------------|------------------------------------|--|--|-------------------------------------|
| Emotional Intelligence (EQ)   |                                    | Breso <i>et al.</i> (2010)         |                                    |                                    |  | Swarnalatha & Prasanna (2012)          | PMI (2007)                          |
| Adaptability\Flexibility      | Mulki <i>et al.</i> (2008)         |                                    |                                    |                                    | Salas-Pilco (2013)                     |  | PMI (2007)                          |
| Ability to handle ambiguity   | Mulki <i>et al.</i> (2008)         |                                    |                                    |                                    | Salas-Pilco (2013)                     |  | PMI (2007)                          |
| Persistence\Perseverance      | Mulki <i>et al.</i> (2008)         | Breso <i>et al.</i> (2010)         | Miles & Maurer (2012)              | Locke (2009)                       |  |  | PMI (2007)                          |
| Resilience                    |                                    | Breso <i>et al.</i> (2010)         |                                    | Locke (2009)                       |  | Swarnalatha & Prasanna (2012)          | PMI (2007)                          |

Following the meta-ethnography, e-interviews, a form of qualitative questioning using technology, were then used for verification of the meta-ethnography results. The e-interviews were distributed via e-mail to a sample of 12 diverse, actual project managers working in an enterprise project office in a modern, dynamic organisation. The project managers were questioned on the relevance of each of the 5 competencies discovered in the meta-ethnography, to their perceived effectiveness in their role. Some very eye-opening responses were received by the researcher, providing insight over and above what was envisaged. Overall, for the specific purposes of the research objectives, 80% of the respondents agreed with Adaptability\Flexibility, 100% agreed with Ability to handle ambiguity, 80% agreed with Persistence\Perseverance, 60% with Resilience and 60% with Emotional Intelligence.

Hence, the researcher is satisfied that a majority of the e-interview respondents agreed that self-efficacy resulted in, or affected, these 5 competencies or attributes in their project management role in their contemporary organisation. In so doing, this shows, via the meta-ethnography combined with

qualitative questioning, the effect of self-efficacy improvement on the effectiveness of project managers in contemporary organisations.

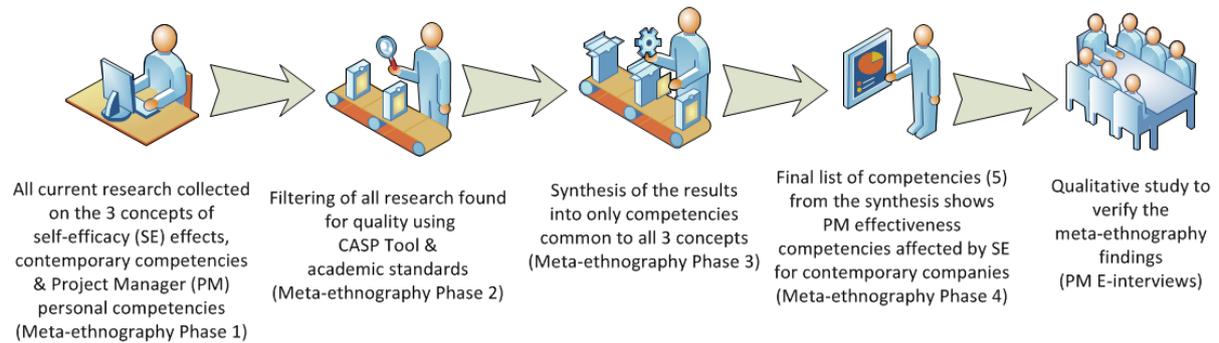


Figure 2: A summary of the research process that yielded the final results

## CONCLUSION

Due to changes in environmental factors in companies, competencies required of project managers will need to continually evolve. Mere technical or industry skill, project methodology application and leadership ability has largely been the focus of project management competencies required up to now, but will not suffice for the modern day project manager. Project managers today typically operate in corporate environments that are increasingly stressful, hostile and cut-throat. Recent factors like the global recession, modern technology and the Internet have changed the outlook of the modern organisation and its expectations.

Project managers now require deeper, intrinsic and more personal qualities than what has been focussed on through the years, to thrive in their role. Previous areas of focus were on industry or technical knowledge and project methodology (management of the work of the project itself) as well as leadership and interpersonal skills (management of other people involved in the project). The next generation of project manager must consider focus on him or herself and his or her self-efficacy for increased effectiveness; where self-efficacy is a person's own judgment of their capabilities to organise and execute the courses of action required to attain predetermined goals. The paper has shown self-efficacy to have a positive effect on the following personal, intrinsic attributes sorely needed in the modern organisation - Adaptability\flexibility, Ability to handle ambiguity, Persistence\perseverance, Emotional Intelligence and Resilience.

Hence, the ability of a project manager to understand self-efficacy, the impact it has on project management effectiveness and how to nurture and maintain it in any particular project or situation, will make the project manager more effective in contemporary organisations.

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# GOVERNING IT PROGRAMMES THROUGH THE LENS OF CORPORATE GOVERNANCE

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## ABSTRACT

*Stakeholders invest in organisations, expecting a return on their investment. These organisations, in turn, invest their revenue streams in productivity or in growth strategies leading to, among other things, an increase in information technology (IT) business initiatives. Given that effective management of a single project is no longer sufficient, organisations are leaning more towards a coordinated way of managing their initiatives to deliver benefits which could not be obtained if these initiatives were managed separately. Programme management has been perceived as the strategy implementation vehicle that links the overall strategy of the organisation with the portfolio of projects. While the use of programmes and programme management has grown, their capability to secure the investment of organisations has not been proven. Numerous failure stories with dramatic consequences for the organisation as a whole have been reported. Over the past decade, research conducted on the performance of IT initiatives has revealed that failure to deliver the benefits from most projects and programmes can be traced to inadequate governance mechanisms, thus prompting the need for an effective mechanism of overseeing these investments. Further to this, the recent series of corporate scandals, meltdowns, fraud and other catastrophic events and the consequent publication of relevant legislation and corporate governance standards have forced top management to become more interested in how their organisational IT initiatives are managed. This paper focuses on establishing a mechanism of overseeing investment made in IT programmes from a corporate governance point of view. Two governance frameworks are considered: one from a developed economy (Sarbanes-Oxley - United States of America) and the other from a developing economy (King Report III - South Africa). An exploratory qualitative approach within a cross-sectional design, combined with a comparative design, was adopted. Qualitative content analysis and document analysis were used for both data collection and analysis. Data were collected from secondary sources to deductively extend the governance mechanism to the temporary aspect of IT programmes. Implications for programme governance from the Sarbanes-Oxley Act and King III Report were identified. The outcome of this research is a set of governance mandates that pertain to the temporary aspect of IT programmes. Corporate governance requirements are extended and contextualised to IT programme management. This entails the open, accountable and controlled management of financial and non-financial programme outcomes, which will remain responsive and responsible to the board and key stakeholders.*

**KEY WORDS:** IT programme management, IT programme governance, corporate governance, Sarbanes-Oxley Act, King III Report

## INTRODUCTION

Stakeholders invest in organisations expecting a return on their investment. These organisations, in turn, whether public or private, invest their revenue streams in productivity or in growth strategies leading to, among other things, an increase in information technology (IT) business initiatives (Bonham, 2005:38-40). Organisations are leaning towards a coordinated way of managing these initiatives to deliver benefits which could not be obtained if these initiatives were managed separately (Reiss, Anthony, Chapman, Leigh, Pyne & Rayner, 2006; Lycett, Rassau & Damson, 2004).

Programme management is perceived as the strategy implementation vehicle that links the overall strategy of the organisation with the portfolio of projects (Marnewick & Labuschagne, 2006; Artto, Martinsuo, Gemünden, & Murtoaro, 2009). While the use of programmes and programme management

has grown, their capability to secure the investment of organisations has not been proven. Over the past decade, research conducted on the performance of IT initiatives has revealed that generally failure to deliver the benefits from most projects and programmes can be traced back to inadequate, or in the worst case, non-existence of governance mechanisms, thus prompting the need for an effective mechanism of overseeing these investments (Crawford & Helm, 2009; Marnewick & Labuschagne, 2011; Programme Management Group: n.d.). Further to this, the recent series of corporate scandals, meltdowns, fraud and other catastrophic events and the consequent publication of relevant legislation and corporate governance standards have forced top management to become more interested in how their organisation IT initiatives are managed (Cooke-Davis, 2005).

This article focuses on establishing a mechanism of overseeing investments made in IT programmes from a corporate governance point of view. Two corporate governance frameworks are considered: one from a developed economy (Sarbanes-Oxley - United States of America) and the other from a developing economy (King Report III - South Africa). The aim is to provide an inclusive perspective with the aim of ensuring compliance with corporate governance mechanisms and improving performance.

An exploratory qualitative approach within a cross-sectional design, combined with a comparative design, was adopted. Qualitative content analysis and document analysis were used for both data collection and analysis. Data were collected from secondary sources (two corporate governance standards) to deductively extend governance mechanisms to the temporary aspect of IT programmes. Implications for programme governance from the Sarbanes-Oxley (SOX) Act and King III Report were identified. These implications were analysed and integrated, using deductive reasoning in order to provide an inclusive view of controlling and overseeing the management of IT programmes.

The outcome of this research is a set of governance mandates that pertain to the temporary aspect of IT programmes. Corporate governance requirements are extended and contextualised to IT programme management. The results present an inclusive approach to IT programme governance. This entails open, accountable and controlled management of financial and non-financial programme outcomes, which, by its strategic fit, will remain responsive and responsible to the board and key stakeholders. This definitely contributes toward enhancing particular responsibilities of an organisation for ensuring compliance with corporate governance requirements and improved performance.

## LITERATURE REVIEW

This section establishes an understanding of the concepts related to the theoretical basis for this research.

### Overview of Corporate Governance

The concept of *corporate governance* is approached differently in the literature. Besides being an issue of global importance, its boundaries and what it constitutes are still subject to debate (Naidoo, 2002). This is due to the fact that corporate governance covers a large number of distinct economic phenomena (Yuksel, 2008).

Cadbury (1992) defines *corporate governance* as “the system by which companies are directed and controlled”. He describes corporate governance as a set of mechanisms that determine how firms should operate. Shleifer and Vishny (1997:737) specify that it is “the way in which suppliers of finance to corporations assure themselves of getting a return on their investment”. This means that corporate governance focuses on assuring shareholders of the benefits provided by their investment; thus, those involved in managing the provided finance should serve them and avoid expropriation.

The Organisation for Economic Cooperation and Development (OECD) (1999 cited in the Center for International Private Enterprise (CIPE), 2002:3) extends the notion of corporate governance to the entire environment within which a corporation operates. It considers that shareholders are not the sole focus of corporate governance, but that other stakeholders should also benefit from the existence of good corporate governance in an organisation, as they are affected by its decisions.

CIPE (2002) considers that governance mechanisms should spell out rules and procedures for making decisions on corporate affairs and, provide the structure through which the company objectives are set, the means of attaining those objectives and monitoring performance. The Global Corporate Governance Forum (GCGF) (2005) gives a more plausible interpretation of rules and institutions related

to corporate governance. It groups the definition of *corporate governance* into two categories: (i) the actual behaviour of a corporation; and (ii) the normative framework. The forum considers that the behaviour of a corporation focuses on issues within the firm itself. The normative framework, on the other hand, entails the rules determined by a legal and/or judicial system as well as financial and labour markets.

Whatever definition of or meaning assigned to corporate governance, the King III Report (Institute of Directors in Southern Africa, 2009) notes that fairness, accountability, responsibility and transparency towards the identified stakeholders of a company are fundamental values that corporate governance should promote. These values are crucial in building and sustaining the corporation stakeholders' confidence.

Important characteristics of corporate governance presented in the definitions above are as follows:

- It focuses on directing and controlling companies.
- It ensures that stakeholders' expectations and demands are met.
- It consists of rules and structures.
- It must incorporate fundamental values such as fairness, transparency, responsibility and accountability towards stakeholders.
- It ensures the delivery of corporate performance, sustainable value and capital enhancement in accordance with the strategy of the corporation.

Naidoo (2002) states that "good corporate governance makes good business sense". Among the advantages of such a system, he asserts that a properly managed company will attract investment, implement sustainable growth, and identify and manage risks within agreed parameters, which would limit potential liabilities. From an investor's point of view it will be logical to deduce that such a company would lower its investment risks and could potentially add significant growth.

A review of the literature reveals an ongoing debate around convergence and divergence in corporate governance among regions, countries and industries. O'Sullivan (2003) presents a plethora of diverse arguments for each case. Aguilera and Jackson (2003) explain the differences in corporate governance practices across national boundaries and give reasons that lead countries to adopt a particular system.

