LIST OF ACRONYMS

BCX	Business Connexions
BDS	Berkley Software Distribution License
BEE	Black Economic Empowerment
COCOF	Budget Commission of the Assembly of the French speaking community
CSIR	Council for Scientific and Industrial Research
DAC	Department of Arts and Culture
DBL	Doctor of Business Leadership
DG	Director General
DoT	Department of Transport
DPSA	Department of Public Service and Administration
eNatis	Electronic National Traffic Information System
EU	European Union
FOSS	Free Open Source Software
FPO	Free Open Source Programme Office
GITOC	Government Information Technology Officers' Council
GPL	General Public License
HR	Human Resources
HRM	Human Resources Management
ICT	Information and Communication Technology
IGOS	Indonesian Go Open Source
IP	Intellectual Property
IT	Information Technology
MISS	Minimum Information Security Standards
MIOS	Minimum Interoperability Standards
MoICT	Ministry of Information and Communication Technology
NACI	National Advisory Council on Innovation

NiDA	National Information and Communication Technology Development Agency
NLSA	National Library of South Africa
OC	Open Content
O-E-S-P	Organisation, Environment, Strategy and Performance
OMB	Office of Management and Budget
PFMA	Public Finance Management Act
PNC on ISAD	Presidential National Commission on Information Society and Development
SA	South Africa
SARS	South African Revenue Service
SCP	Structure Conduct Performance
SITA	State Information Technology Agency
SLED	SUSE Linux Enterprise Desktop
SLES	SUSE Linux Enterprise Server
SLTSM	Social Learning Theory of Strategic Management
SMME	Small, Medium and Micro Enterprises
SSP	Strategy Structure Performance
R&D	Research and Development
TAM	Technology Acceptance Model
TCO	Total Cost of Ownership
UK	United Kingdom
US	United States
USAASA	Universal Services and Access Agency of South Africa

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CHAPTER 1
PROBLEM STATEMENT

1.1 Introduction

South Africa adopted a policy for Open Source Software in 2003 (Republic of South Africa. Department of Public Service and Administration, 2006). This was followed by further research and consultation which led to a recognition that issues of open content are part and parcel of issues of open technology, and therefore that Open Content (OC) must be included within Free Open Source Software (FOSS) policy (South Africa. Department of Public Service and Administration, 2006). The revised policy was adopted in 2007. The adoption of the FOSS policy is based on evidence of potential FOSS/OC contributions to economic development generally, and it directly supports South African economic development priorities.

A problem that is likely with rolling out FOSS government wide is the absence of documented cases of the successful implementation of the FOSS policy by any sphere or department of government in South Africa. This is in spite of the fact that there are a number of FOSS projects that are currently taking place in government. For instance, the Presidential National Commission on Information Society and Development (PNC on ISAD) has completed its migration thus, taking the lead (Webb, 2010). The National Library of South Africa has also completed its process of migration (FOSS Focus, 2009).

This lack of documentation may result in managers in government finding it difficult to know how best to go about migrating to FOSS. A failure to address this problem will delay the take-up of FOSS, in spite of all its stated benefits. Evidence so far within the Government of South Africa is that the adoption of FOSS is progressing rather slowly (Webb, 2010).

The key words that were used to check for previous research relating to the topic are: strategic management, strategic management frameworks, grounded theory, emergent theory, theory development, case study method, technology migration, technology innovation, open value creation, Free Open Source Software (FOSS), open content, change management and strategy effectiveness.

The search engines that were used are Google, Google Scholar, Yahoo, Proquest, Academic One File and Ebsco Host.

In the following section, a problem statement is presented. This is followed in section 1.3 by an outline of the importance of the study. Section 1.4 presents a proposed methodology. The chapter ends in section 1.5 with a presentation of the significance of the study.

1.2 The Problem Statement

According to the FOSS policy of South Africa, each sphere of government and each department will need to assess precisely how each of the elements of FOSS migration and the various levels of commitment will be managed according to their own strategies, plans and projects (Republic of South Africa. Department of Public Service and Administration, 2006). In some cases, reference will be made to the Constitution and the human rights protected therein (such as the right of access to information, the right to freedom of expression, the right to equality without discrimination with regard to language, among others), while in other cases it will be national or provincial legislation, municipal by-laws, departmental strategic plans or other documents that establish the basis of the relevant scope for migration. Not all elements and levels of usage of FOSS will be appropriate for each strategy, plan or project undertaken by a department, but these must be assessed and justified on a case-by-case basis in a manner consistent with the policy. This allows for a policy that is clear and easy to understand, yet flexible and adaptable in its implementation.

Given the absence of documented cases of the successful implementation of the FOSS policy by any sphere or department of Government in South Africa, a problem that confronts managers is that of knowing how best to go about migrating to FOSS. A failure to address this problem will delay the take-up of FOSS, in spite of all its stated benefits.

There are a number of challenges that are likely with a large-scale process of migrating government services to Open Source. These are likely to cause anxieties that may delay the full adoption of FOSS by managers. The field of strategic management has developed a number of frameworks about how organisations can be managed for effectiveness (Farjoun, 2002; Adcroft, Willis and Hurst, 2008; Ansoff, 1980; Barney 2001; Ginter and White, 1982; Grobman, 2005; Munive-Hernandez, Dewhurst, Pritchard and Barber, 2004; Mintzberg, 1987). None of the existing frameworks explains how to manage the process of Information Technology migration or innovation to FOSS (see snapshots at the end of this document).

This is in spite of the existence of a number of possible problems with such large-scale technology migration efforts as envisaged by the South African Government (Bruggink, 2003; Cook and Horobin, 2006; New Zealand Government. Ministry of Justice, 2007; Republic of South Africa. State Information Technology Agency, 2008). Amongst these problems are:

- the anxiety amongst users about being confronted with a new system based on unfamiliar language, resulting in slow adoption;
- the resistance to such innovation from civil servants (and the public) that is used to using proprietary software;
- doubts about the levels of support that will be available from local firms and the wider user and developer community for FOSS;
- the need for capacity building on the use of the new software;
- uncertainties around levels of compatibility/interoperability between open source and other proprietary software that is in common usage not only in South Africa, but also by other governments and entities with whom the South African Government interacts with;
- anxieties about the availability of FOSS solutions that are appropriate in every situation for every user;
- the absence of a critical mass of users of FOSS;
- whether there are adequate governance rules for use by role players to manage their use of FOSS, including information security etc; and
- whether there is enough content structure development and standardisation to allow for the wide use of FOSS.

