

FACTORS THAT INFLUENCE THE OUTCOME OF INFORMATION TECHNOLOGY PROJECTS IN SOUTH AFRICA: AN EMPIRICAL INVESTIGATION

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Purpose: In developing countries such as South Africa, many organisations are reliant on information and communication technology (ICT) to provide accurate, relevant and timely information. For organisations to obtain and sustain a competitive advantage, ICT systems are constantly implemented, upgraded, modified or replaced. These initiatives are often managed as projects.

While there is an increasing amount of both financial resources and effort being spent on ICT, these projects are not always delivered within the predetermined project constraints. This implies additional time to complete, as well as additional costs, as resources are not released in time to participate in other projects. It is therefore important to understand the factors that influence the outcome of South African ICT projects relative to their original constraints.

Problem Investigated: The goal of this article is to determine the factors that influence South African ICT projects, taking into consideration the fact that most current published research on this topic was done within the context of a developed country such as the USA and Europe.

Design and/or methodology: The outcomes of ICT projects in South Africa as well as the factors that influence them were determined through an extensive survey. An analysis was done on the factors together with a correlation between the main factors contributing to project outcomes. The purpose of this was to establish if a factor's presence or absence influenced the eventual outcome.

Findings: The factors that contribute to a successful outcome are often outside the direct control of the project manager and tend to be complex in nature. One factor that does stand out is that the alignment of projects with business objectives influences their perceived success.

Originality/Value: The benefits of this article are that it firstly provides a South African perspective of current ICT project management practices, and secondly, it highlights factors that influence project outcome. Organisations can use this information to improve their current practices.

Conclusion: The value of the research results presented in this paper lies in the realisation that project success is not just determined by adherence to best practices or formal processes, but requires an environment and context conducive to business success.

Keywords: Information technology, projects, project management, project outcome, project success, project failure, empirical research, survey, South Africa

INTRODUCTION

In the last few years, the project management discipline has matured through the publication of several standards [Ahlemann, Teuteberg & Vogelsang, in press; Crawford, Pollack & England, 2007], best practices [Crawford & Pollack, 2007], research articles [Marnewick & Labuschagne, 2008; Sewchurran & Barron, 2008] and significant growth in its community of professional practitioners [Smith, 2003; Leyborne, 2007]. From this, it may be concluded that today, the majority of projects are completed successfully. However, literature suggests that this is not the case, especially in the information and communication technology (ICT) environment [Hyväri, 2006; Rubinstein, 2007; Pellegrinelli, Partington, Hemingway, Mohdzain & Shah, 2007].

According to the 2006 Chaos report [Rubinstein, 2007], only 35% of ICT projects are completed successfully, with 19% being outright failures and 46% being challenged. The Chaos report defines a challenged project as completed and operational, but over budget and/or over the time estimate and/or with fewer features and functions than initially specified [McPherson, n.d.]. This definition is

based on the triple constraint of projects [Peterson, 2007; Schwalbe, 2007:8] and differs from what others consider the criteria to be for measuring project outcome [Agarwal & Rathod, 2006; Muller & Turner, 2007]. The report further shows that there is an inverse correlation between the size of the project and its outcome [Ives, 2005]. The larger the project, the lower the probability of success and vice versa.

The above results are obtained from surveys conducted predominantly among US-based organisations. Similar studies have been done for other developed countries as well [O'Leary & Williams, 2008; Thomas & Fernandez, in press]. Recent statistics on South African success rates could not be found. In 2003, the Prosperus report [Sonnekus & Labuschagne, 2003; Sonnekus & Labuschagne, 2004] showed the success rate of ICT projects in South Africa to be 43%, with 35% being challenged and 22% failing.

This article provides the results of a research project that set out to answer three questions within the South African context:

- What is the outcome of ICT projects and how does that compare to the 2003 Prosperus report?
- What is the correlation between the size of the project and project outcome?
- What factors influence the outcome of a project and what is the correlation between those factors?

The article is divided into three main sections. The first describes the research methodology and design that were followed in conducting the research. The second section focuses on the analysis and interpretation of the results in relation to the three research questions stated above. The third section provides some recommendations to ensure continuous improvement in project success.