Whatever governance system is pursued in a particular market, it still has to be shaped by key elements of good corporate governance. These key elements are responsibility, accountability, transparency and fairness (Institute of Chartered Accountants in England and Wales, n.d.; Monks & Minow, 2011). It is based on these key elements and, due to the non-existence of an international code that can apply worldwide, the OECD (2004) has provided a set of guiding principles to which companies should aspire.

These principles are set out in table 1.

Table 1. Principles of corporate governance

| No. | Principle  |
|-----|--|
| 1   | Ensuring the basis for an effective corporate governance framework |
| 2   | The rights of shareholders and key ownership functions             |
| 3   | The equitable treatment of shareholders                            |
| 4   | The role of stakeholders in corporate governance                   |
| 5   | Disclosure and transparency  |
| 6   | The responsibilities of the board                                  |

Corporate governance principles can hold true only when they are applied within a defined corporate governance structure through which a company sets its objectives, and the process of attaining these objectives and monitoring performance is stipulated.

There is no universally effective and accepted corporate governance structure (Clarke, 2007; Shivdasani & Zenner, 2002). This is due to the multiplicity of factors that are considered in shaping the structure of corporate governance. Clarke (2007) states that "different approaches to business formation, and the accompanying corporate governance structure and regulation have evolved in different social and economic contexts". Among the factors contributing to these differences, he points out the following variables:

- National, regional and cultural differences

- Ownership structure and dispersion
- The industry and market environment
- Firm size and structure
- Life cycle variation, including origin and development, technology, periodic crises and new directions
- CEO tenure, attributes and background

However, a probe of corporate governance scholarships has revealed a correlation among the legal system, ownership structure, market type, governance theory, governance model and the type of board structure (Bhasa, 2004a; Bhasa, 2004b; Mallin, 2004). By categorising these correlating elements, two different governance structures are identified. Table 2 depicts these elements, and presents their correlation and emergence within the two structures.

Table 2. Governance structures

| No. | Element                    | Governance Structure 1 | Governance Structure 2 |
|-----|----------------------------|------------------------|------------------------|
| 1   | <b>Legal system</b>        | Socialist democracies  | Capitalist economies   |
| 2   | <b>Ownership structure</b> | Concentrated           | Dispersed              |
| 3   | <b>Governance theory</b>   | Stakeholder theory     | Shareholder theory     |
| 4   | <b>Governance system</b>   | Insider                | Outsider               |
| 5   | <b>Board structure</b>     | Dual board             | Unitary board          |

Beside corporate governance principles and structures, the GCGF (2004) admits that the enforcement method used in the code plays a critical role in influencing organisations to ensure compliance. The broad approaches to the enforcement methods are discussed below.

Maassen (2003) defines *self-regulation* broadly as a regulatory regime developed, founded and enforced exclusively by the industry. It can be understood as a private or sectional business initiative that regulates the practices of companies without government intervention. The Security Market Association in Finland (2009) describes such a system as having the following characteristics: (i) voluntary, (ii) established in cooperation with industry organisations, (iii) varies in its level of binding force, (iv) more detailed than legislation, (v) replaces or complements legislation, and (vi) may include control and consequences for violations of the system.

The opposite of self-regulation would be a statutory Act. Explicit government legislation, consisting of Acts passed by parliament with a mandatory enforcement through the judicial system, governs the activities of organisations.

Literature differentiates between these systems mostly based on their focus, development, implementation, enforcement, flexibility, evolution, comprehension, scope and procedure (GCGF, 2004; Security Market Association in Finland, 2009). These differences are summarised in table 3.

Table 3. Self-regulation versus statutory codes

| No. | Factor                | Self-regulation       | Statutory Codes  |
|-----|-----------------------|-----------------------|------------------|
| 1   | <b>Focus</b>          | Good or best practice | Minimum standard |
| 2   | <b>Development</b>    | Faster                | Long             |
| 3   | <b>Implementation</b> | Faster                | Long             |
| 4   | <b>Enforcement</b>    | Voluntary             | Enforced         |
| 5   | <b>Flexibility</b>    | Easier                | Difficult        |
| 6   | <b>Evolutionary</b>   | First                 | After            |
| 7   | <b>Comprehension</b>  | Ease of comprehension | Legal precision  |
| 8   | <b>Scope</b>          | Practical             | Broad            |
| 9   | <b>Procedure</b>      | Quick                 | Slow             |

#### Overview of Programme Management

Programme management has been defined differently in the literature, mostly described as the management of a collection of projects or the management of change. The Office of Government Commerce (OGC) (2011) extends programme management to other activities or works, which, together with projects, deliver organisational changes. The Project Management Institute (PMI) (2013c) underlines the overriding mission of a programme: the achievement of the strategic benefit. While

definitions of programme management vary in the literature and depend on the field of application, some common aspects may be addressed:

- Coordinated management
- Management of interrelated projects and other activities
- Achievement of change
- Delivery of benefit
- Accomplishment of strategic objectives or stated business goals

In the context of this study, programme management is defined as the coordinated management of interrelated projects and other activities with the aim of achieving organisational change and/or delivering benefits of strategic importance.

The common elements identified, which have led to the definition of programme management, describe what programme management entails. Besides these elements, numerous activities which are required in order to achieve effective programme management are grouped into what Reiss et al. (2006:28), OGC (2011) and PMI (2013b), respectively, identify as topic areas, governance themes or programme knowledge areas.

Two dimensions shape the perception of programme governance of Reiss et al. (2006) and the OGC (2011), viz. (i) the structure, which would include functions and responsibilities, and (ii) the processes and procedures that must be applied. It must be noted that the structure will depend on the organisation and the complexity of the programme (Reiss et al., 2006).

The PMI (2013b) provides an understanding of what should be expected from a programme governance framework. It states that effective governance ensures:

- Strategic alignment and realisation of the promised value
- Appropriate communication with all stakeholders, and their awareness about issues and progress
- The use of appropriate tools and processes in the programme
- Decisions made rationally and with justification
- Clear definition and application of responsibilities and accountabilities

Programme governance is therefore an integral part of corporate governance. It comprises roles and responsibilities for rational decision-making, the means of making those decisions (Capital Ambition, 2011), and tools, policies, procedures and practices that must be applied consistently (PMI, 2013b). At the same time it must make sure that proper disclosure mechanisms for timely decision-making are in place (Williams & Parr, 2008), and that the programme remains aligned with the strategic objectives of the business (Reiss et al., 2006).

In order to understand the specific aspect of IT programmes, it is important to understand its IT components. The IT projects within an IT programme are the ones that distinguish IT programmes from other programmes.

Charvat (2002:12) claims that IT is changing at such an amazing rate that companies use more and more solutions that require enhancing existing systems and decommissioning older ones in order to survive in the competitive marketplace.

IT projects are diverse. They can range from a small number of people installing off-the-shelf hardware and software to hundreds of people analysing business processes and developing new software to meet business needs (Schwalbe, 2013). As a result, a subset of life cycles for the development of information systems termed SDLC is mapped onto the traditional project management life cycle phases. Furthermore, IT projects support every possible industry, ranging from the film to the construction industry (Schwalbe, 2013; Taylor, 2004:7).

From an IT perspective, IT Governance Ltd (n.d.) notes that the intensity of information and knowledge, and the networking and connectivity prevalent in the global information economy demand attention, as "a failed IT project can place an organisation at a strategic disadvantage to its competitors". Peters and Verhoef (2008) state that the consequence of the risk of IT project failure can be substantial and can alter yield drastically.

What makes IT projects different are their unique risks, the rapid development requirements to meet rush-to-market demands, the short life of technology and multiple dependencies on other projects (Taylor, 2004:7). Peters and Verhoef (2008) mention cost overrun due to the phenomenon of requirement creep, or as the result of compressing time in the presence of growing demand. This leads to IT projects often not being completed within the defined time frame and budget and not adding value to the organisation (Marnewick & Labuschagne, 2008). These dependencies and complexities are more evident when these IT projects are undertaken in the context of an IT programme. The question remains how corporate governance approaches are to be conceptualised, developed and maintained at IT programme level in order to ensure that executives and top management have control over initiatives undertaken by their organisations (Cooke-Davies, 2005).

## **METHODOLOGY**

The research project began with the acknowledgement that IT programmes constitute one of the main sources of risk at corporate level. This can have a huge impact on organisational performance if not addressed appropriately. Therefore there is a need to extend the corporate governance mechanism to IT programmes in order to ensure compliance and improve performance. Qualitative data were collected from secondary sources to formulate strategies so that IT programmes can be governed from a corporate governance perspective.

The research was an exploratory study, specifically designed to identify the relevance and determine the implications of corporate governance for IT programme management governance by analysing SOX (2002) and King III (2009) and inductively integrating and aligning their implications with the temporary aspect of IT programmes. SOX and King III were explored in order to gain a deeper understanding and illumination of their context, and to investigate and establish their plausible relevance implications for IT programmes, which are difficult and complex to quantify.

A cross-sectional design, combined with a comparative design, was used as the architecture for the collection and analysis of data. The qualitative cross-sectional design provided the structure for the simultaneous collection of data from two corporate governance standards. The comparative design was applied at the integration stage where implications identified from SOX and King III were compared for a deeper awareness and understanding. This enabled the integration of implications when similarities were established. The need to apply the comparative design accentuates the fact that the researchers did not focus on the specific context of each governance standard, but rather on how the implications derived from these standards can be contrasted in developing an explicit focus at the outset. Thus an open-ended approach was adopted in many instances, which is widely associated with a qualitative research strategy.

The purpose of integrating the two models was to provide a holistic mechanism of overseeing IT programme management activities. The process consisted of analysing these implications, and gaining a deeper awareness and understanding of the requirements, comparing them and in the case of similarity, using deductive reasoning to reformulate the integrated implications for IT programme activities.

A comprehensive literature review was conducted in order to establish the foundation of corporate governance and programme management. Over 40 journal articles, 25 books and periodicals were reviewed as part of the literature review. They were also used for the exploration process in order to understand the relevance of and necessity to extend the corporate governance mechanism to IT programme activities.

After having established the relevance of corporate governance for IT programme management, it was then possible to proceed with the second stage. Document analysis was conducted on SOX and King III to understand how governance issues should be dealt with throughout the organisation. This analysis provided an understanding of not only the immediate context of SOX and King III, but most importantly also the significance within IT programme management.

A qualitative content analysis was then applied to SOX and King III. This entailed the discovery of underlying themes, focusing on the essence (Denscombe, 2007). Before the appraisal of SOX and King III, the coding unit (unit of analysis), the coding categories and the coding rules were defined. Among various coding units such as words, concepts, sentences, paragraphs, full text or themes used

in qualitative content analysis, a theme was used as the coding unit, considering that for this particular research an idea or a statement needed to be fully expressed. An a priori coding approach was used by establishing coding categories before the analysis of the materials based upon some theories. The intention was that the data extracted should reflect basic governance principles stated in the literature. Coding categories were then drawn from the integrated view of programme management activities that resulted from the literature review section as per table 4.

Table 4. List of categories for qualitative content analysis

| <b>Predefined Coding Category</b>                |
|--|
| 1. Strategic alignment                           |
| 2. Roles and responsibilities                    |
| 3. Policies, procedures, processes and practices |
| 4. Monitoring and controlling performance        |
| 5. Disclosure and reporting                      |
| 6. Compliance                                    |
| 7. Knowledge management                          |

Coding rules or recording instructions were defined for the first and the second appraisal. During the first appraisal, which took place directly in the literature piece (SOX and King III), themes that fit a category as per table 2 were highlighted and the category concerned was indicated in the margin. If a theme fit or elaborated on more than one category, all of them were mentioned in the margin. The second appraisal consisted of processing or extracting data in order to finalise the content analysis process. For each analysed corporate governance standard, the extraction process took place between two documents: the SOX or King III document used in the first appraisal and a coding table drawn from table 4, containing predefined coding categories in the left-hand column. For each standard the located themes (sections or chapters) were then extracted from the standard, and coded in the right-hand column of the coding table under the predefined coding category that was mentioned in the margin during the first appraisal. Each standard was coded more than once by different researchers and the coding results were only considered when at least two iterations had produced the same result for two researchers.

The themes extracted during the content analysis process were requirements that were relevant to programme management. Further analysis was needed. Content analysis, as a method for both data collection and data analysis, and inductive reasoning were used in order to determine for each relevant requirement the implication for IT programme management. It was possible then to compare and integrate related implications in order to provide an integrated view of governing IT programmes through the lens of corporate governance.

The disadvantages of content analysis emerge from common issues associated with qualitative research: reliability and validity. In order to deal with reliability in qualitative content analysis, sufficient resources are needed to ensure error-free coding. The researchers applied consistency by coding each standard individually and more than once. The coding results were considered when at least for each researcher two runs on the standard had produced the same result, and when the result of both researchers were the same. The researchers had also built a validity dimension within the design framework that ensured the validity of the outcome of the content analysis. The consecutive use of document analysis and content analysis led to triangulation of the method, which is crucial in ensuring validity in qualitative research.