1.3 Importance/Purpose of the Study

The purpose of this study is to develop an emergent strategic management framework for Information Technology migration to FOSS by the South African Public Service. Such a framework will make the following valuable contributions.

a. It will support the growth of the field of strategic management. It will do this by contributing knowledge and insights that can be applied to technology innovation in general and migration to FOSS in particular.
b. The framework will assist the Government of South Africa and by extension, other entities and governments with the effective management of IT migration to FOSS.

1.4 Research Design

The method that will be used to develop this framework is a case study method using Grounded theory. Grounded theory is selected because it has been identified as an appropriate tool for theory development (Glaser and Strauss, 1967). Grounded theory is consistent with the organic perspective because it allows for the emergence of a framework from data.

Grounded theory is described as a general methodology for developing frameworks that are grounded in data systematically gathered and analysed. The framework evolves during actual research, and it does this through continuous interplay between analysis and data collection (Strauss and Corbin, 1997; Glaser and Strauss, 1967).

Bakir and Bakir (2006) state that grounded theory is often used where a totally fresh approach to the existing theory or framework is warranted because existing theories or frameworks do not adequately explain a phenomenon (as is the case with the dominant rational strategy discourse and its critiques), or when existing frameworks or theory on the phenomenon being studied is minimal.

1.5 Significance of the Study

A strategic management framework for Information Technology migration to Free Open Source Software (FOSS) will assist the Government of South Africa with the better implementation of its FOSS policy. The framework may provide guidance to public sector managers regarding how the process of migrating can best be managed.

By helping to accelerate the introduction of FOSS in South Africa, such a framework will make a contribution towards ensuring that South African society takes advantage of the value that open source software can deliver. This includes its contribution to the attainment of South Africa's developmental goals, including improving the efficiency and reach of government service delivery; improving national competitiveness; supporting local innovation and investment; broadening BEE participation in the economy, and building a better world.

The study also further extends the body of knowledge in the field of strategic management by extending the scope of frameworks to cover Information Technology innovation to FOSS.
The framework can be verified from different perspectives by researchers in the field.

1.6 Conclusion

The South African Government's adoption of a FOSS policy in 2003 was based on potential FOSS/OC contributions to economic development and other national priorities. The government wide roll out of FOSS in government following the adoption of this policy is likely to be hampered by the absence of documented cases of successful implementation of the policy by any sphere or department of government in South Africa. In addition, the absence of strategic management frameworks to guide migrating IT to FOSS is likely to further delay the adoption of FOSS in the South African Government.

Managers in the South African Government are therefore likely to be reluctant to migrate their IT to FOSS. A failure to address this problem will delay the take-up of FOSS, in spite of all its stated benefits. The purpose of this study is to develop a strategic management framework for IT migration to FOSS by the South African Public Service. This framework may assist the South African Government with the effective management of its migration to FOSS. The framework will also contribute to the body of knowledge in the field Strategic Management by extending the application of strategic management frameworks to FOSS. The methodologies used to develop the framework are grounded theory and the case study method.

Chapter 2 presents the background and context of FOSS migration in the South African Public Sector. A review of literature on technology innovation, FOSS and relevant aspects of strategic management is presented in Chapter 3. Chapter 4 presents the research design, followed by an outline of the research methodology used to conduct this study in Chapter 5. In Chapter 6, the theoretical framework or thesis is developed. This is followed in Chapter 7 by an outline of the process followed in refining the theoretical conjectures through a presentation to a focus group of practitioners. The document ends in Chapter 8 with the presentation of conclusions, limitations of the research and some issues for further research.

CHAPTER 2
BACKGROUND AND CONTEXT OF FOSS MIGRATION IN THE SOUTH AFRICAN PUBLIC SECTOR

2.1 Introduction

This study is undertaken within the context of efforts by the South African Government to migrate its Information Technology software from proprietary software to FOSS. Since the adoption of the policy for FOSS migration in 2003 by the South African Government, there has been little progress towards adoption by departments and public entities. In cases where some departments or public entities have migrated, there has been no documentation of how the process was managed. This lack of documentation may be one reason why progress towards migration is slow. Managers in the public service may be finding it difficult to know how best to go about migrating.

The field of strategic management has developed frameworks that can be used to guide organisations on how to be effective in pursuing their objectives, but there is none that explains how organisations can effectively manage the process of Information Technology migration to FOSS. By developing a strategic management framework for Information Technology migration to FOSS, this study is an attempt at filling this gap.

The study will assist the Government of South Africa by providing some guidance to managers on how to manage their migration to FOSS effectively. It will also contribute to the field of strategic management by adding insights that can be applied to technology innovation in general and migration to FOSS in particular.

2.2 The Decision to Migrate to FOSS

Persuaded of FOSS benefits, the South African Cabinet resolved in 2003 that government should move towards the utilisation of FOSS (Cabinet Memorandum No. 29 of 2003 *cited* by Republic of South Africa. Department of Public Service and Administration, 2006). This followed a proposal submitted jointly by the National Advisory Council on Innovation (NACI) and the Government IT Officers Council (GITOC). The approach during the initial phase following the adoption of this policy was to create knowledge and awareness amongst

government departments. This was later followed by further research, which recognised that issues of open content (OC) are part and parcel of issues of open technology, and therefore that open content must be included within a revised FOSS policy (Republic of South Africa. Department of Public Service and Administration, 2006). Cabinet adopted a revised FOSS policy in 2007 (Webb, 2010). This revised policy mandates the use of FOSS and this is described below.

1. The South African Government will implement FOSS unless proprietary software is demonstrated to be significantly superior. Whenever the advantages of FOSS and proprietary software are comparable FOSS will be implemented when choosing a software solution for a new project. Whenever FOSS is not implemented, then reasons must be provided in order to justify the implementation of proprietary software.
2. The South African Government will migrate current proprietary software to FOSS whenever comparable software exists.
3. All new software developed for or by the South African Government will be based on open standards, compliant with FOSS principles, and licensed using a FOSS license where possible.
4. The South African Government will ensure all government content and content developed using government resources is made open content, unless analysis on specific content shows that proprietary licensing or confidentiality is substantially beneficial.
5. The South African Government will encourage the use of open content and open standards within South Africa.

In spite of these commitments to FOSS, levels of adoption in South Africa remain lower than those in countries that adopted such policies later than South Africa (Mtsweni and Bierman, 2008). According to Webb (2010), although more than half of all departments have FOSS implementation plans, only about 25% use FOSS web servers, about 40% use FOSS in some form at the back end, and only 12% use some form of FOSS on the desktop.