RESEARCH METHODOLOGY AND DESIGN

Cresswell [2003:120] defines research as "*a set of interrelated constructs (variables), definitions, and propositions that presents a systematic view of phenomena by specifying relations among variables, with the purpose of explaining natural phenomena*". This research observes the current practices in industry through a survey and attempts to provide some explanation as to the observed phenomena. The research design as a strategic framework provides an explicit plan of action which includes the techniques for data collection, analysis and reporting [Hart, 1989; Blanche & Durrheim, 2004; Emrouznejad, Parker & Tavares, 2008].

The research type used is exploratory in nature. Devlin [2006] suggests that this approach has the goal of formulating problems more precisely, obtaining insight and forming a hypothesis. This type of research is usually small scale and undertaken to define the exact nature of the problem with a view to gaining a better understanding of the environment within which the problem exists.

This research is a longitudinal study and compares the results of the Prosperus 2003 report with the current findings. The intention is that this research be repeated every second year to determine trends and influence the outcome of ICT projects in the future.

Quantitative Research Approach

The research approach selected was quantitative as project management issues are investigated in a large population using predetermined categories so that broad and general comparisons can be made [Patton, 2002; Creswell, 2003; Blanche & Durrheim, 2004]. Another reason is that numbers can be analysed using descriptive and inferential statistics [Bless & Higson-Smith, 2004; So & Leung, 2004].

Profile of the Respondents and Setting

Two hundred and twenty respondents, representing different types of industries in South Africa, participated in the survey. There were 44 females, 155 males and 22 respondents who did not indicate their gender. The majority (68.6%) of the respondents were between the ages of 30 and 50, and 13 did not indicate their age. Participants from the various organisations presented a random

sample, which was important to ensure that they were representative [Page & Meyer, 2000; Blanche & Durrheim, 2004].

Data Collection Methods

Data was collected using a structured questionnaire with 155 items placed under 23 questions. The questionnaire was distributed to over 800 people and a total of 221 responses were received. Fifteen questionnaires were removed as these were incomplete or inconsistent, leaving 206 usable responses from 10 industry sectors.

The questionnaire was hosted electronically on a website and invitations to participate were distributed via e-mail, personal invitation and a South African project management magazine. To secure as many responses from as many different industry sectors as possible, two research assistants followed up with invitees and collected data via e-mail [Devlin, 2006:131]. Senior students were also utilised in collecting responses from different organisations.

ANALYSIS OF DATA

The data collected through the questionnaire was processed and analysed by Statkon, an independent enterprise operated by the Statistics Department at the University of Johannesburg, specialising in statistical analysis. SPSS [Armstrong & Everett, 1990; Hinton, Brownlow & McMurray, 2004], a statistical analysis software package, was used.

The following types of analysis and statistical tests were performed on the data [Leeper, n.d.]:

- Reliability analysis - allows the researcher to study the properties of measurement scales and the items that comprise the scales
- One way ANOVA - used to test the hypothesis that several means are equal, frequent and descriptive
- T-test - tests the difference of means between two groups defined by a missing indicator variable for each of the other variables.

The mean, variance and standard deviations were devised from the data as they formed the basis for inferential statistical procedures [Blanche & Durrheim, 2004].

The Assessment of Trustworthiness

Reliability is concerned with the consistency of measures. Equivalent-form reliability, similar to the test-retest method and item analysis, was used for judging the reliability of the research design [Bless & Higson-Smith, 2004:179].

To ensure the validity of data, content validity, face validity and construct validity were used. Triangulation and various sources of evidence enhanced the construct validity of this study. This research is characterised by the use of different data sources (10 industry sectors), improved content and known theory or models such as the PMBoK® guide [PMI, 2004] and Project Management Maturity Models (PMMM) [Kwak & Ibbs, 2002; Dinsmore & Cabanis-Brewin, 2005; Crawford, 2006]. The Organisational Project Management Maturity Model (OPM3) [PMI, 2003] was not used as this would make it impossible to compare results with the Prosperus 2003 report.