The advantage of content analysis resides in the quality of the data collected. While methods such as surveys or interviews can provide data biased by informants, content analysis provides quality data already assessed when the document source is published. The explicit procedure offered by content analysis simplified the researchers' task of analysing the large volumes of SOX and King III in a short period of time.

## RESEARCH RESULTS

The Institute of Directors in Southern Africa (2009) recognises that the advancements and changes in the IT area have led to IT being regarded as an integral part of an organisational strategy rather than a mere enabler within an organisation. While technology developments could help improve governance, they also brought an increased number of risks and challenges that needed to be addressed. It is also

reported that the rate of technological advancement and the limited understanding among stakeholders have produced further challenges.

#### Analysis of Sarbanes Oxley Act (2002)

The Sarbanes-Oxley Act was chosen as the corporate governance blueprint in this study for the following reasons:

- While other codes (self-regulated codes) favour a voluntary enforcement, SOX favours the broader public interest, is stricter on accountability and has strong investigation, enforcement and sanctioning processes (Maassen, van den Bosch, & Volberda, 2004; Wymeersch, 2006).
- The weakness proven in more sophisticated market economies due to the limit of self-regulated codes calls for a statutory code such as SOX, particularly in developing economies where strong institutional frameworks, within which corporate governance can operate, are lacking (De Jong et al., 2005; GCGF, 2004).
- Despite the existence of variations in corporate governance models around the world, SOX remains the most well-known and commonly used Act due to its particularities (Muthukumar, 2009).
- The strong influence of SOX on IT and its level of authority have made it the benchmark standard (Cuong, 2007).

Within SOX numerous provisions are made relating to accounting firms, independent auditors and corporations. Among its 11 titles are some concerned with particular responsibilities of corporations to improve the quality of disclosure related to their financial conditions.

To ensure compliance with corporation provisions SOX, unlike all preceding US legislation, holds CEOs and CFOs personally accountable for the integrity of the financial statements filed with the Securities and Exchange Commission. It also emphasises management responsibilities regarding the adequacy of internal control over information that ends up on financial statements.

Although officers and management are held accountable and responsible for the quality of disclosure in producing reliable financial information, it must also be recognised that “the data necessary to assemble the disclosures comes from a wide range of sources”; these data sets should be assembled, consolidated and reported at multiple levels of an organisation (Leech, 2003). Thus, SOX provisions extend to the entire organisation. They cover everyone and everything involved in company finances. Weinstein (2006) clarifies that everyone in a company responsible for how money is spent is affected by SOX.

With this broad understanding of the corporate responsibilities of SOX, it was then important to consider the temporary organisation within which programme management falls and to identify SOX provisions that are relevant and their implications to IT programmes. Seven sections relevant to IT programme management were identified and extracted. They can be grouped into four mandates: (i) Disclosure of Financial Information (Sections 302, 401 and 906); (ii) Internal Control (Section 404); (iii) Real-time Disclosure of Additional Information (Section 409); (iv) Information Retention (Sections 802 and 1102). The relevance of the above mandates and their implications on IT programme management are discussed.

Table 5 summarises relevant mandates from SOX and their implications for IT programme management.

Table 5. SOX mandates and their implications for IT programme management

| Predefined Category                           | Mandate                                     | SOX Section  | SOX Requirement   | Implication for IT Programme Management   |
|---|---|--|---|---|
| <b>Strategic Alignment</b>                    |   |  |   |   |
| <b>Roles and Responsibilities (Structure)</b> | Disclosure of Corporate Financial Reporting | <b>302</b> Corporate Responsibility for Financial Report                         | CEO and CFO are required to: <ul style="list-style-type: none"> <li>– Review and sign the report</li> <li>– Ensure reliability and completeness</li> <li>– Set up and maintain control in the process</li> <li>– Prove the effectiveness of their internal control</li> <li>– Ensure timely and reliable disclosure</li> <li>– Disclose deficiencies that can lead to inaccurate or incomplete information</li> <li>– Disclose any fraud involving management or employees, regardless of materiality</li> <li>– Disclose any change to internal control</li> </ul> | <b>SOX1 Accountability and Responsibilities for Financial Reporting</b><br>Accountability and responsibilities for financial reporting must be defined. Penalties related to financial reporting are extended to the programme accountable authority.   |
|   |   | <b>401</b> Disclosure in Periodic Reports (Off-Balance Sheet Transaction)        | Financial reports must include all material off-balance sheet transactions, arrangements, obligations (including contingent obligations) that are reasonably likely to have a current or future effect on the financial condition of the corporation.   |   |
|   |   | <b>906</b> Corporate Responsibility for Financial Report                         | Requires certification similar to Section 302, and carries criminal penalties of up to \$5 million or 20 years' imprisonment.   | <b>SOX2 Responsibility for Certification</b><br>The signing authority of programme financial statements should be the one accountable for the programme outcome, and must ensure reliability and accuracy of the report.  |
|   |   | <b>1102</b> Tampering with a Record or Otherwise Impeding an Official Proceeding | Carries criminal penalties of up to 20 years for persons who corruptly alter, destroy, mutilate or conceal records (including electronic records) and documents.  | <b>SOX3 Accountability and Responsibility for Records</b><br>Define responsibilities and accountability for record retention.   |
| <b>Monitoring and Controlling Performance</b> | Internal Control                            | <b>404</b> Management Assessment of Internal Controls                            | There must be a report that: <ul style="list-style-type: none"> <li>– Acknowledges management's responsibility in setting and maintaining internal control structures and procedures for financial reporting</li> <li>– Contains a recent assessment of the reliability of the controls</li> <li>– States that an external auditor has attested to and reported on the assessment made by management</li> </ul>   | <b>SOX4 Internal Control</b><br>Implement a programme management process that establishes programme control structures and processes to be exercised on all programme activities (financial and non-financial) throughout the programme life cycle. Assess the effectiveness of the controls and recommend the use of appropriate product development processes for SOX compliant programmes.<br><b>SOX5 Attesting the Assessment</b><br>An external auditor should attest to and report on the assessment of internal controls done by management. |
| <b>Disclosure and Reporting</b>               | Disclosure of Corporate Financial Reporting | <b>302</b> Corporate Responsibility for Financial Report                         | <i>As coded under "Roles and Responsibilities".</i>   | <b>SOX6 Financial Statement</b><br>Financial statements related to IT programme management must be certified and reported. This includes all programme activities that have current or future material effect on the programme benefit.<br><b>SOX7 Timely Disclosure</b><br>Timely disclosure of deficiencies that can lead to inaccurate or incomplete information, any fraud regardless of materiality and any change to internal control.  |
|   |   | <b>401</b> Disclosure in Periodic Reports (Off-Balance Sheet Transaction)        | <i>As coded under "Roles and Responsibilities".</i>   |   |

| Predefined Category         | Mandate  | SOX Section  | SOX Requirement  | Implication for IT Programme Management   |
|-----------------------------|--|--|--|---|
|                             | Real-Time Disclosure of Additional Information | <b>409</b> Real-time Issuer Disclosure               | Requires a real-time disclosure of additional information concerning material changes in the financial conditions or operations of the organisation.   | <p><b>SOX8 Additional Information Disclosure</b><br/>Implement a real-time monitoring and reporting process for additional information (risk, issues, internal or external environmental factors, events, legislation, change) to the programme; thus, facilitate timely decision-making.</p> <p><b>SOX9 Benefit Disclosure</b><br/>Disclose any change to the programme benefit.</p> |
| <b>Knowledge Management</b> | Information Retention                          | <b>802</b> Criminal Penalties for Altering Documents | Requires the retention of relevant records such as work papers, documents that form the basis of an audit or review, electronic records which are created, sent or received in connection with an audit or review and which contain conclusions, opinions, analyses or financial data relating to such an audit or review. | <p><b>SOX10 Information Retention</b><br/>Implement a process for retaining programme-related documents, correspondence, decision documents and analysis documents for both paper-based and electronic records.</p>   |

### Analysis of King III (2009)

King III was chosen as the other corporate governance blueprint in this study for the following reasons:

- It is the researchers' country-specific code of best practice which is adopted as a mandatory requirement for all listed companies.
- It applies to all entities regardless of the manner and form of incorporation or establishment and whether in the public, private or non-profit sectors. The principles contained in the report have purportedly been drafted so that every entity can apply them and, in doing so, achieve good governance (Hendrick, Ricardo & Wyngaard, 2010).
- The self-regulation approach is far more preferable to having an outside agency such as government to monitor and enforce those standards. This allows organisations to maintain control and avoid bureaucratic burdens and the cost of mandatory compliance (PWC, 2009).
- It is considered as one of the enviable corporate governance reforms and one of the most popular reports on corporate governance, as it has inspired many other countries in the region (Global Business and Technology Association, 2013). It has led to the recognition of South Africa as a pioneer in promoting corporate governance (Solomon & Maroun, 2012).

As is the case with SOX, King III has numerous provisions that relate to corporate reporting, with substantial implications for IT programmes. Besides having requirements similar to SOX, King III devotes a full chapter to IT governance with clear mandates for IT investments.

King III considers that IT has become an integral part of the business, and an important strategic asset that can be used to create opportunities and competitive advantage. As such, IT brings about significant risks and should be well governed and controlled.

Of the nine chapters of King III, five are relevant to IT programme management and they were identified and extracted. These are: (i) Board and Directors; (ii) The Governance of Risks; (iii) The Governance of Information Technology; (iv) Internal Audit; (v) Integrated Reporting and Disclosure. The relevance of the above mandates and their implications on IT programme management are discussed.

Table 6 summarises relevant mandates from King III and their implications for IT programme management.

Table 6. King III mandates and their implications for IT programme management

| Coding Category                                      | Chapter                                     | Governance Element  | King III Principle/Requirement   | Implication for IT Programme Management   |
|--|---|---|--|---|
| <b>Strategic Alignment</b>                           |   |   |  |   |
| <b>Roles and Responsibilities (Structure)</b>        | 4. The governance of risk                   | The board's responsibility for risk governance  | 4.1 The board should be responsible for the governance of risk.  | <b>King III (1) Responsibility and Accountability for Risk</b><br>The board should take responsibility for the governance of risk and disclosure while the programme manager takes responsibility for risk management, design, implementation and monitoring of the risk management plan.   |
|  |   | Management responsibility for risk management   | 4.4 The board should delegate to the management the responsibility to design, implement and monitor the risk management plan.  |   |
| <b>Policies, Procedures, Processes and Practices</b> | 4. The governance of risk                   | The board's responsibility for risk governance  | 4.2 The board should determine the levels of risk tolerance.   | <b>King III (2) Risk Tolerance and Appetite</b><br>Starting with the programme's business case and during the programme life cycle, the risks involved should conform satisfactorily to the risk tolerance level as set out by the board. No programme should be undertaken if risks involved are not within the set tolerance and appetite level.                                |
|  |   | Management responsibility for risk management   | 4.4 The board should delegate to the management the responsibility to design, implement and monitor the risk management plan.  | <b>King III (3) Risk Management Plan</b><br>The programme manager should design, implement and monitor the risk management plan within the programme.   |
|  |   | Risk assessment   | 4.5 The board should ensure that risk assessments are performed on a continual basis.  | <b>King III (4) Risk Assessment and Response</b><br>The programme manager should provide assurance that risks within the programme are assessed continuously, that appropriate frameworks and methodologies are implemented to increase the probability of anticipating unpredictable risks and that appropriate responses are implemented for identified risks.                  |
|  |   |   | 4.6 The board should ensure that frameworks and methodologies are implemented to increase the probability of anticipating unpredictable risks.   |   |
|  |   | Risk response   | 4.7 The board should ensure that management considers and implements appropriate risk responses.   |   |
| <b>Monitoring and Controlling Performance</b>        | 4. The governance of risk                   | Risk monitoring   | 4.8 The board should ensure continual risk monitoring by management.   | <b>King III (5) Risk Monitoring and Assurance</b><br>Programme risk management effort should be monitored and communicated to the board throughout the programme life cycle.  |
|  |   | Risk assurance  | 4.9 The board should receive assurance regarding the effectiveness of the risk management process.   |   |
|  | 5. The governance of information technology | 5.4 The board should monitor and evaluate significant IT investments and expenditure. | <b>King III (6) IT Investment and Expenditure</b><br>The board must oversee the value delivery of IT and monitor the return on investment from significant IT initiatives. This is achieved when IT initiatives are aligned with the overall objectives of the organisation. In the case of outsourcing, the board should then obtain independent assurance on the supporting governance and controls. |   |
|  | 7. Internal audit                           | Internal audit's approach and plan  | 7.3 Internal audit should provide a written assessment of the effectiveness of the company's system of internal controls and risk management.  | <b>KING III (7) Assessment of Internal Control and Risks</b><br>A generally accepted framework should be implemented for internal IT programme controls and risk management, and must be assessed to ensure effective IT programme internal controls and risk management from conception to delivery. The programme manager has to specify the elements of the control framework. |
| <b>Disclosure and Reporting</b>                      | 2. Boards and Directors                     | Role and function of the board  | 2.13 The board should report on the effectiveness of the company's system of internal control.   | <b>King III (8) Internal Control Reporting</b><br>Internal control related to programmes should be reported to enable the board to report on the company's overall system of internal control.  |