In order to stimulate progress towards FOSS adoption, a FOSS strategy, also approved by Cabinet, was compiled by SITA in 2008 (SITA, 2008). According to this strategy, the vision is set out as a situation where:

- using FOSS is the accepted practice in all spheres of Government in South Africa;
- the FOSS ecosystem has developed to a point where it requires less effort for an organisation to use FOSS than Proprietary Software;

- the South African Government contributes FOSS to the global community; and
- citizens have comprehensive access to FOSS and give preference to using it.

The mission statement accompanying this vision is to ensure a sustained trend towards using and developing FOSS in government. A feature of this strategy is the upholding of the view that in South Africa, legislation would not be the appropriate manner for promoting FOSS.

2.3 The Role of the State Information Technology Agency (SITA)

The State Information Technology Agency (SITA) is a public entity that was established by the South African Government in 1999 in terms of Chapter 6 of the Public Finance Management Act (Republic of South Africa. Parliament of the Republic of South Africa, 1999). Its mandate is to provide effective and efficient ICT products and services across the three spheres of government, namely, national, provincial and local government. This agency has been given a mandate to establish a FOSS Programme Office to coordinate the implementation of FOSS in government and to administer the migration to FOSS. The FOSS Programme Office has drafted a project charter which presents a governance structure for the management of the FOSS project (Webb, 2010). A Steering Committee of Directors Generals from different departments has been established to oversee the FOSS project (Republic of South Africa. State Information Technology Agency, 2009). The Departments represented on the Steering Committee are:

- Public Service and Administration (chairperson);
- Science and Technology;
- Communication;
- Education;
- Trade and Industry;
- Home Affairs;
- Chief Executive Officer of the Council for Scientific and Industrial Research (CSIR);
- Chief Executive Officer of the State Information Technology Agency (SITA);
- Government Chief Information Officer; and
- Chair of the Government Information Technology Officers' Council's standing committee on Open Source Software.

The DG Steering Committee is supported by a Programme Steering Committee made up of government officials of the institutions that are represented in the DG FOSS Steering Committee and other institutional representatives invited by members as and when necessary.

This committee supports the FOSS Programme Office which is established at SITA and is headed by a FOSS Programme Manager.

2.4 FOSS Migration Management

The FOSS Programme Office has initiated a number of activities aimed at supporting migration to FOSS by government departments. These include FOSS readiness assessments that were conducted at the Departments of Communication, Public Service and Administration, Home Affairs and the Government Communication and Information Systems (FOSS readiness assessments, 2008). Other departments where SITA has started with readiness assessments are Social Development, Housing, Public Works, Correctional Services, Arts and Culture and the Universal Service and Access Agency of South Africa (USAASA).

The National Library of South Africa (NLSA), the Presidential National Commission on Information Society and Development (PNC on ISAD) and SITA have fully migrated to FOSS. Departments and entities at advanced stages of implementation include the Department of Trade and Industry, the South African Revenue Service (SARS), and the Department of Arts and Culture (FOSS Focus, 2008). The Departments of Communication and Transport are other examples of departments that are implememnting FOSS, the latter through its Electronic National Traffic Information System (eNaTIS).

The Programme Office has trained 40 interns who will be deployed to assist departments that are migrating to FOSS with technical assistance. This initiative is part of a three pronged training strategy developed by the Programme Office. The other two legs of the strategy entail the training of IT managers, technicians and end-users of government departments. This will be delivered in collaboration with other training institutions. The third leg involves assisting organisations with the establishment of FOSS competency centres which will facilitate research and development. These centres will also cater for the training needs of the public, including government, industry and academia.

Levels of adoption in the South African public sector remain low in spite of all the efforts that have been made since 2003. One likely explanation is that public sector managers are not certain and lack proper guidance about how best to manage the process of migration. According to NACI (2004), the challenge of migrating legacy systems to open source

platforms can be daunting and can also involve risks that many organisations will hesitate to take without clear guidelines and support. Part of the challenge is that there is a lack of documentation of cases of successful migration to FOSS within the South African public service. Although some models for technology adoption exist, there is no existing strategic management framework that guides organisational migration to FOSS.

Farjoun (2002) refers to two perspectives for strategic management. These are the mechanistic perspective which considers strategy as a posture, a relatively stable configuration, fit or alignment between mutually supporting organisational elements such as activities and organizational structure. The organic perspective, on the other hand represent a shift from underlying epistemological assumptions of the mechanistic perspective by introducing dynamic and eclectic views of key constructs, highlighting the importance of strategy process and portraying a more complex view of causality. Adopting the latter perspective, Farjoun (2002) defines strategy as the planned or actual coordination of an organisation's major goals and actions, in time and space, that continuously co-align the organisation with its environment. The latter is the perspective that informs the approach to this study.

Migration to FOSS can be regarded as an example of open technology innovation. Open innovation is defined as the systematic encouragement and exploration of a wide range of internal and external sources for innovation opportunities, consciously integrating that exploration with an organisation’s capabilities and resources, and exploitation through multiple channels. Open source software involves collaboration between organisations, suppliers, customers or makers of related products to pool software research and development to produce a shared technology (West and Gallagher, 2005).

2.5 Departments and Public Entities to be Included in the Study

A case study approach using four organisations was used for the purpose of this study. Two of the organisations are government departments, namely the Department of Communication’s Presidential National Commission on Information Society and Development (PNC on ISAD) and the Department of Transport. At the Department of Transport, the focus will be on the Electronic National Traffic System (eNaTIS). The third and fourth organisations are public entities, *viz.* the State Information Technology Agency (SITA) and the National Library of South Africa (NLSA). The former is a government agency responsible for supporting government departments with all their Information Technology requirements. These

organisations were selected either because they have fully migrated to FOSS or are at an advanced stage of implementation.

2.6 Conclusion

The intention to migrate government Information Technology to FOSS is well established through policy in South Africa. Practical steps to support departments with migrating have been taken through the establishment of a governance structure made up of Directors Generals and the mandate given to the SITA to support departments. This led to the establishment of a Programme Office at SITA that has implemented FOSS migration initiatives, including the conduct of readiness assessments and the training of interns to assist departments with FOSS migration.

These efforts notwithstanding, the process of migrating to FOSS by government departments is progressing slowly. The lack of guidance for managers within the public service on how to manage the process effectively is a key barrier to migration (NACI, 2004). By developing a framework for Information Technology migration to FOSS, this study will assist the Government of South Africa by providing some guidance to managers on how to manage their migration to FOSS effectively. The study will also contribute to the field of strategic management by adding insights that can be applied to technology innovation in general and migration to FOSS in particular.