The researchers performed the necessary preparations to improve their essential competence in the field, which included the clarification of biases and assumptions [LeCompte, Preissle & Renata, 1993] which should enhance the validity and reliability of the findings.

Merriam's strategies [1999] (peer/colleague examination, the statement of the researcher's biases, submerging the researcher in the study) were followed in this study, thus enhancing the internal validity of the findings.

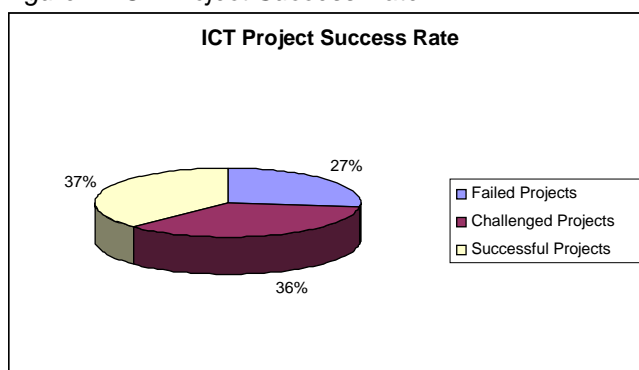
The following section focuses on the analysis of the data in relation to the factors that contribute to ICT project outcomes in South Africa.

ICT Project Outcomes

The interpretation of project success, failure and challenge was left to the discretion of the respondent, as this is still being debated with several opposing views [Turner, 2004; Yu, Flett & Bowers, 2005; Agarwal & Rathod, 2006; Wang & Huang, 2006; Jha & Iyer, 2007; Shepherd, Covin & Kuratko, in press].

The first question in the survey focused on the number and outcome of projects managed by respondents. The total number of projects managed by the 206 respondents between 2005 and 2007 was 529. Figure 1 is a graphical representation of the findings and from this it can be seen that according to the respondents, 37% of ICT projects were perceived as successful, 27% were perceived as failures and 36% were challenged.

Figure 1: ICT Project Success Rate



Twenty-seven per cent still represents a significant waste of financial resources, time and effort. Table 1 below shows the longitudinal analysis.

Table 1: Comparison of Project Outcome between Prosperus 2003 and 2007 Survey

Project Outcome	Prosperus 2003 %	2007 Survey %	Variation %
Failures	22	27	↑ 5
Challenged	35	36	↑ 1
Successful	43	37	↓ 6

These results show that challenged projects have remained the same, while failures have increased and successes have decreased. Given the development and maturation of project management as a discipline, the expectation would have been the opposite, i.e. to see an increase in successful projects and a decrease in failures.

This indicates that there has been a change in the practices, the way outcome is measured and/or the characteristics of the projects being undertaken. Further investigation is required to determine the exact reasons for this phenomenon.

Based on the fact that a significant portion of ICT projects in South Africa are perceived as failures, the following section focuses on the correlation between project size and project outcome. Ives [2005] states that ICT projects fail because of the project's size, which is often of a greater magnitude than originally perceived. The Chaos chronicles also support the causality of project size on project outcome [Hyväri, 2006].

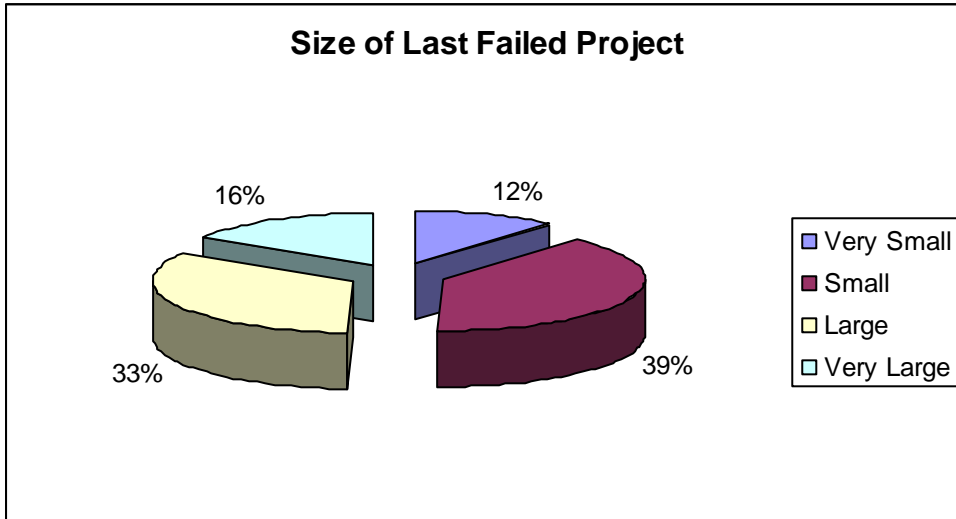
Relationship between Project Size and Project Outcome