| Coding Category             | Chapter                                     | Governance Element              | King III Principle/Requirement  | Implication for IT Programme Management   |
|-----------------------------|---|---------------------------------|---|---|
|                             | 4. The governance of risk                   | Risk disclosure                 | 4.10 The board should ensure that processes are in place enabling complete, timely, relevant, accurate and accessible risk disclosure to stakeholders.  | <b>King III (9) Risk Disclosure</b><br>Programme risks should be communicated in good time to the programme authorising body in a relevant, accessible and accurate format. This includes undue, unusual and unexpected risks.      |
|                             | 9. Integrated reporting and disclosure      | Transparency and accountability | 9.1 The board should ensure the integrity of the company's integrated report.   | <b>King III (10) Integrated Report</b><br>Financial statements and sustainability related to IT programme management must be certified and reported. Appropriate systems and processes must be followed to produce such submission. |
| <b>Knowledge Management</b> | 5. The governance of information technology |                                 | 5.4 The board should monitor and evaluate significant IT investments and expenditure. <ul style="list-style-type: none"> <li>5.4.2 The board should ensure that intellectual property contained in information systems is protected.</li> </ul> | <b>King III (11) Protection of Intellectual Property</b><br>Necessary steps should be taken to protect the intellectual property in the information system being produced as part of an IT programme.                               |

### Comparison and Integration of Implications from SOX and King III

In this section governance implications from the two standards are compared and, in the case of similarities, integrated. Using deductive reasoning, similar implications are analysed and consolidated to give organisations an indication of what is required to govern IT programmes. Finally, a new naming scheme is devised for these implications with the ultimate goal of lessening the focus on a specific context of each standard analysed, and providing a standardised and exclusive view of governance over IT programmes. The comparison of the control objectives derived from SOX and King III, the consolidation and new naming are depicted in table 7.

Table 7. Comparison and integration of SOX and King III

| Old Implication Identifier |               | Integration | New Naming   |
|----------------------------|---------------|-------------|--|
| SOX                        | King III      |             |  |
| SOX1                       |               |             | ITPMG 01 Responsibility for Programme's Financial Statement  |
| SOX2                       |               |             | ITPMG 02 Certification of Programme's Financial Statement    |
| SOX3                       |               |             | ITPMG 03 Responsibility for Record Retention                 |
| SOX4<br>SOX5               | King III (7)  | yes         | ITPMG 04 Assessing Internal Control and Risks                |
| SOX6                       | King III (10) | yes         | ITPMG 05 Integrated Report                                   |
| SOX7                       | King III (8)  | yes         | ITPMG 06 Internal Control and Timely Reporting               |
| SOX8<br>SOX9               | King III (9)  | yes         | ITPMG 07 Additional Disclosure                               |
| SOX10                      | King III (11) | yes         | ITPMG 08 Protection of Information and Intellectual Property |
|                            | King III (1)  |             | ITPMG 09 Responsibility for IT Programme's Risk              |
|                            | King III (2)  |             | ITPMG 10 Risk Tolerance and Appetite                         |
|                            | King III (3)  |             | ITPMG 11 Risk Management Plan                                |
|                            | King III (4)  |             | ITPMG 12 Risk Assessment and Response                        |
|                            | King III (5)  |             | ITPMG 13 Risk Monitoring and Assurance                       |
|                            | King III (6)  |             | ITPMG 14 Programme Investment and Expenditure                |

There are five integrations that result from the comparison of SOX and King III. These integrations are discussed and the resulting integrated implications are reformulated.

#### ITPMG 04 Assessing Internal Control and Risks (SOX4, SOX5 and King III (7))

SOX4 and SOX5 focus on establishing internal control, as does King III (7) which requests a framework for internal control and risk, but they differ on who should attest to the effectiveness of this mechanism. While SOX advocates the use of external auditors, King III requests that this assessment be made by internal auditors. The researchers' view is that by combining these two approaches, organisations will benefit from both the in-depth understanding of the organisation by internal auditors and the independent opinion of external auditors. The integrated implication can be formulated as: *A generally accepted framework for IT programme management that establishes internal controls and risk management must be implemented. This includes control structures, processes and all other elements of the control framework to be exercised on all IT programmes. The effectiveness of this mechanism should be assessed by internal auditors and finally attested to by external auditors. Appropriate processes should be used for SOX and King III compliance programmes.*

#### ITPMG 05 Integrated Report (SOX6 and King III (10))

SOX6 requires management to report on the financial profile of the company to stakeholders. King III (10) argues that focusing this report largely on financial information does not provide sufficient insight to enable stakeholders to get the real picture of the company's performance. It therefore adds sustainability and social responsibility to the report. The integrated implication states that: *Financial statements and sustainability issues related to IT programme management must be certified and reported. This includes all the IT programme's activities that have a current or future material effect on the programme's benefit. Appropriate systems and processes must be followed to produce this submission.*

#### ITPMG 06 Internal Control and Timely Reporting (SOX7 and King III (8))

SOX7 and King III (8) both focus on internal control reporting. The consolidated implication is formulated as follows: *Internal control related to programmes should be reported to enable the board to report on the company's overall system of internal control. Besides periodical reporting, deficiencies that can lead to inaccurate or incomplete information, any fraud regardless of materiality and any change to internal control should be disclosed in good time to ensure that appropriate decisions are made.*

#### ITPMG 07 Additional Disclosure (SOX8, SOX9 and King III (9))

SOX8 and SOX9 mention factors other than internal control which should also be reported in good time but do not specify to whom the report should be addressed. King III (9) clarifies the addressee that should receive

this information. The integrated implication should read: *Implement a real-time monitoring and reporting process for additional information such as risk (undue, unusual and unexpected), issues, internal or external environmental factors, events, change to the programme's benefit and legislation change to the programme. These must be communicated in good time to the programme authorising body in a relevant, accessible and accurate format, thus facilitating timely decision-making.*

**ITPMG 08 Protection of Information and Intellectual Property (SOX10 and King III (11))**

SOX10 recommends the protection of information or records. King III (11) extends this requirement beyond knowledge management and administrative rules and practices to include the protection of intellectual property. The integrated implication is formulated as: *Implement a process for retaining programme-related documents, correspondence, decision documents and analysis documents for both paper-based and electronic records, and take the necessary steps to protect the intellectual property in the information system being produced as part of an IT programme.*

Table 8 provides the final implications of SOX and King III on IT programmes.

Table 8. Final implications

| FINAL IMPLICATIONS |   |
|--------------------|---|
| No.                | Description   |
| ITPMG 01           | <b>Responsibility for Programme's Financial Statement</b><br><i>Accountability and responsibilities for programme's financial and sustainability reporting must be defined. Penalties related to financial reporting should be extended to the programme accountable authority.</i>   |
| ITPMG 02           | <b>Certification of Programme's Financial Statement</b><br><i>The signing authority of programme financial statements and sustainability should be the one accountable for the programme outcome, and must ensure reliability and accuracy of the programme financial and sustainability report.</i>  |
| ITPMG 03           | <b>Responsibility for Record Retention</b><br><i>Within the programme governance mechanism, responsibilities and accountability for record retention should be defined, and penalties related to persons who corruptly alter, destroy, mutilate or conceal records should be enforced.</i>  |
| ITPMG 04           | <b>Assessing Internal Control and Risks</b><br><i>A generally accepted framework for IT programme management that establishes internal controls and risk management must be implemented. This includes control structures, processes and all other elements of the control framework to be exercised on all IT programmes. The effectiveness of this mechanism should be assessed by internal auditors and finally attested to by external auditors. Appropriate processes should be used for SOX and King III compliance programmes.</i> |
| ITPMG 05           | <b>Integrated Report</b><br><i>Financial statements and sustainability issues related to IT programme management must be certified and reported. This includes all the IT programme's activities that have a current or future material effect on the programme's benefit. Appropriate systems and processes must be followed to produce this submission.</i>   |
| ITPMG 06           | <b>Internal Control and Timely Reporting</b><br><i>Internal control related to programmes should be reported to enable the board to report on the company's overall system of internal control. Besides periodical reporting, deficiencies that can lead to inaccurate or incomplete information, any fraud regardless of materiality and any change to internal control should be disclosed in good time to ensure that appropriate decisions are made.</i>  |
| ITPMG 07           | <b>Additional Disclosure</b><br><i>Implement a real-time monitoring and reporting process for additional information such as risk (undue, unusual and unexpected), issues, internal or external environmental factors, events, change to the programme's benefit and legislation change to the programme. These must be communicated in good time to the programme authorising body in a relevant, accessible and accurate format; thus facilitating timely decision-making.</i>  |
| ITPMG 08           | <b>Protection of Information and Intellectual Property</b><br><i>Implement a process for retaining programme-related documents, correspondence, decision documents and analysis documents for both paper-based and electronic records, and take the necessary steps to protect the intellectual property in the information system being produced as part of an IT programme.</i>   |
| ITPMG 09           | <b>Responsibility for IT Programme's Risk</b><br><i>The board should take responsibility for the governance of risk and disclosure while the programme manager takes responsibility for risk management, design, implementation and monitoring of the risk management plan.</i>   |
| ITPMG 10           | <b>Risk Tolerance and Appetite</b><br><i>Starting with the programme's business case and during the programme life cycle, the risks involved should conform satisfactorily to the risk tolerance level as set out by the board. No programme should be undertaken if risks involved are not within the set tolerance and appetite level.</i>  |
| ITPMG 11           | <b>Risk Management Plan</b><br><i>The programme manager should design, implement and monitor the risk management plan within the programme by applying risk management systems and processes throughout the programme life cycle.</i>   |
| ITPMG 12           | <b>Risk Assessment and Response</b><br><i>The programme manager should provide assurance that risks within the programme are assessed continuously, that appropriate frameworks and methodologies are implemented to increase the probability of anticipating unpredictable risks and that appropriate responses are implemented for identified risks.</i>  |

| FINAL IMPLICATIONS |   |
|--------------------|---|
| No.                | Description   |
| ITPMG 13           | <b>Risk Monitoring and Assurance</b><br><i>Programme risk management effort should be monitored effectively and continually and the programme manager or the programme accountable authority should provide assurance of the effectiveness of such mechanism to the board throughout the programme life cycle.</i>  |
| ITPMG 14           | <b>Programme Investment and Expenditure</b><br><i>The board must oversee the value delivery of IT and monitor the return on investment from significant IT initiatives. This is achieved when IT initiatives are aligned with the overall objectives of the organisation. In the case of outsourcing, the board should then obtain independent assurance on the supporting governance and controls.</i> |

## CONCLUSION

Programme management constitutes a means by which organisations achieve almost everything they undertake. As investors invest in companies, and demand transparency and accountability in return for their capital so as to establish confidence, organisations invest in IT programmes and demand proper management of these investments in order to ensure the delivery of the expected benefit.

The investments made in organisations are mostly driven as programmes for which the outcome should guarantee a return on investment and attainment of strategic objectives. An organisation would therefore not ensure compliance with corporate governance if corporate governance provisions did not pertain to the management of programmes, as this constitutes the major source of risk for investors.

The Sarbanes-Oxley Act (2002) and the King Code of Governance for South Africa (2009) have each proven to have enormous implications for IT programmes. In addition, their integration has added richness to how organisations can benefit from applying the resulting requirements to the management of IT programmes. Instead of arguing which is the best standard, the researchers have focused on how each can complement or clarify the other.

From a programme management point of view, the key to enhancing compliance with SOX provisions related to particular responsibilities of a corporation for improving the quality of disclosure of their financial conditions entails the following:

- A clearly defined accountability and responsibility framework over programme financial statements and other events that have a material effect on the programme outcome
- A framework that establishes and maintains internal control and risk management throughout the programme life cycle
- A process that monitors and discloses additional information of an IT programme in good time to ensure real-time decision-making
- A well-established framework for information retention and protection of intellectual property within the IT programme organisation

The results of the research present an inclusive approach to IT programme governance. Open, accountable and controlled management of financial and non-financial programme outcomes is ensured, while maintaining an effective system of internal control and managing risks. Clear indications have been provided on how the board should implement the governance mechanism and how management should integrate responsible and accountable practices in the day-to-day activities of the programme.