The next chapter presents a review of the literature on FOSS and technology innovation. It also briefly presents literature on some strategic management frameworks that may be relevant to the development of a framework for Information Technology migration to FOSS.

CHAPTER 3
LITERATURE REVIEW

3.1 Introduction

The problem that the study seeks to address is the lack of guidance for managers in the South African public sector regarding how to go about managing the process of migrating to FOSS. This results partly from the absence of documented cases of the successful implementation of the FOSS policy by any sphere or department of Government in South Africa. It can also be attributed to the absence of a strategic management theoretical framework for migrating to FOSS (see snapshots in Appendix 1). This is in spite of the documentation of factors for, and barriers to, successful adoption of FOSS as discussed later in this chapter. A failure to address this problem will continue to delay the take-up of FOSS, in spite of all its stated benefits.

The key words that were used during the literature review were selected in order to provide as broad a coverage of the subject as possible whilst remaining focused on the problem statement. Technology migration as a key word was used to conduct a broad search that includes all forms of technology migration, including FOSS migration as a form of technology migration. Technology innovation was also used as a key word to broaden the search and as an acknowledgement that FOSS migration represents a form of technology innovation. Open value creation and open content are other key words that were used because FOSS is an example of open value creation and is closely associated with the concept of open content (West and Gallagher, 2005). Finally, Free Open Source Software was used as a key word to narrow down the search and focus it on the main subject of the investigation.

This review of literature starts in Section 3.2 with definitions of terms including technology, innovation, technology innovation and FOSS. This is followed in Section 3.3 by a discussion of the benefits of technology innovation and FOSS. The literature on the adoption of technology innovation and FOSS is presented in Section 3.4. Section 3.5 discusses barriers to technology innovation and FOSS adoption with the implementation of technology innovation and FOSS discussed in Section 3.6. The literature on conditions for successful technology innovation and FOSS implementation is presented in Section 3.7. This is followed by a discussion of the roles of culture and policy in technology innovation and FOSS implementation in Sections 3.8 and 3.9 respectively.

Section 3.10 presents literature on the management of technology innovation and FOSS migration. The literature on the measurement of technology innovation and FOSS success is presented in Section 3.11. Section 3.12 presents some literature on strategic management frameworks. A critical review of some of the FOSS migration literature presented in this chapter is conducted in section 3.13, followed by a presentation of the research questions in section 3.14. The chapter ends in section 3.15 with some concluding remarks that include a brief outline of the following chapter. Snapshots presenting the results of searches conducted on a strategic management theory for technology innovation to open value creation as well as on the benefits of FOSS for South Africa are attached as Appendix 1.

3.2 Technology Innovation and Free Open Source Software

FOSS adoption is recognised as a form of open innovation (West and Gallagher, 2005). It is for this reason that this review of the literature also covers FOSS as an example of technology innovation to open value creation. Technology refers to the body of know-how about the means and methods of producing goods and/or services (Tungande, 2007). This author further posits that modern technology is increasingly science based, but that it also includes methods of organisation as well as process techniques.

Innovation can be defined as bringing new technologies or capabilities into use. It includes product innovation, which refers to line extensions, me-too products and new products (Rapp, Scillewaert and Hao, 2008). The second part of this definition is limited in that it only focuses on products to the exclusion of services, which are a key part of what service-oriented organisations such as governments do. The first part is more all encompassing and relevant for the purpose of this study.

Narvekar and Jain (2006) regard innovation as the process of taking an original idea and converting it into measurable business value to an organisation. This definition introduces an element of business value to the definition of innovation. Its applicability to the public sector may not be immediately apparent to public sector managers who have not adopted a new public sector concept. The concept of a new public sector emphasises the government's imperative of delivering value to stakeholders, including citizens, service providers and other client entities of government departments. Ozgen and Olcer (2007) identify six areas of systematic innovation. They are: product innovation, process innovation, business model innovation, marketing innovation, organisational innovation and strategic innovation. Variations of these areas are used by other authors including Mishra (2005). This framing of

innovation facilitates analysis from different perspectives. It adequately reflects the breadth to which the concept of innovation can be applied.

FOSS is software that requires free distribution of software in source code form and the right to modify the software (West and Gallagher, 2005). They further state that FOSS also differs from proprietary software in that its development is done collaboratively. According to Chesbrough (2006), open innovation is the use of purposive inflows of knowledge to accelerate internal innovation, and expand the markets for external use of innovation, respectively. Open innovation is a paradigm that assumes that firms and other organisations can and should use external ideas as well as internal ideas, and internal and external paths to market, as the firms or organisations look to advance their technology.

Technology innovation and FOSS can be discussed under a number of themes that have relevance for the purpose of developing a strategic management framework for technology migration to open value creation. The following sub-sections present a critical discussion of the existing literature on technology innovation and FOSS.

3.3 The Benefits of Technology Innovation and FOSS

This sub-section presents the literature on the benefits of technology innovation and FOSS. The first part focuses broadly on the benefits of technology innovation. The second part focuses specifically on the benefits of FOSS as an example of technology innovation.

3.3.1 The Benefits of Technology Innovation

The benefits of technology innovation have been noted by a number of researchers. In relation to e-Government, the Winter Commission's report of 1993 found that digital technologies in the United States have contributed to lean and responsive governments and have improved productivity (United States Federal Government. Winter Commission, 1993). Technology innovation has a potential for improving the competitiveness of firms and nations, and makes a contribution to individual and national security (Roberts, 2007; Viljamaa, 2005; Schmitt, 2005).

Technology innovation can also enhance the quality of life, contribute to employment creation, support the achievement of environmental sustainability, enhance the performance of organisations and promote the information society (Li and Liu, 2006; Tungande, 2008). Tungande further emphasises the role of technology innovation to poverty alleviation and the

encouragement of development in both urban and rural settings. Corea (2007) claims that technological innovation now occupies the driving seat as the primary source of growth.

As a form of technology innovation in the public sector, e-Government is defined by Gonzales, Gasco and Llopis (2007) as using ICT to provide citizens with improved access to information related to public administration. This definition is limited in that it views e-Government only from an information delivery point of view which does not address the service delivery opportunities presented by this form of technology innovation. A more comprehensive definition is provided by Heeks (2002) regarding e-Government as the use of ICTs to improve the activities of public sector organisations. According to Mishra (2005), technologies that involve computing, information, communications, automation and microelectronics can transform any sector of the economy, including government.