The second question in the survey follows on from the previous section and focuses on the factors that influence project outcome. The focus was on the last project that a respondent was involved in,

with the first determinant being size. Respondents were given four qualitative sizes without any limiting quantifiers.

The first part focused on the size of the last failed project and was based on a total of 143 projects. Sixty-three respondents stated that they had never been involved in a failed project. The results are shown in figure 2.

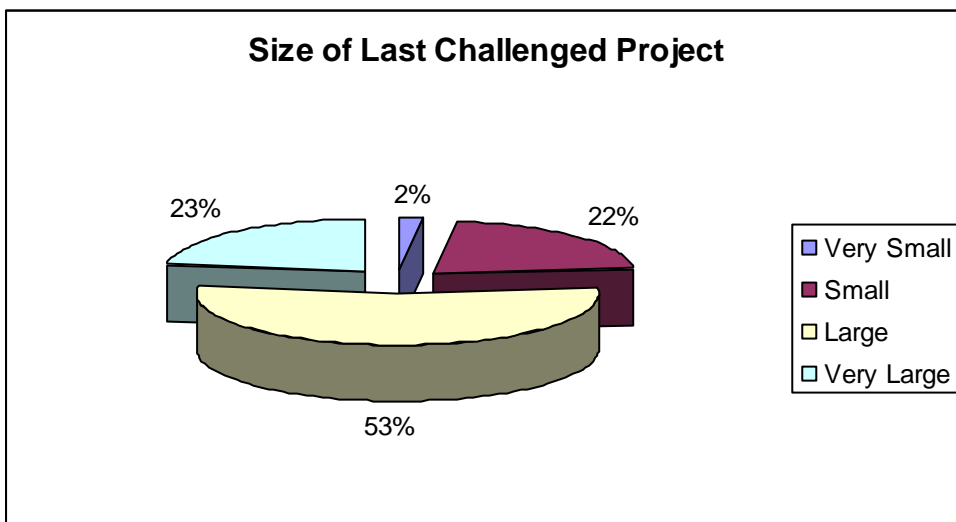
Figure 2: Size of last failed project



The results indicate a normal distribution with a cumulative total of 72% for small (39%) and large (33%) projects.

The second part focused on the impact the project size had on challenged projects and was based on a total of 187 projects. Nineteen respondents indicated that they had not been involved in a challenged project before. The results are displayed in figure 3.

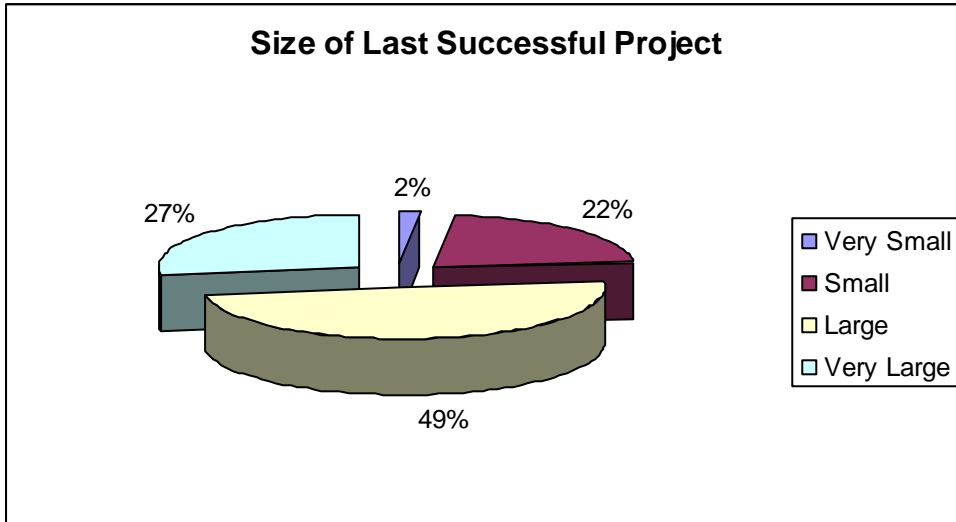
Figure 3: Size of last challenged project