As the researchers concludes the study, it must be said that by no means can the board and top management continue to fly blind in funding IT programmes. An understanding of the investment made in IT programmes, a clear view of the major risks of this investment from a risk and return perspective and an independent opinion that attests to how effectively the whole process unfolds are some of the factors that would empower them.

While the results of this research would clearly lead to compliance with corporate governance requirements, capability to improve IT programme performance cannot be guaranteed. Further research would need to be done in order to unpack the complexity of issues affecting the performance of IT programmes and to investigate the means of resolving those issues.

The research result also indicate the limitations of current corporate governance efforts as they fail to provide enough specific guidance on all building blocks of an IT programme governance mechanism. These limitations

are reflected in the worldwide guiding principles of corporate governance, which focusses more around dealing with the issue of separation of ownership from management.

Given the level of organisations' reliance on IT and the level of investment in IT initiatives in today's business environment, current corporate governance guiding principles need to be reviewed in order to include guidance related to IT investments. This would be a good starting point as these principles shape corporate governance effort worldwide.

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# APPLIED GOVERNANCE OF ICT PROJECTS: A BRIDGE BETWEEN PROJECT GOALS AND PROJECT SUCCESS

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## ABSTRACT

*Project management is termed a discipline. To have discipline implies having been trained to adhere to and obey the rules or a code of behaviour and be accountable when these rules are broken. Therefore, a discipline requires disseminating knowledge of desired codes of behaviour, practitioners performing duties in accordance with these codes of behaviour and corrective measures being implemented where required. Data collected indicates that IT project managers do not show discipline. IT projects that have been surveyed over the last decade have indicated that little progress has been made to increase project success. Less than half of projects delivered in the past ten years can be termed a success. Companies executing projects have also not matured beyond level three of the project management maturity index. Little organisational learning has taken place in what factors or practices increase the successful delivery of an IT project during the same period. An audit of numerous projects also found that only 71.3% of recommended best practices were performed by IT project managers. Methodologies and standards indicate that these best practices increase the likelihood of project success. An argument can be made that management behaviour requires guidance to assist in increasing project success. Formalised governance is proposed as a possible solution to increase the likelihood of project success. Governance is guiding behaviour to achieve a desired goal. Various foundational and theoretical governance frameworks exist outside of the project management discipline, but within this discipline, very little is to be found on the governance of projects. Current methodologies and standards fail to guide the project manager in project governance. In this study, suitable governance foundations for project management were analysed as a basis for developing an IT project governance framework. Governance mandates the establishment of policies, procedures and especially risk management to achieve the stated project goal. A survey was conducted to determine which project management best practices are employed by project managers. These best practices relating to governance aspects and activities were collated to determine how rigorously governance is applied in the delivery of IT projects. The King III Report was used as a framework to identify and map project management best practices to project governance activities. The results indicate that certain governance aspects are implemented but very little attempt is made to formalise an implemented governance structure. This paper indicates what existing governance activities are being practised by IT project managers and to what extent these activities are being practised. These activities can be formalised as a basis for adopting a minimal approach to adhering to good corporate governance within the context of project management. Activities and principles not addressed are evaluated for appropriateness.*

**KEY WORDS:** Project success, governance, audit, best practices

## INTRODUCTION

Over the past decade, information communication and technology (ICT) project managers have consistently delivered projects below the success rate of 50% (Erasmus & Marnewick, 2012; Marnewick, 2013). Confidence in the discipline of project management will not grow if such mediocre results are continually delivered. Improvement on the status quo will not occur spontaneously, but must rather be achieved through guidance.

The process of guiding behaviour to achieve a desired outcome is called governance (Bevir, 2013). For the discipline of project management, a desired outcome would be the delivery of a successful project (Schwalbe, 2010). Most projects in the ICT sector cannot be categorised as being successfully completed (Marnewick,

2013). Given the importance of ICT to the economy and individual organisations, it is imperative that projects produce a desired outcome if they are to be seen as a viable method of pursuing business objectives (Media Information and Communication Technology Sectoral Education and Training Authority, 2011).

However, projects are also undertaken in the context of the organisation that experiences a need for a project to be completed successfully (Marchewka, 2012). As such, the project management team is accountable to the organisation itself. The organisation should have certain corporate governance measures in place. This entails the governance of project management taking place within the greater context of corporate governance.

Research was done in this study to determine what best practices are followed by project management practitioners. This article does not concern itself with all the best practices as identified by the community of project management practice. Rather, it determines which best practices that relate to governance are being employed by ICT project managers.

This research may contribute meaningfully to the ongoing discussion on what constitutes governance in project management and may serve to increase awareness of the critical need for governance in project management. Governance as a concept is ill-defined outside the domain of public management (Grindle, 2011; Hill, 2013). This article seeks to highlight best practices that are already employed in the project management discipline and relate them to the governance of projects.

This article attempts to address these issues in the following structure: the first section focuses on the literature review which briefly outlines the concept of governance and its appropriate position in project management. The second section describes the research methodology that was followed to collect data. The third section highlights important results based on descriptive analysis. The article concludes in the fourth section with a discussion on the implications for researchers and practitioners.

## LITERATURE REVIEW

It is estimated that the ICT services sector value is to grow to R41.39 billion in 2014 (Media Information and Communication Technology Sectoral Education and Training Authority, 2011). This reflects a growth of 7.4% over the forecasted period of 2011 to 2014. Similarly, the packaged software market value is forecast to grow to R17.76 billion. The ICT sector market value is worth at least R60 billion. This industry depends heavily on implementing initiatives through projects.

As seen in figure 1, investing in ICT initiatives may more often than not deliver an unfavourable outcome.

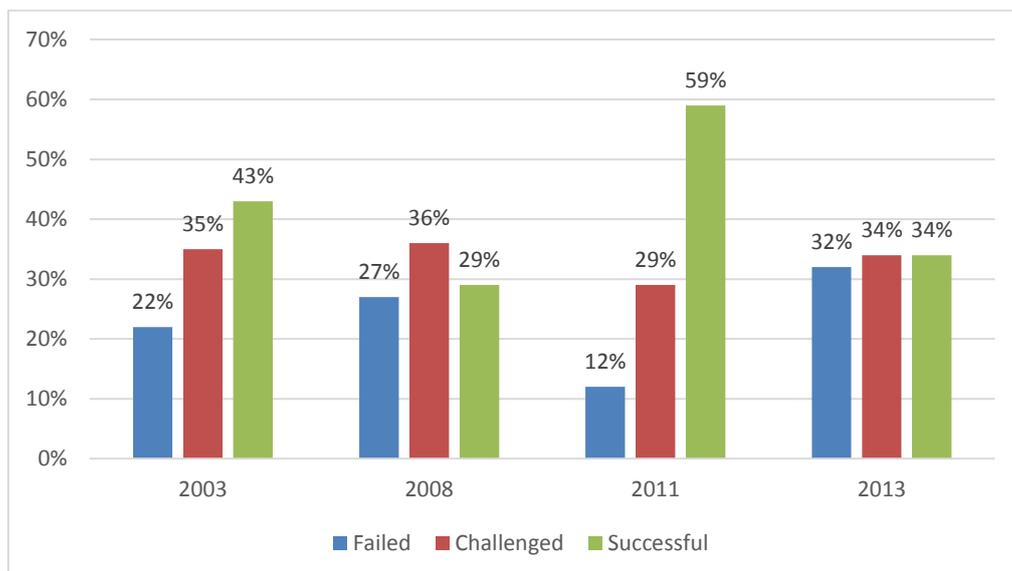


Figure 1. ICT project success rates 2003-2013

Between 2003 and 2013, ICT projects could not be successfully delivered on a consistent basis. Most alarmingly, research has indicated that projects that are categorised as failures have increased to their highest level in ten years. Clearly, project success is elusive in the South African ICT context.

This may indicate a need for more stringent governance of projects. Governance emerged from the Rule of Law which required all institutions and individuals to be accountable (Dam, 2006). This includes the implications that individual and corporate rights need to be protected according to a standard that applies to all (LexisNexis, 2013). These rights include the right to freedom, to own property and recourse to a legitimate, transparent and accountable system of governance (Mills, 2004). Therefore, whatever system of governance that is implemented should ideally protect these rights in whatever context they are applied.

The World Bank Group (2013) indicates that there is a positive correlation between investments and governance applied in a stringent manner. This visibility of good governance increases investor confidence. Similarly, this would apply to investing in ICT projects. Should stakeholders perceive that an organisation has a system of governance that ensures accountability, transparency and protection of rights in the steering of projects to a desired outcome, they would be more amenable to investing in such projects (Globerman & Shapiro, 2002).

Projects can be considered to be temporary organisations that have to deliver a product or service to a stakeholder (Muller, 2009). As such, there is room to apply guidance to increase the likelihood of project success. This guidance may take the form of a governance framework. However, projects are undertaken in the greater context of the organisation that should already be operating under a governance framework of its own. This higher order of guidance is corporate governance.

Corporate governance is applied to organisations in different ways across the globe. Some governance frameworks like the Sarbanes-Oxley Act require organisations within the United States of America to comply with legislation or else face sanctions (Anand, 2008; Romano, 2005). A similar situation exists in China where organisations are expected to comply with the Chinese Organisation Law of 2005 (Pissler & Liu, 2013). Other regions subscribe to governance philosophies that rather require organisations to comply with stated governance principles or explain where this is not the case. This is true for the Organisation for Economic Co-operation and Development (OECD) and its 34 member countries (Organisation for Economic Co-operation and Development, 2004, 2012). In the South African context, the King III Report of 2009 is relevant. While the King III Report falls in this category of voluntary compliance, it does allow governance boards in organisations to only apply principles as practical in the context in which the organisation is operating, while ensuring that stakeholder needs are addressed and good governance is not compromised (Institute of Directors, 2010).

Good governance is a term that has a definition that is in flux (Grindle, 2011; Hill, 2013; Zattoni & Cuomo, 2010). It therefore may be necessary to view good governance as a set of best practices that assist in steering a project to a desirable conclusion while upholding the ideals of stakeholder rights, responsibility, accountability and transparency (Aguilera & Cuervo-Cazurra, 2009; Ogden & Watson, 1999). This view is also supported by the King III Report's definition of governance (Institute of Directors, 2010).

There are various models, guidelines and standards that serve to inform project managers of which best practices and processes will lead, if employed, to likely project success (Association for Project Management, 2004, 2012; Great Britain Office of Government Commerce, 2009; Project Management Institute, 2013a, 2013b, 2013c). These collections of best practices should in theory increase project success rates if implemented. This is clearly not the case, as seen in figure 1. It could be that these best practices are (i) ineffective with regard to project success, (ii) not implemented at all or (iii) not implemented correctly. A fourth consideration could be that these guiding best practices do not support good governance at all.

The following research questions were therefore raised:

1. Which recommended project management best practices relate to the governance of project management?
2. To what extent are project practitioners implementing governance-related best practices?
3. Is there a relationship between the application of project best practices related to governance and project success?

## RESEARCH METHODOLOGY

A questionnaire was circulated to a purposive sample of project management professionals in the ICT industry as population. Each respondent had to consider various projects under their control. The questionnaire in the form of a project audit was completed for each completed project and not one questionnaire per project manager. Roman (1983) suggests that technical objectives, cost and budget, human resources, project termination and managerial implications need to be analysed. The weighting of each of these five areas differs between projects as well as industries.

Data was obtained for 717 projects in this manner detailing information in the following structure:

1. General project information which covered project background information such as project cost, budget and overall project length.
2. Section A requested project managers to indicate which best practices they performed in a particular project for the following areas:
  - Project goals
  - Project activities
  - Project management
  - Human resource management
  - Risk management.
3. Section B requested similar information in the following sections:
  - Leadership style
  - Directing operations
  - Project reporting
  - Project execution.

Sections A and B consisted of 102 questions indicating the extent to which best practices were implemented when tabulated. For the purpose of this article, the best practices in sections A and B that relate to governance are investigated.

The subsections for the investigation of implemented best practices that relate to governance as highlighted by the King III Report are as follows:

1. Steering or guiding of behaviour to a desired outcome
2. Increasing level of responsibility and accountability
3. Increasing transparency
4. Protecting stakeholder rights.

Tabulating these results for governance-related best practices provides a basis for descriptive statistics.