The view adopted by the Winter Commission and other researchers is that technology innovation can be applied by government to reduce the cost of service delivery, including the costs of transferring benefits to citizens (Pirog and Johnson, 2008; Ladner, Petry and McCreedy, 2008; Al-Fakhri, Cropf, Higgs and Kelly, 2008; Flak, Nordheim and Munkvold, 2006; Elsheikh, Cullen and Hobbs, 2008; Gasmelseid, 2007; Orange, Elliman, Kor and Tassabehji, 2007). Other cost saving benefits include a reduction of paperwork, lower numbers of errors and the achievement of scale economies (Chen and Thurmaier, 2008).

In South Africa, these benefits provide opportunities for increasing access to benefits such as social grants at a lower cost than is presently the case. This can be achieved through a reduction in transaction costs, including the reduction of direct contact with government officials and the elimination of the need for citizens to travel long distances to collect their grants and do other transactions with government (Akesson, Skalen and Advarsson, 2008; Lawson-Body, Keengwe, Mukankusi, Illia and Miller, 2008; Chen and Thurmaier, 2008). Not much work has been done in South Africa to quantify these benefits, suggesting that some of these assertions may need to be viewed with some caution (See Appendix 1 for snapshots).

Other benefits, including service delivery improvement contributions of technology innovation in government are reported in a study to develop standards for the evaluation of e-government services in Europe by Lee, Irani, Osman, Balci, Ozkan and Medeni (2008). Researchers such as Akesson *et al*. (2008) and Elsheikh *et al*. (2008) corroborate these findings, observing that the introduction of e-Government contributes to improved service

quality in that it enhances cross-functional cooperation between departments, allowing them to operate across organisational boundaries.

Technology innovation can also improve trust in government because information such as legislation and other information can be made publicly available (Ladner *et al*., 2008; Goh, Chua, Luyt and Lee, 2008; Al-Fakhri *et al*., 2008). Access to information by citizens results in the strengthening of democracy because it enables citizens to be able to make informed decisions about government performance and thus, be in a better position to hold politicians accountable (Flak *et al*., 2006; Lawson-Body *et al*., 2008). The studies that are *cited* above seem to adopt a linear view of the relationship between an innovation and its benefits. In reality, many of the benefits will be mediated by a number of factors, for example, levels of literacy of citizens, the degree of political freedom in a country, and the availability of complementary services such as electricity. The relationship between technology innovation and its benefits is often complex.

The reciprocal direction of influence between technology innovation and government service delivery has been noted by some researchers including Lee *et al.* (2008), Chhabra and Jaiswal (2008) and Elliman, Irani and Jackson (2007). According to these authors, the rollout of e-Government has the potential to alter and improve government service delivery processes (Groznik, Kovacic and Trkman, 2008; Gil-Garcia, Chengalur-Smith and Duchessi, 2006). A successful roll out of e-Government can deliver lasting benefits for government institutions on a number of fronts. This observation supports the need to use organic and non-linear viewpoints to explain the management of technology innovation processes.

The foregoing discussion notwithstanding, a number of researchers report a disjuncture between theory and practice in relation to the benefits of e-Government. According to this perspective, practical applications of technology innovation in government have failed to produce the benefits predicted by a great deal of the theory (Akesson *et al*., 2008; Coursey and Norris, 2008; Cordella, 2007).

3.3.2 The Benefits of FOSS

This sub-section presents literature on the benefits of technology innovation as it relates to FOSS and open innovation. The benefits of ICT in creating opportunities for developing countries to make progress are also highlighted. Camara and Fonseca (2007) report that there is consensus that the arrival of ICT may be a good opportunity for developing countries to

achieve their developmental goals. In South Africa, the National Advisory Council on Innovation (NACI) regards the benefits of FOSS adoption as including the stimulation of SMME development in the ICT field, including development in the area of the provision of ICT support services (Visser, 2005). FOSS is an example of open innovation (West and Mahoney, 2005). Open innovation is regarded as the process of systematically encouraging and exploring a wide range of internal and external sources of innovation opportunities, consciously integrating that exploration with firms' capabilities and resources, and broadly exploiting those opportunities through multiple channels (West and Gallagher, 2005).

The value of open innovation is acknowledged at organisations such as IBM where Newbold and Azua (2007) developed a model for open innovation and concluded that the switch from conventional committee evaluation of projects to an open collaboration model resulted in a drastic increase in the number of projects selected. In their review of the Millennium Pharmaceuticals open business model to product development, Chesbrough and Schwartz (2007) also note that this company has demonstrated that well thought through and implemented co-development initiatives can increase the return on investment from internal Research and Development by leveraging the capabilities of partner organisations.

Regarding FOSS, Mosoval, Gardiner, Healey, Prestedge and Johnson (2006), consider it as a viable option for businesses in South Africa. The reasons *cited* for this relate to the range of benefits that can be derived, including the relatively low costs of FOSS compared to proprietary software (Brown and Adler, 2008; Mosoval *et al*., 2006; Waring and Maddocks, 2005). The Linux operating system or the Apache web server for instance is a FOSS option, which cost a fraction of comparable proprietary software. In a case study review conducted by Waring and Maddocks (2005), they found that seven out of the eight case studies they reviewed found significant cost savings from FOSS. The only case that did not record cost savings found that existing proprietary software did not interface with FOSS, which means that there would be significant hardware upgrade costs to be incurred when migrating organisations to FOSS.

Not only is FOSS affordable to obtain, but it also has many cost advantages on total cost of ownership (TCO). The availability of the source-code for instance means that organisations are able to make adaptations without needing to pay for the services of the company that developed the software. The absence of licensing costs also contributes to lowering the TCO. In addition, the relative stability of FOSS resulting from a large community of developers eliminating errors means the costs of support are low (Cassell, 2008). As large consumers of

ICT systems, governments, including the South African Government, stand to save considerably on licence and support costs by switching to FOSS (Mtsweni and Biermann, 2008; Mosoval *et al.*, 2006; Hwang, 2005). This cost advantage should not be construed as meaning that there are no costs associated with FOSS. Organisations still need to retain or source ICT development skills in order to benefit fully from FOSS.