The results are similar to the previous part as a cumulative total of 75% is shown for small (22%) and large (53%) projects. The major difference is that a significantly larger part of very large projects (23%) was perceived as challenged compared to a significantly smaller portion of very small (2%) projects.

The third part focused on the relationship between project size and successful projects and was based on a total of 199 projects. Seven respondents indicated that they had not been involved in a successful project before. The results are displayed in figure 4.

Figure 4: Size of last successful project



Again, the results are very similar to the previous parts as a cumulative total of 71% is shown for small (22%) and large (49%) projects. The results are similar to the challenged projects in that a significantly larger part of very large projects (27%) was perceived as successful compared to a significantly smaller portion of very small (2%) projects. Table 2 below shows a summary of the above results.

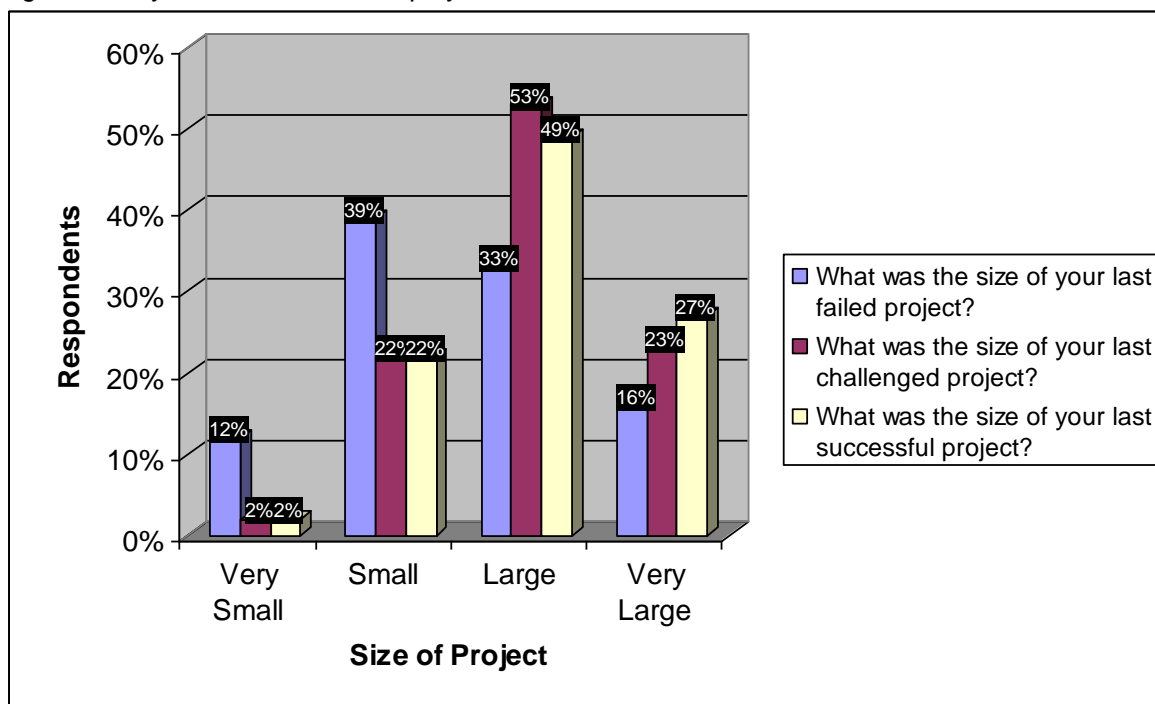
Table 2: Project size in relation to project outcome