## RESULTS AND FINDINGS

The 54 best practices relating to governance are divided into the four categories of the governance definition supported by the King III Report. These four are (i) steering or guiding, (ii) transparency, (iii) upholding stakeholder rights and (iv) responsibility and accountability. The responses from 717 projects were tabulated. Figure 2 illustrates where the emphasis lies in project practice with regard to governance:

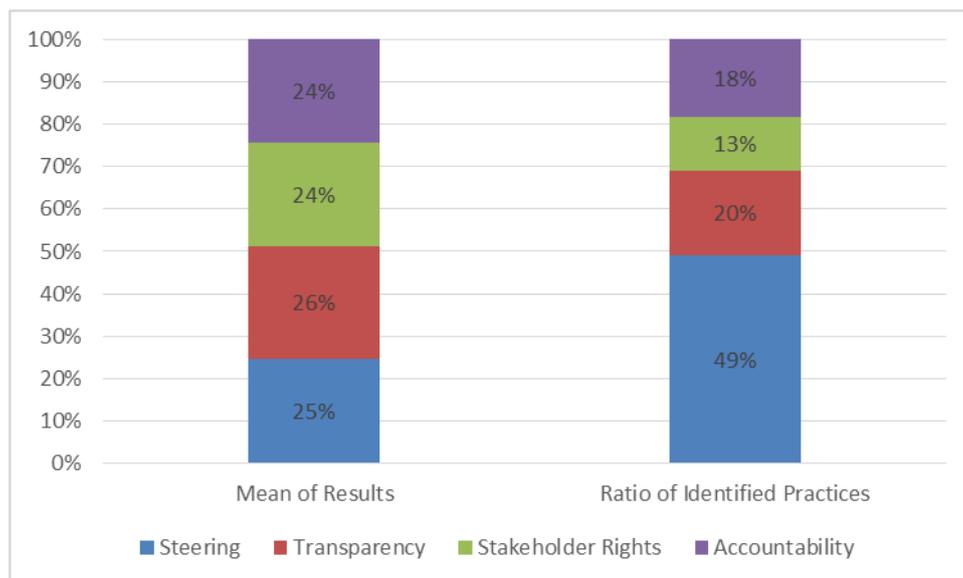


Figure 2. Four categories of King III governance

Although more practices were identified as relating to *Steering*, the application of steering practices accounts for 25% of the audit result. The practices for *Accountability* and *Stakeholder rights* are in the minority,

comprising 18% and 13%, respectively. However, they contribute almost a quarter of the entire governance effort.

The greatest emphasis lies in *Transparency* while *Steering* seems to be slightly secondary. *Accountability* and upholding *Stakeholder Rights* appear jointly as a third priority. This may be due to more emphasis being placed on reporting practices in the set of identified best practices than on steering. However, by far the majority of best practices relating to governance reside in the steering category. The ten most implemented practices within the *Steering* category are illustrated in figure 3.

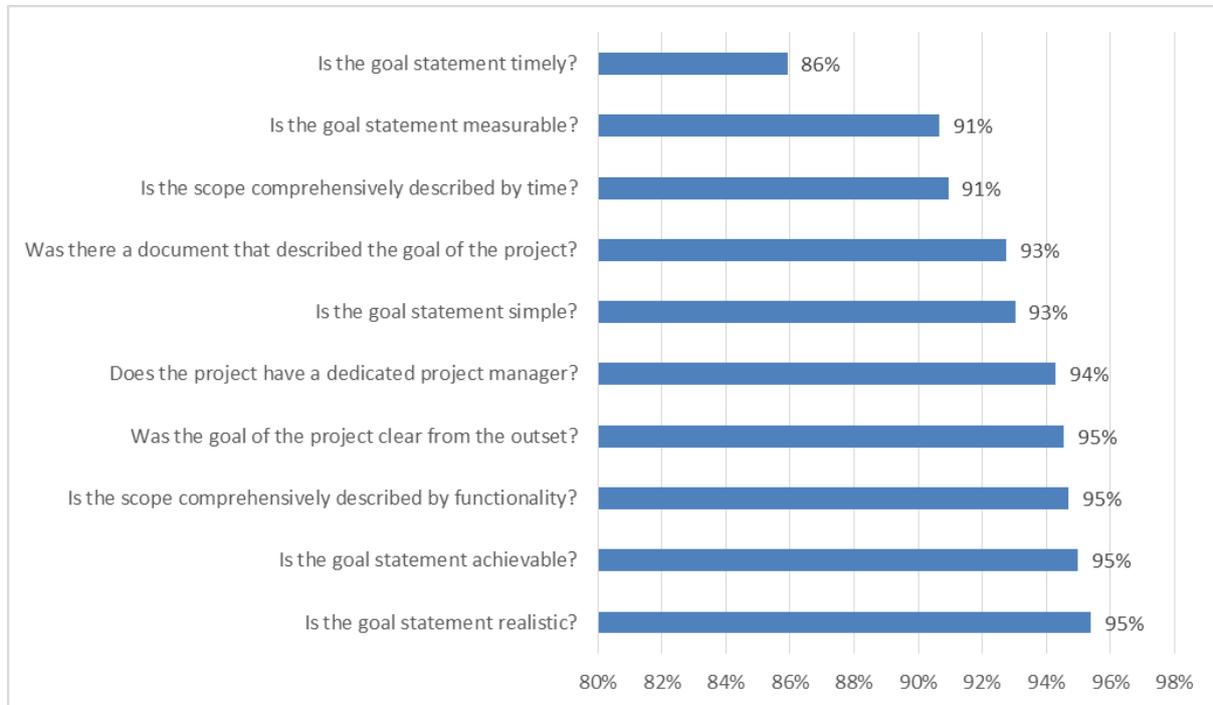


Figure 3. Top ten implemented *Steering* practices

Clearly the practices related to *Steering* that were implemented in the majority of cases revolve around goal setting. This is to be expected in that no governance can take place without the desired outcome being well defined. It is heartening to observe the emphasis on goal setting as this lays a solid foundation for the application of governance of projects. It is also worthwhile noting that in 94% of cases a dedicated project manager is appointed to steer the project to a successful outcome.

The ten least implemented *Steering* practices were extracted from various sections of the survey. These sections included risk management, human resources management and directing operations. Figure 4 illustrates the ten least implemented *Steering* practices.

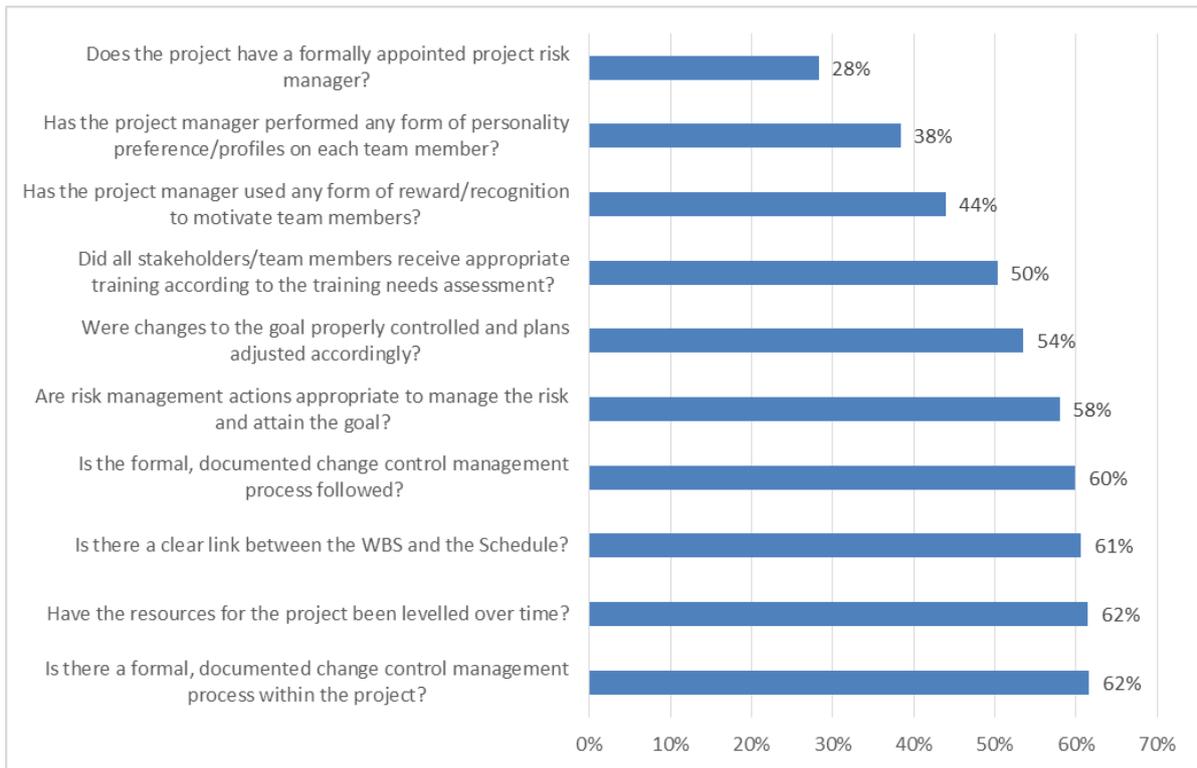


Figure 4. Ten least implemented *Steering* practices

All of these practices were performed less frequently than the average governance activity. There appear to be few *Steering* practices applied in human resource management as well as in risk management. Few projects actively manage change or risk. This lack of steering may increase the likelihood of project failure if risks and change are not taken into account. It would also be problematic to steer a project to success if the relevant stakeholder did not receive training. No amount of steering can lead to project success if the relevant resources and stakeholders are not equipped with the skills to complete the project.

Even though the desired outcome is very well understood, as illustrated in figure 3, figure 4 demonstrates that momentum is lost when trying to achieve the desired outcome. Risks may be permitted to occur unmanaged and undocumented changes are permitted to increase scope. Concurrently, the suitability and quantity of available human resources to perform the planned work are not guided towards the well-defined desired outcomes.

*Accountability* has the lowest priority as it relates to the four categories of the governance definition. Various best practices relating to *Accountability* are identified in figure 5.

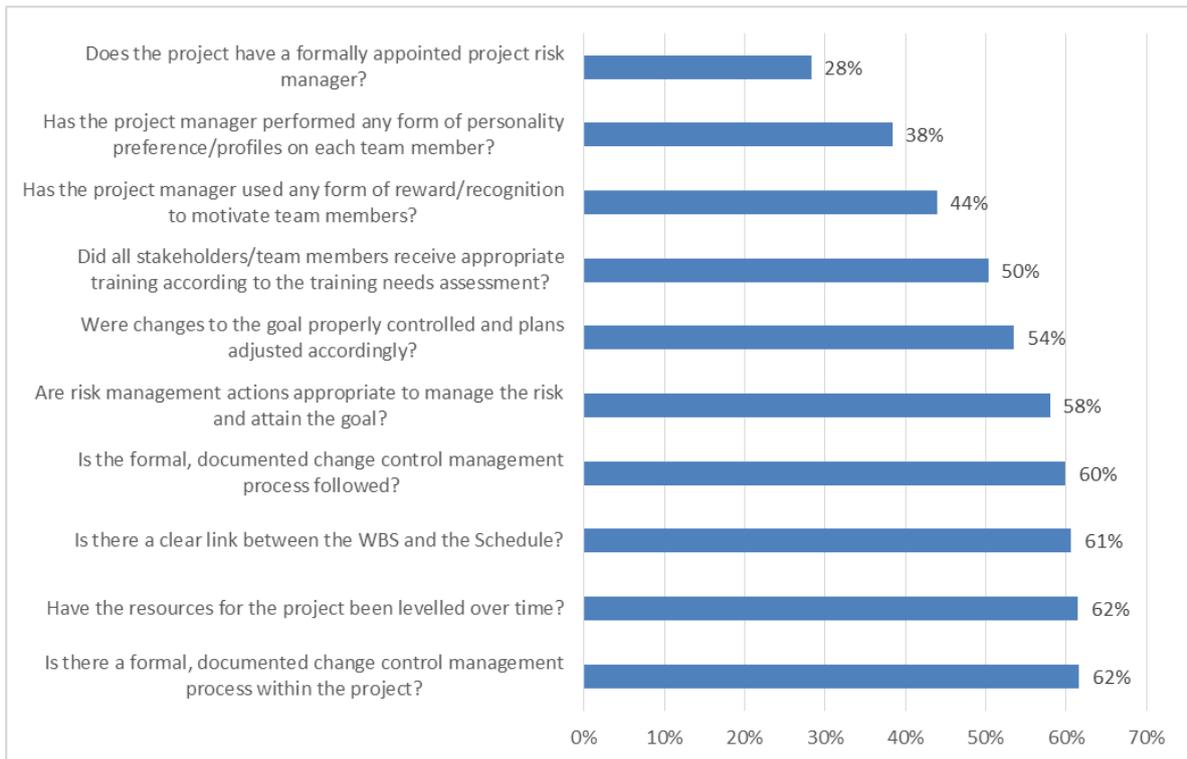


Figure 5. Implemented *Accountability* practices

There is a strong sense in *Accountability and responsibility* that the project manager takes ownership of the project. This is also supported by the fact that the project manager is accountable for the success of the project by virtue of the fact that these project management responsibilities form part of their own performance objectives according to which they are evaluated. It is, however, worrisome to note that project managers only received delegated authority 74% of the time when they took ownership of projects in only 90% of projects. Another concern is the fact that in most cases there was no mechanism to ensure that reports had been read. Without this controlling mechanism, project members cannot be held accountable for not having up-to-date project information. This lack of accountability might have a negative impact on the overall steering efforts.