Open standards in software development are a contributory factor to the use of FOSS and are most beneficial to governments because they tend to consume huge amounts of information whose optimal value is realised when it is readily accessible to citizens (Hwang, 2005; Simon, 2005). Open standards allow for a modular development of FOSS solutions meaning that there is no need to rely on one software provider for the total solution, but rather, it is possible to combine software from different sources limiting vendor lock-in (Simon, 2005). Open standards supporting FOSS can also be beneficial for the development and sharing of educational resources by educators (Pfaffman, 2007), an important factor in developing countries.

There are various forms of licensing for FOSS that deliver different sets of benefits. The General Public License (GPL) is one of the most popular forms of FOSS licensing and is categorised as “copy left”. This means that any software released under it must be free to copy, modify and redistribute. The source code must be made available with the software and applications released under this license cannot be changed to closed source. Where there is a need to protect aspects of the source code, the Berkley Software Distribution License (BDS) allows for the mixing of open and closed codes (Fitzgerald, 2006).

The fact that users of FOSS have access to the source code makes it possible to adapt this form of technology innovation to local requirements (Cassell, 2008; Mosoval *et al*., 2006). The South African Government can benefit from GPL based FOSS solutions because they can be adapted and modified in order to suit any local conditions, including local languages and culture (Mtsweni and Biermann, 2008; Mutula, 2007). FOSS allows users who require certain additional features implemented to do so without hindrance (Bjorgvinsson and Thorbergsson, 2007; Hwang, 2005; Simon, 2005). There is an example of a Luganda web browser developed in Uganda called “Kuyangirizi” which has been translated from the Mozilla browser. A Zulu version of Open Office is available in South Africa. These local language versions are examples of how FOSS can be geared towards supporting developing countries to create technology products that fit their specific needs (Camara and Fonseca, 2007). A further benefit specifically for developing countries is that FOSS can result in the

development of a domestic ICT support industry that can provide employment opportunities. It enables developing countries to bridge the digital divide (Cook and Horobin, 2006; Mutula, 2007).

Technology companies that have adopted FOSS acknowledge its benefits. For instance, one of the major reasons for IBM's adoption of Linux is its scalability and adaptability, allowing the company to enhance its hardware without the need to replace the operating system (IBM, 2003 *cited* by Mosoval *et al*., 2006). In addition, FOSS works well with old computers, eliminating the need to upgrade hardware with every new software release. A concern has been expressed though regarding the size of the recent releases of Linux and that there may be a risk that the benefit of not needing to upgrade hardware with every software release may be lost.

There are several researchers who have shown that the security achieved with FOSS exceeds that achieved with proprietary software (Mosoval *et al*., 2006; Sherif, Zmud and Browne, 2006; Hwang, 2005, Drosdik, Kovacs and Kochis, 2005; West and O'Mahony, 2005). According to these researchers, this is an outcome of the open availability of the source code in FOSS, allowing more people to view it and to detect and correct errors. The frequency with which FOSS updates are made to the public also contributes to improved security as it allows for developers to test the software well ahead of its final release. For instance, a survey of Linux development by Evans Data found that 92% of their Linux systems have never been infected with a virus and 78% have never been cracked (Simon, 2005)

Another benefit is that there is now enhanced support for FOSS, including through call centres. Companies like Red Hat, C2net, Linux Care and Canonical offer round the clock support for FOSS users around the world (Mosoval *et al*., 2006; Waring and Maddocks, 2005). In South Africa, the Shuttleworth Foundation is facilitating, supporting and funding initiatives that should aid in building awareness around FOSS (Mosoval *et al*., 2006). The South African Government highlights some of the foregoing benefits as reasons for adopting a FOSS policy. Other benefits with relevance to government that are *cited* include local IT skills development, national technology independence, economic development, reduction in software privacy, increased government efficiency and effectiveness and less corruption (Mtsweni and Biermann, 2008; Schweik, English, Kitsing and Haire, 2008; Hwang, 2005; Waring and Maddocks, 2005).

Interoperability is another factor that is attractive with FOSS. According to Drozdik *et al.* (2005), this relates to the development and implementation of electronic data interchange guidelines and other mechanisms that facilitate the exchange of information between different entities. This is one of the major barriers to the rollout of e-Government and the creation of government portals that serve as one-stop shops for citizens. The foregoing benefits can be classified under four broad areas of motivation; these are technical, economic/financial, skills-related and ideological areas (Camara and Fonseca, 2007).

It is worth noting though that a number of the foregoing studies *citing* the benefits of FOSS originate from countries other than South Africa. Mtsweni and Biermann (2008) for instance state that the benefits of using FOSS have been investigated and realised in various countries such as Malaysia, Germany and the United Kingdom. Camara and Fonseca (2007) report on a survey of FOSS usage by the Ministry of Science and Technology of Brazil. In the absence of home grown large-scale studies, managers in South Africa are likely to continue to question the prudence of pursuing FOSS migration.

3.4 The Adoption of Technology Innovation and FOSS

Research on the adoption of technology innovation in the form of e-Government and FOSS in government, is relatively nascent (Coursey and Norris, 2008; Cassell, 2008). Coursey and Norris (2008) observe that, with the exception of models predicting individual user adoption such as the technology acceptance model, there is sparse theory in this area. The foregoing observation notwithstanding, some researchers note that the market share for FOSS is growing significantly due partly to the rising price of Microsoft products, the increased availability of FOSS, and the increased quality and effectiveness of desktop FOSS software (Mtsweni and Biermann, 2008; Kuchma, 2008).

According to Mosoval *et al.* (2006), since April 1996, FOSS web server Apache has been a market leader, followed by Microsoft IIS. Apache held almost 65.94% of the global market share in 2003 with over 25 million servers worldwide. In comparison, Microsoft IIS held 24.30% of the market share with 11 million web servers worldwide. Mtsweni and Biermann (2008) note that government adoption of FOSS is an enabler for wider adoption by the private sector. According to Cook and Horobin (2006), government has important influences on FOSS adoption because this puts pressure on those who wish to do business with government to follow suite.

More progress in adoption has been made on the server side, with a number of governments around the world, including Malaysia and Germany having migrated (Mtsweni and Biermann, 2008). In 2007 there were 286 FOSS license initiatives within the government sector globally, with some governments recommending FOSS, others mandating its adoption, whilst others were doing research and development on it. Red Hat reports that 160 national, provincial and local governments around the world are using FOSS, one way or the other (Mtsweni and Biermann, 2008). Amongst the researchers who have looked at FOSS adoption in South Africa are Mtsweni and Biermann (2008). They conducted a study looking at the current implementation of FOSS within the South African Government's server environment. They found that, although there is a general acceptance that FOSS based applications offer a viable alternative to those based on proprietary software, FOSS is still not fully implemented both within the South African private sectors and government. For instance, they found that South African Government servers are mainly based on proprietary software with about 45% of the departments indicating proprietary software usage. The Linux firewall was only used by 9 out of the 31 departments surveyed.