	Total Number of Projects	Very Small	Small	Large	Very Large	TOTAL
What was the size of your last failed project?	143	12%	39%	33%	16%	100%
What was the size of your last challenged project?	187	2%	22%	53%	23%	100%
What was the size of your last successful project?	199	2%	22%	49%	27%	100%

Given the information in table 2, it can be reasoned that the larger the project, the higher the potential for the project to be a success or challenged. Very small projects have a greater relative probability of failure (12%) compared to success (2%), and for small projects this figure is 39% and 22%, respectively. Very large projects, on the other hand, have a better chance of success: 27% compared to 16% failing; and for large projects the results are 49% and 33%, respectively.

Figure 5 is a graphical presentation of the project size in relation to the project success. It is clear that the distribution of the failed projects is fairly normal, but the distribution of challenged and successful projects is skewed towards the large and very large projects.

Figure 5: Project size in relation to project outcome



The final section of the article focuses on the factors that influence the outcome of the project: successful, challenged or failed.

Factors Influencing Project Outcome

The respondents were asked to indicate the factors that made a direct contribution to the outcome of the project. Respondents were only asked if a factor influenced the outcome of the project and not to rate them relative to one another. The factors were compiled from what was used in the Chaos chronicles [Jugdev & Müller, 2005] as well as an intensive literature review [Nguyen, Ogunlana & Lan, 2004; Andersen, Birchall, Jessen & Money, 2006; Ali, Anbari & Money, 2008]. Table 3 shows the factors for each outcome with the top three scores for each category highlighted.

Table 3: Factors influencing project outcome

Factors Influencing Project Outcome	Failed Projects	Challenged Projects	Successful Projects
Communication between team & customers	47	54	156
Executive support	47	36	121
Handling of change	45	52	110
User involvement	45	45	104
Clarity of business objectives	39	55	133
Clarity of requirement definition	37	56	126
User understanding of technology	36	50	75
Change control processes	36	27	85
Understanding of user's needs	30	37	115
Communication between project team members	26	40	150
Formal methodologies	26	30	87
Project manager competency	22	28	121
Support of innovative technology	20	21	64

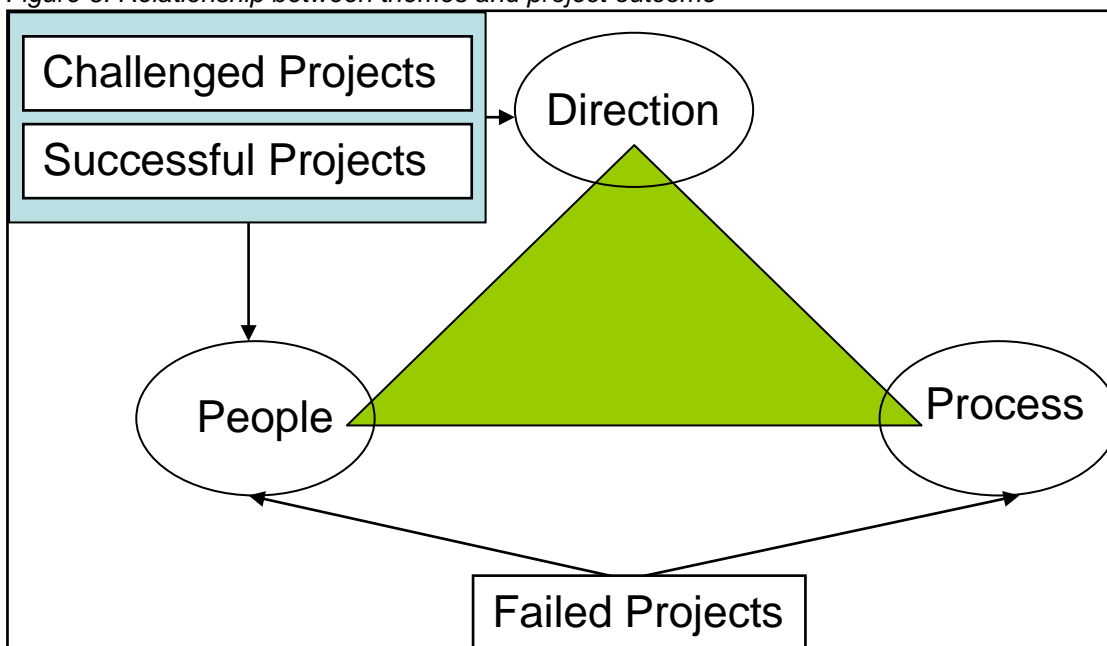
Auditing of processes	16	27	45
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It is apparent from the above table that respondents were more confident in terms of the factors and their influence on successful projects than on their influence on failed projects.