*Transparency* is the category within the governance definition that enjoys the highest priority in the surveyed projects. Figure 6 illustrates that most of the best practices related to transparency received results higher than the audit average of 71%.

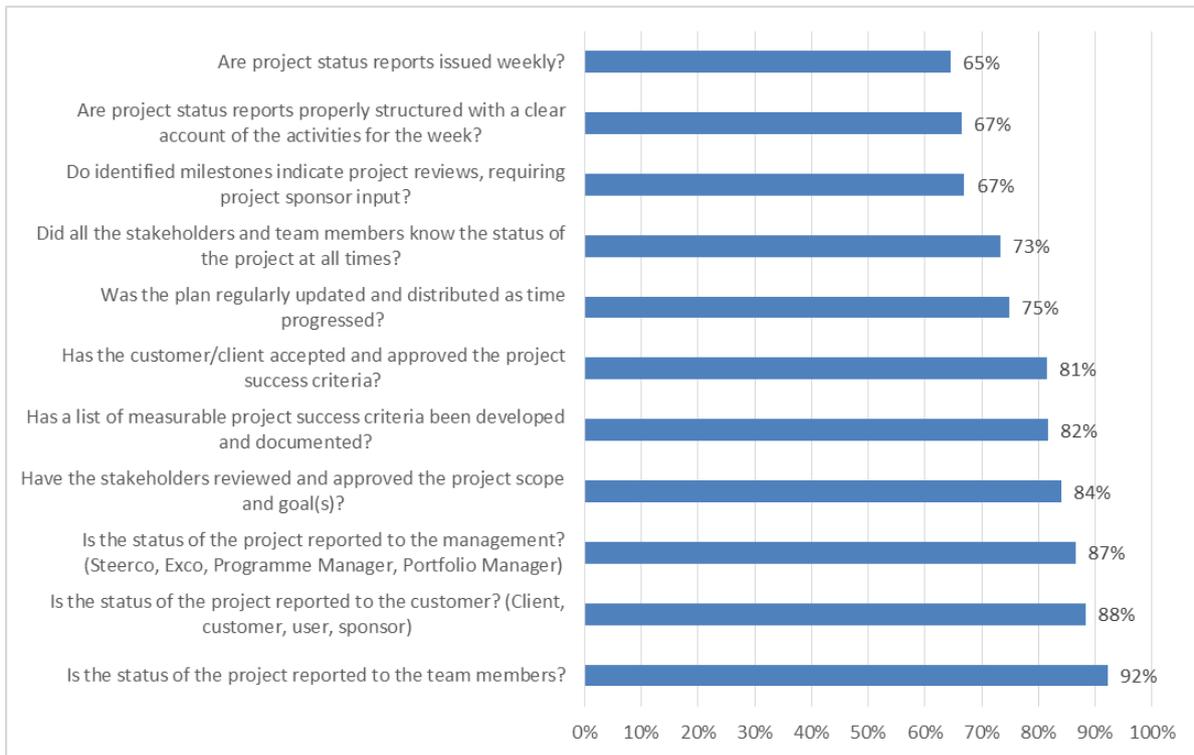


Figure 6. Implemented *Transparency* practices

Reports are disseminated to stakeholders, customers, project team members and executive committees. There can be no question that information regarding project status is freely shared. The only concern would be that it is not shared often enough. Only in 65% of cases were project reports disseminated to interested parties. This may impede corrective steering efforts and render the governance process inefficient. Project managers must be commended on the fact that they communicate transparently and ensure that relevant information is disseminated and relevant input is received. One must, however, reflect that even though this information is sent in a transparent manner, there is no mechanism to ensure that reports are actually read. Even though communication is transparent, it is no guarantee that effective communication is taking place.

Ensuring that *Stakeholder rights* are upheld is the governance category that is also the least prioritised. Figure 7 analyses which activities support *Stakeholder rights*.

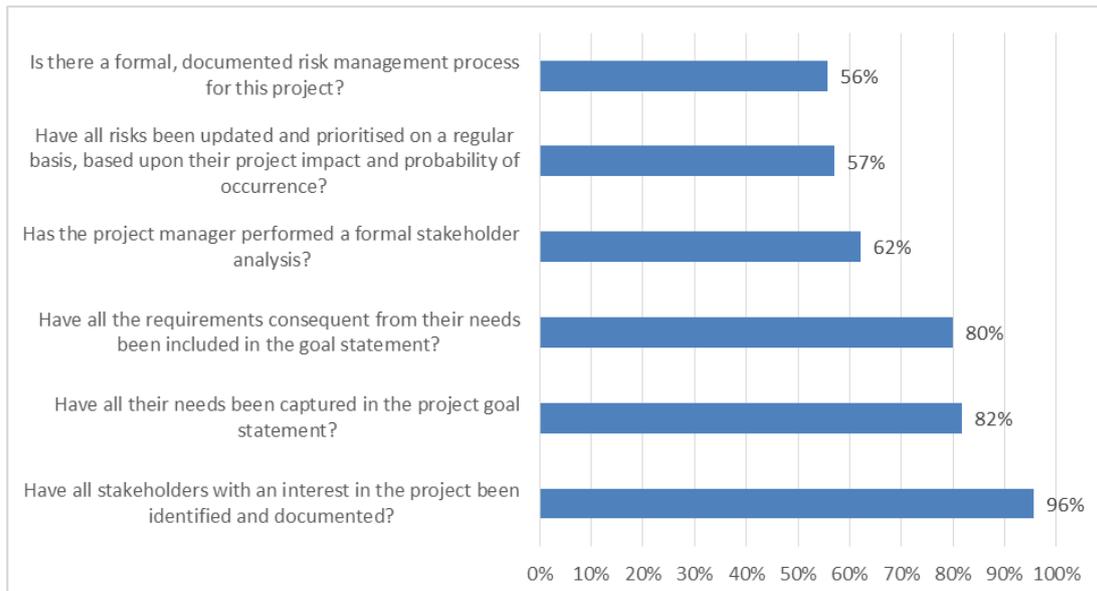


Figure 7. Implemented *Stakeholder rights* practices

The rights relevant stakeholders have can be derived from their needs and requirements. In this sense, project managers are diligent in ensuring that they identify all relevant stakeholders, their needs and consequently, their requirements. However, momentum is again lost in that no stakeholder analysis (62%) is performed to ensure that they are involved at the appropriate level according to their level of interest and influence. And once again, risk management deficiencies become visible in that a formal risk management process only existed in 56% of cases surveyed. If these risks are not managed effectively, the stakeholders may suffer financial loss. Stakeholders expect a level of return commensurate with their level of investment. If risk management is neglected, the rights of stakeholders cannot be advanced.

The four categories within the governance definition have been discussed and certain concerns and commendations have been highlighted. When seeing the identified governance practices in the context of the identified areas of the questionnaire, specific areas of concern also arise as detailed in figure 8.

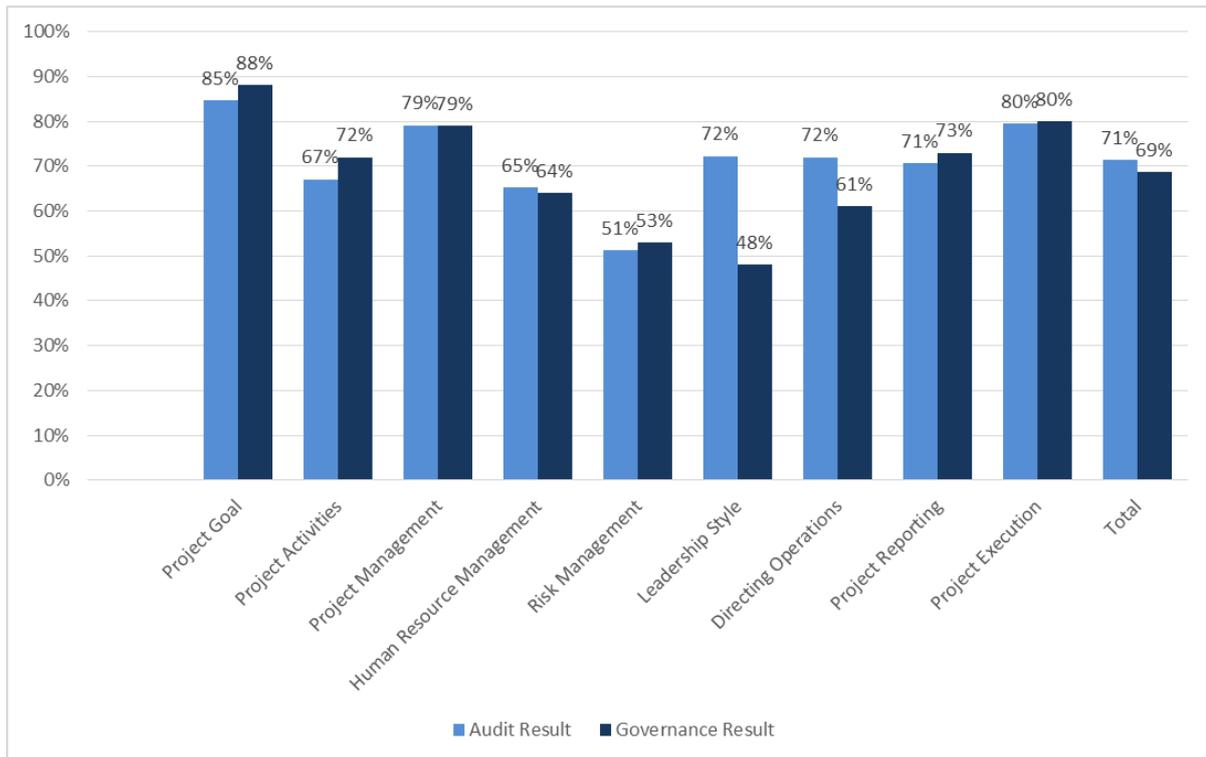


Figure 8. Project audit results vs. governance activities result

Generally, project managers performed 71% of the best practices recommended by literature. As no benchmark exists, it is difficult to determine whether this is a satisfactory result or not. The best practices identified as relating to governance in the King III context have also been tabulated. Project managers performed fewer of these at a level of 69%, which is below the average audit result of 71%. It does seem, however, that the audit result and the governance result generally remain close to each other for most areas of investigation. Three aspects deserve further investigation, though. These are the greater discrepancies between the audit result and governance result for (i) leadership style and (ii) directing operations. The third aspect is the very low audit and governance result for risk management.

When investigating the leadership style section, three practices were identified as relating to governance. These three practices relate to the *Steering* and *Stakeholder rights* category of the governance definition as illustrated in figure 9.

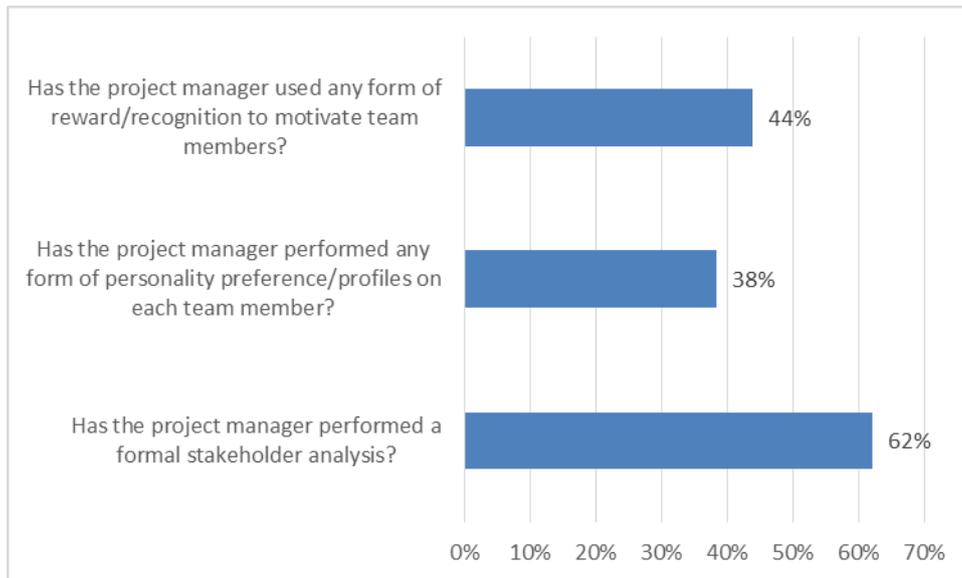


Figure 9. Leadership style practices relating to governance

The steering activities of reward and recognition, and personality assessment achieved low levels of implementation. This may be a cause for concern as it may impact the ability of a project manager to steer the project effectively to the desired outcome. This contributed to the lower score of *Steering* in relation to the other three categories of the governance definition. It is also disconcerting to note that a stakeholder analysis was done on identified stakeholders in only 62% of projects surveyed. This begs the question how stakeholders' rights can be protected when it is not clearly established what the level of involvement or interest a stakeholder has in a particular project.