The foregoing finding seem to contradict those of Mosoval *et al.,* (2006) who reported in their study that the SITA indicated that the government network is predominantly run on FOSS. These researchers found that there was a 67% level of FOSS usage in the South African Government. Mosoval *et al* (2006) further *cite* the National Advisory Council on Innovation (2004) as stating that FOSS has become a viable business alternative for a number of private sector companies in South Africa. Amongst South African companies that have adopted FOSS in some of their systems are Pick 'n Pay, the JD Group, Pep Stores, Bears and Lewis. Twenty-five other furniture and clothing chain stores are reported to be using Linux-based applications. There seems to be little disagreement though that adoption on the desktop environments within the South African Government is low (Mtsweni and Biermann, 2008; Mosoval *et al*., 2006).

One possible explanation for this low level of adoption could be poor marketing. It would seem that FOSS developers believe that its benefits over proprietary software are self-evident and should automatically lead to its adoption (Camara and Fonseca, 2007). This situation is receiving attention from the Shuttleworth Foundation, which is facilitating and supporting initiatives aimed at enhancing awareness, uptake and growth of FOSS in South Africa. The Foundation is working on a classroom version of Linux called edubuntu. SITA and the Council for Scientific and Industrial Research (CSIR) are also working with Universities and

business to establish a resource centre to develop FOSS programming skills (Mosoval *et al*., 2006).

In Malaysia, the government adopted a FOSS policy in 2004. By 2006, the status of FOSS implementation in the Malaysian public sector was such that 61% of IT personnel had received training. Almost 3000 government employees had been trained on various FOSS products including Open-Office by 2008. FOSS is widely used in both the server and desktop environments in Malaysia, with about 200 state agencies already using FOSS. By March 2008, about 120 state agencies had migrated desktop users (Mtsweni and Biermann, 2008). Brazil is also at an advanced stage of FOSS adoption. This country is amongst those with the largest number of FOSS developers and contributors. A FOSS policy was adopted by the Brazilian Government in 2003. This policy mandates FOSS preference in all government departments and agencies (Mtsweni and Biermann, 2008). The Government of Brazil initiated a project in 2004 to convert 80% of departments' computers from Windows to Linux. In 2005, almost 60% of state departments were already using FOSS.

Mtsweni and Biermann (2008) also report that the German federal office migrated from Windows NT to Debian Linux in 2002. Ten thousand desktop machines of the German foreign office were converted to FOSS in 2007. The Munich Municipality has also migrated 14 000 of its Windows desktop and laptop computers to Linux and Open Office. Germany is seen as a leader in FOSS use, as reflected in its levels of adoption by government and business (Waring and Maddocks, 2005). With a few exceptions, for example Germany, where migration was reportedly facilitated by the publication of a comprehensive guide for migration for use by all departments and agencies, the reasons for successful migration are not always explored in the literature on adoption. According to NACI (2004), other governments that have either expressed an interest in FOSS or have implemented it are China, Thailand, Argentina, France, the United Kingdom, the Phillippines, Sweden, Norway and the United States.

In discussing adoption, the different perspectives for the adoption of technology innovation are important to keep in mind. This is particularly the case where one seeks to develop a theoretical framework for technology innovation. The economic rationalistic perspective focuses on the economic returns of technology innovation. From this perspective emanates the theory of network externalities, which posits that for certain technologies, adoption decisions depend on the number of other adopters. This means that organisations will wait until there is a critical mass of adopters before they can also adopt (Mishra, 2005). The

informational cascade theory suggests that private technology assessments of managers may be outweighed by observed adoption by others, meaning that even though managers could be negatively disposed towards an innovation, its level of adoption by others may persuade them to make the shift (Wang and Miao, 2006).

The social-relational perspective on the other hand examines the implications of inter-organisational relationships on innovation. For example, the imitation of innovation by an organisation is likely to be accelerated where it is perceived that organisations that have adopted the technology are more successful (Wang and Miao, 2006). These authors further explain that the socio-cognitive perspective posits that an understanding of an innovation is an enabler to its adoption, and that other organisations that have adopted the innovation are an important source of this understanding. In their study of customer acceptance of technology products for instance, Elliot and Fu (2008) state that if a customer has a better understanding of the technology there is a high probability that s/he may adopt it. The organising vision theory posits that various organisations interested in an IT innovation tend to form a community where they create a vision for organising in a way that makes use of the IT innovation within their organisational structures.

The Technology Acceptance Model (TAM) of Davis (1989) is another tool that has gained attention in attempts at understanding the adoption of technology. This model can be applied to understanding how FOSS adoption happens. According to this model, the key concepts in technology adoption are: perceived ease of use, perceived usefulness, attitude towards use and actual use, with all these concepts being positively correlated with adoption (Elliot and Fu, 2008; Lu, Yu and Liu, 2005). The TAM is an extension of the Reasoned Action Theory, which claims that normative pressure or social norm drives the behaviour towards adoption (Elliot and Fu, 2008; Gao and Damsgaard, 2007). This is where organisations adopt innovations because of external pressure caused by large numbers of organisations that have already adopted the innovation.

In their study, Elliot and Fu (2008) also use the concepts of perceived expressiveness and perceived enjoyment to develop a theoretical framework for technology adoption. Perceived expressiveness is defined as an individual's ability to express his/her emotional identity through the technology. According to these researchers, the sending and receiving, or filtering of messages is an expressive form of communication, which may affect behaviour. Perceived enjoyment refers to the extent to which the activity of using a technology is perceived to be enjoyable. These, together with some of the TAM concepts, are independent variables in the

technology adoption framework. The relationship between these variables and their outcomes on adoption is moderated, by amongst other variables, aspects of the user, including gender and age.