Based on the information in table 3, the two main themes of the top four factors for failed projects are people (communication between team and customers; executive support; user involvement) and processes (dealing with change). Various literature sources support this finding [Van Marrewijk, 2007; Nieminen & Lehtonen, 2008; Bellini & Canonico, 2008].

For challenged projects, two main themes emerge, namely people (communication between team members) and direction (clarity of business objectives; clarity of requirement definition). For successful projects, two main themes also emerge, namely people (communication between team and customers; communication between project team members) and direction (clarity of business objectives; clarity of requirement definition). Figure 6 shows the different themes and how these themes relate to project outcome.

Figure 6: Relationship between themes and project outcome



The only common factor across all three project outcomes is communication between team and customers. Communication on projects has long been recognised as a critical success factor for project success [Goczol & Scoubeau, 2003; Chiocchio, 2007; Peterson, 2007]. Good communication facilitates project success while poor communication hinders it.

When analysing the commonality between challenged and successful projects, two factors emerge. These are communication between team and customers and clarity of business objectives, often defined by the customer. This clearly shows the importance of a collaborative approach between project team and customer, as well as the importance of aligning projects with business objectives. Misaligned projects are often perceived as failures despite being completed within the triple constraints. Aligned projects, although sometimes being over budget or schedule, are often perceived as successful as they still deliver some degree of business value which is, from a business perspective, more important than adherence to the triple constraint. Based on the above finding, a number of recommendations can be made to improve the probability of project success.

RECOMMENDATIONS

From the above findings, the following recommendations are made:

- Organisations must provide clear guidance on how to measure the outcome of an ICT project. Several references can assist an organisation in developing such criteria [Bryde, 2003; Olsson, Johansen, Langlo & Torp, 2008].
- Small projects should not be underestimated. The same effort and focus must be applied to the management of small projects as to large projects. Several formal methodologies have been developed that focus on the management of small projects [Ken, 1994; Rowe, 2007].
- Alignment between business objectives and projects is crucial. Poor alignment can lead to wasted effort and resources despite completing a project within the triple constraints. There are several methods for ensuring alignment [Marnewick & Labuschagne, 2006; Marnewick & Labuschagne, 2008].
- A good relationship between customer and project team is fundamental to project success. Projects require a collaborative environment and not an adversarial one. Several publications are available on establishing and maintaining such an environment [Stewart, 2001; Bourne & Walker, 2006].

CONCLUSION

The focus of the article is to develop a better understanding of current practices in ICT projects in South Africa. The first section illustrated the current state of ICT project outcomes. The second and third sections showed the correlation between project size and outcome as well as the factors that influence the outcome of an ICT project.

As can be seen from the above results, the outcome of ICT projects in South Africa has changed over the last few years. An increase in the maturity of the project management discipline does not necessarily mean that more projects are managed successfully. The factors that contribute to a successful outcome are often outside the direct control of the project manager and tend to be complex in nature. The second conclusion is that project size could influence the outcome. Further investigation is required to determine why small projects tend to be more likely to fail than to succeed. The final conclusion is that the alignment of projects with business objectives influences their perceived success.

The value of the research results presented in this paper lies in the realisation that project success is not just determined by adherence to best practices or formal processes, but requires an environment and context conducive to business success. Project success cannot be viewed in isolation either. The cumulative result of projects is what ultimately determines business success.

Since this research is longitudinal, the research will continue to determine if there are any improvements in the successful delivery of ICT projects and what organisations must have in place to ensure continuous improvement.

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