Figure 10 indicates the relevant governance practices identified in the directing operations section of the questionnaire.

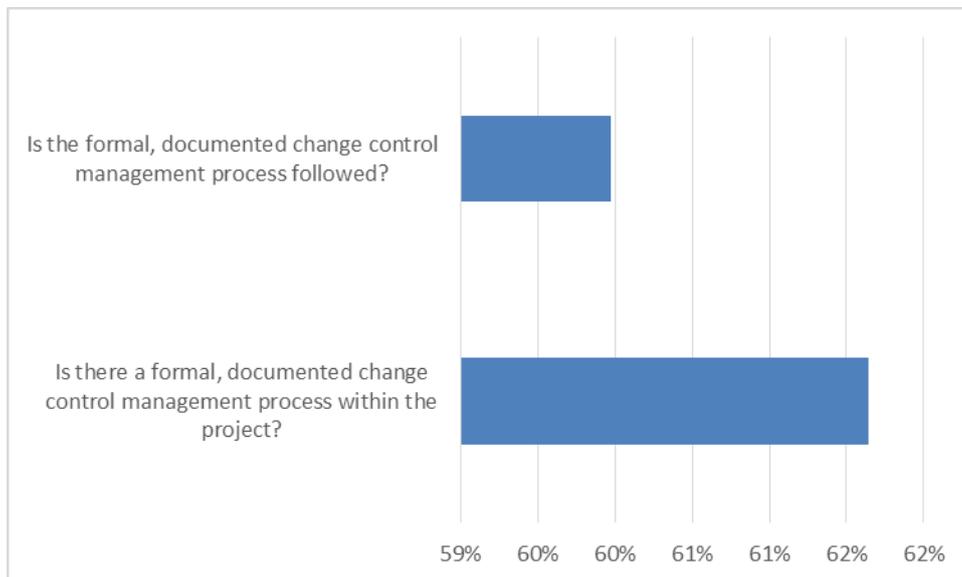


Figure 10. Directing operations practices relating to governance

The two identified practices relate specifically to steering or guiding as part of governance. A change control practice is essential to ensure that undocumented changes are not introduced so as to minimise "scope creep" (Schwalbe, 2009). These undocumented changes may cause the desired outcome to change or not be achieved at all. It does seem, though, that when a change control process is established, it is generally followed as demonstrated in table 1.

Table 1. Correlation between establishing a formal change control process and following it

|   |                     | Is the formal, documented change control management process followed? |
|---|---------------------|---|
| Is there a formal, documented change control management process within the project? | Pearson correlation | .860**  |
|   | Sig. (2-tailed)     | .000  |
| **. Correlation is significant at the 0.01 level (2-tailed).                        |                     |   |

A very strong, significant correlation is found between the establishment of a formal, documented change control process and adherence to that process. This is a positive state of affairs that serves to indicate that when steering is provided, behaviour is influenced. It is, however, lamentable that the opportunity for steering the project to the desired outcome is not taken by project managers in the broad sense.

Risk management is a critical function of governance and is so highlighted in various governance codes and project standards (Association for Project Management, 2004; Hampel, 1998; Institute of Directors, 2010; McKnight, Milonas, Travlos, & Weir, 2005; Project Management Institute, 2013a; Vinten, 2001). Given the importance literature places on the management of risk, one would expect a higher implementation of risk management practices in order to achieve the desired outcome of a project. The data collected, however, indicates the opposite, as illustrated in figure 11.

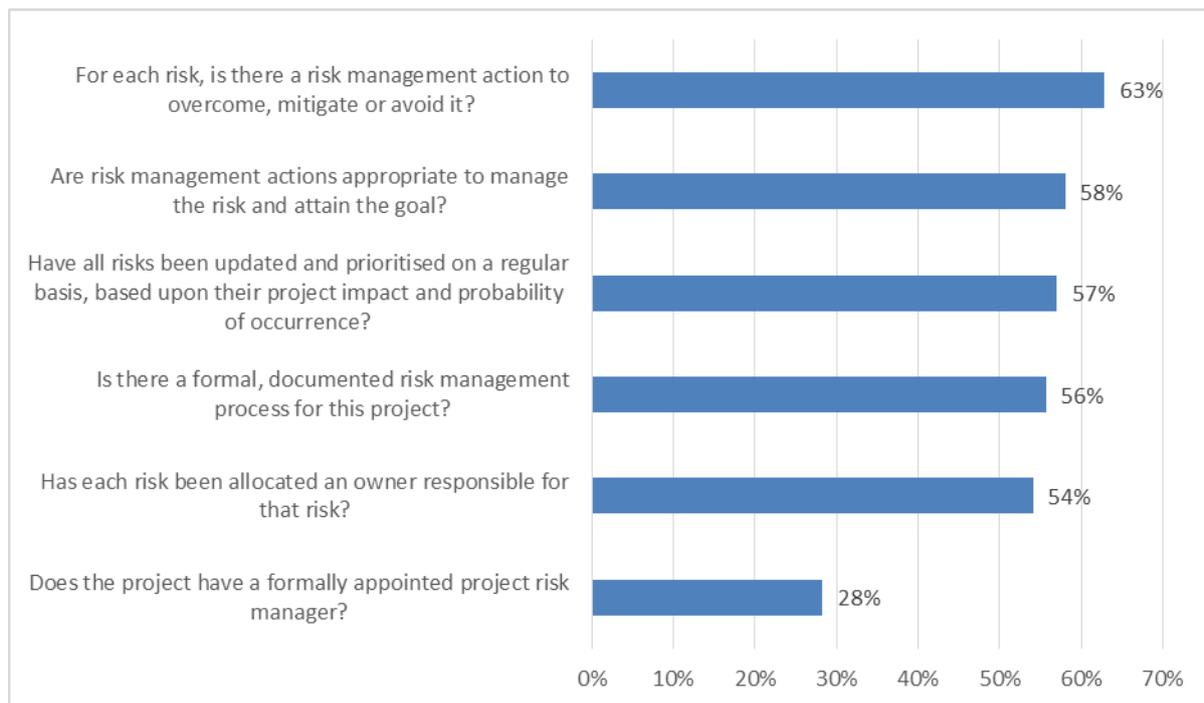


Figure 11. Risk management practices relating to governance

Risk management as a focus area scored the lowest of all the areas in terms of the total audit result and related governance practice result. The reason for this low level of compliance could lie in the fact that a formally appointed person responsible and accountable for risk was present in less than two-thirds of projects. The result would be a complete lack of steering away from risk towards the desired outcome. This is the main area where project managers are negligent in their duty to uphold the rights of stakeholders as well.

The overall view serves to indicate that there is little evidence of formal governance structures being implemented in ICT projects. This view is supported by the fact that only 66% of respondents responded positively when asked if a formal governance structure existed in their context. Table 2 sets out the relationship

between the existence of a formal governance structure and best practices relating to steering, accountability, transparency and upholding stakeholder rights.

Table 2. Relationship between steering, accountability, transparency, upholding stakeholder rights and formal governance structure presence

|  |                     | Is there a formal governance structure on the project? |
|--|---------------------|--|
| Steering practices   | Pearson correlation | .537**   |
|  | Sig. (2-tailed)     | .000   |
| Transparency practices                                       | Pearson correlation | .443**   |
|  | Sig. (2-tailed)     | .000   |
| Accountability practices                                     | Pearson correlation | .613**   |
|  | Sig. (2-tailed)     | .000   |
| Stakeholder practices  | Pearson correlation | .540**   |
|  | Sig. (2-tailed)     | .000   |
| **. Correlation is significant at the 0.01 level (2-tailed). |                     |  |

Medium to strong relationships are observed. This may indicate that the existence of a formal governance structure could include the identified best practices. A case may also be made in that a certain low order type of governance does operate without the explicit mentioning of a governance structure being formalised. The benefits of a formalised, documented structure of any type include that it can be monitored, measured and managed. Where no such structure exists, governance happens accidentally in probably an unguided manner.

These results can be interpreted to indicate that the governance of projects is not implemented in a formal manner for the purposes of guiding behaviour to a desired outcome.

## CONCLUSION

It is apparent that governance is not implemented in the ICT project management discipline as a concerted effort. In some cases it seems that governance is a natural by-product of the application of best practices. It emerges without effort or guidance. In this state of affairs, it could mean that governance is not seen as an integral part of increasing the likelihood of project success. Overall the notion emerges that not even standard community developed best practices are implemented consistently – the best practices relating to governance even less so. This may result in inconsistent project success rates as is apparent through previous research. Even though the governance effort is spread out evenly among *Steering, Transparency, Accountability* and upholding *Stakeholder rights*, there is no balance in the activities that should implement governance.

It is, however, clear that project managers do not consistently apply best practices in their projects. This may be as a result of the lack of appropriate steering and accountability. This article is only able to determine what the current state of governance in ICT projects is. The current levels of compliance may by no means be sufficient. The current inconsistent and low levels of ICT project success may provide a basis for such an assertion. Further research is demanded in the area of what constitutes good governance in project management. A clear link is also to be established between a concerted governance effort in ICT projects and the resultant outcome.

It is the conclusion of this paper that governance is not applied consistently in ICT projects and that project managers are not subjected to rigorous compliance measures. A project manager's behaviour must be guided by way of implementing best practices that increase accountability, transparency and upholding stakeholder rights. Through the implementation for activities that support the four dimensions of this governance definition,

projects may be steered to the desired outcome of delivering project success. Until such a regime is seriously considered and implemented, the undesirable outcome of ICT projects will remain the status quo.

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**GROWING PROJECT  
MANAGEMENT IN AFRICA**

*PMSA National Conference  
29 September - 01 October 2014*

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**Programme Committee**  
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### **ANNEXURE 3 Review Panel**

The review panel followed a double-blind review process, with each reviewer receiving two or more papers. Reviewers were elected based on their standing within the project management community. The following reviewers volunteered their time in the interest of ensuring that the content at the conference meets a high standard. Their participation is sincerely appreciated.

Prof. Erling Andersen  
Prof. Stephen Flowerday  
Prof. Les Labuschagne  
Dr Ginger Levin  
Dr Ernest Mnkandla  
Prof. Stephanie Teufel  
Prof. Mariki Eloff  
Dr Kevin Grant  
Prof. Tim Kloppenborg  
Prof. Ude Ojiako

## ANNEXURE 4 Review Process

A 'Call for Papers' issued in early 2014, inviting anyone interested in making a contribution towards the conference to submit a short abstract by mid-April. The author(s) did not necessarily have to be a member of the PMSA. By 9 July 2014 prospective authors were required to submit a draft paper for review. All articles submitted were subjected to a double blind refereeing process by the Review Committee. The Review Committee was made up of local and international experts in the field of Project Management. Reviewers remained anonymous to the authors of the papers.

**Abstract Review:** Abstracts were reviewed for relevance to the conference theme. Acceptance of the abstract did not guarantee the acceptance of the full paper. All abstracts will be reviewed by a subcommittee of the Paper Review Committee.

**Full Paper Review:** Each draft paper was reviewed by at least two experienced and well respected individuals. In a double blind peer-review process full papers are scrutinised by an international panel of reviewers. The two reviewers are asked to provide specific feedback, both positive and negative, to the authors. Only accepted reviewed papers were published in the formal conference proceedings. All papers were reviewed using the following criteria:

- Originality
- Significance
- Research Design
- Technical Quality
- Relevance
- Presentation

Reviewers were also asked to give an Overall Rating as well as a Confidence in Rating for each the paper. In the next section, reviewers had to qualify their rating by providing a rationale for the Overall Rating given. This was followed by the Reviewer Comments that would assist the authors in improving and correcting their papers. Reviewers were asked to be as comprehensive as possible in this section.

The Organising Committee received the completed review forms from the Reviewers and combined the scores from the reviewers for each paper to determine a whether they would be accepted or not. Only papers with a combined value above a certain threshold were accepted as full papers. In the event where two reviewers differed drastically from one another, the paper was sent to a third reviewer.

The reviewers' comments were forwarded to the author with the request to submit a final revised version of the paper by 18 August 2014. Only those papers which were of an acceptable quality as recommended by both Reviewers are included in the formal Conference Proceedings as Reviewed Papers.

The review process used is based on what is considered the international de facto standard for double-blind paper reviews