The Technology Diffusion of Innovation Theory highlights four elements that characterise successful diffusion of technology. These are: (a) an innovation and its characteristics; (b) the communication of a technology's characteristics through specific channels; (c) their communication to the members of a social system; and (d) their communication over time. According to Gao and Damsgaard (2007), some of the important attributes of technology that contribute to adoption are trialability, relative advantage, compatibility, observability and complexity. All the foregoing theories are important in the understanding of how technology adoption can occur. The limitation though is that there seems to be limited empirical work to confirm some of these perspectives and theories. It also seems that best results may be obtained from using these in combination, rather than working on the basis of one or the other perspective or theory

3.5 Barriers to Technology Innovation and Successful FOSS Migration

Part of the process of successful technology innovation, including migration to FOSS is an acknowledgement of the existence of barriers to technology innovation. This acknowledgement is important in the development of a theoretical framework for technology migration. Gasmelseid (2007) reports an estimate of a high number of failures of technology innovations in government. Amongst the reasons named by these researchers for such failures are the lack of; leadership and strategic thinking behind such efforts, technology infrastructure that facilitates access by citizens, connectivity and network readiness, institutional infrastructure that secures an e-business climate and legal infrastructure that maintains trust, information security and privacy; skills to manage the innovation, finances for its implementation and standards for interoperability (Coursey and Norris, 2008; Elsheik, Cullen and Hobbs, 2008; Chen and Thurmair, 2008; Lawson-Body *et al*., 2008; Rapp, Schillewaert and Hao, 2008; Flak, Nordheim and Munkvold, 2006).

Other barriers to innovation, specifically with relevance to ICT, relate to licence conditions that governments enter into with proprietary software providers and that make technology innovation and the adoption of open source software impossible. Some of the FOSS licenses may also be barriers to adoption. For instance, some FOSS licences make it compulsory to contribute to the development of the source code. Such a condition makes it impossible for

users who do not posses the necessary ICT skills to fulfill the licence condition, reducing the likelihood of adoption of FOSS (Waring and Maddocks, 2005). In addition, the condition to release and make freely available applications that are derived from a FOSS source code can create problems for businesses that have intellectual property to protect and/or governments that have national security considerations (Mosoval *et al*., 2006). This situation is fortunately ameliorated by the existence of FOSS licences that allow organisations to protect part of the source code on applications, e.g. the Berkley Software Distribution License (BDS)

Waring and Maddocks (2005) warn against what they refer to as "version proliferation" in FOSS. This occurs when forking out occurs where there are unresolvable differences between members of a FOSS development team. Different groups have been known to continue working on developing the same software in parallel. This can have the effect of discouraging users from trying out FOSS (Waring and Maddocks, 2005). Concerns have been expressed regarding the level of support available for FOSS. The fact that in most small scale FOSS development projects there is no one individual or company that is responsible for documentation and providing support has been noted as a concern (Schweik *et al.*, 2008; Mosoval *et al*., 2006; Waring and Maddocks, 2005; Simon, 2005) In the South African Government, lack of support as a concern was mentioned by 26% of the departments studied by Mtsweni and Biermann (2008).

In contexts where there are limited ICT skills, the levels of functionality of FOSS can be bewildering making the perceived inadequacy of support a formidable barrier (Cassell, 2008). The low levels of ICT skills in South Africa thus represent a barrier to the quick adoption of FOSS (Mosoval *et al*., 2006). The situation relating to support is changing, with an increase in the number of companies dedicated to providing such support.

Another concern regarding migrating to FOSS is that it might not be compatible with other software and hardware. For instance, in their investigation into the implementation of open sources software within the South African Government, Mtsweni and Biermann (2008) found that FOSS's lack of compatibility with current proprietary solutions used in government is the main challenge faced by 83% of government departments that are implementing FOSS. This might mean that users would need to find FOSS drivers independently, a factor that might be discouraging. Other common barriers include the lack of approved standards, resistance amongst managers and users and also risk aversion (Chhabra, Bahadur and Jaiswal, 2008; Mtsweni and Biermann, 2008; Madsen and Ulhoi, 2005). Part of the resistance emanates from the impact of legacy software that may have been used by an organisation over extended

periods of time, resulting in managers being unwilling to take risks with software with which they are not familiar with (Camara and Fonseca, 2007).

Waring and Maddocks (2005) observe that a study by Gatner which found that increases in service and management costs associated with migrating to FOSS outweigh the benefits gained through not paying licence fees fails to take into account the different business situations where additional service/management costs may not be required, or the licence fee forms a much larger percentage of IT costs. Li, Zhao and Liu (2006), studied the effects of Human Resources Management on technological innovation amongst Chinese firms. They found that process appraisal is positively correlated with innovation, whereas there exists a negative correlation between outcomes appraisal and control and innovation. This suggests that for organisations, including governments, to succeed in innovating, emphasis needs to be placed on process appraisal, which encourages risk taking. An emphasis on outcomes appraisal may serve as a barrier to innovation, including in the adoption of FOSS.

There also may be immense political pressure and vested interests that may act against the adoption of FOSS. Cook and Horobin (2006) report that in Indonesia, migration by government to FOSS was hampered by an agreement that the government has with Microsoft, resulting from a meeting between Bill Gates and then President Sisilo Bambang Yudhyono. This agreement stipulates that Microsoft will pay US$1 for each of the 50 000 PCs that are running on Windows Software. The same political pressure is reported by Cassell (2008) in a study that looks at why governments choose to migrate to FOSS and what factors affect implementation.

3.6 Implementation of Technology Innovation and FOSS

In developing a theoretical framework for technology innovation for migrating to FOSS, it is important to know what research and theory says about the implementation of technology innovation generally, and specifically FOSS migration. However, there is very little literature that focuses on the implementation of FOSS projects within organisations (Casell, 2008; Waring and Maddocks, 2005). The level of FOSS implementation within the South African government is low, lagging behind countries that announced intentions to adopt around the same time as South Africa did (Mtsweni and Biermann, 2008).

Orange *et al.* (2007) suggest that the implementation of innovation consists of three elements relating to knowledge acquisition and involving the fusion of old knowledge with new. These

elements are: (a) the execution of the innovation project; (b) the launching and sustaining of the innovation process; which will only be completed once there is (c) adoption. These researchers present a conceptual action-orientated model for the innovation process. According to this model, the technology innovation process starts with defining the requirement or problem through the scanning of both the internal and external environments for solutions. This is followed by implementation planning with a number of stages leading to the implementation cycle, followed by an evaluation, which in turn will improve implementation. The weakness with this model is in its reductionist prescription of a linear sequencing of actions. In reality, things may be more complex than that, involving iterations and complex links between the various actions.

In the evaluation of the implementation of technology innovation, people, processes and technologies should be regarded as amongst the most important factors to analyse. In addition to analysing each factor and its relationship with the innovation, the relationship between the factors is also important (Orange *et al*., 2007). The importance of people and processes is an acknowledgement that challenges of technological innovation in government have shifted from the technological to the organisational and process domains (Groznik *et al.*, 2008; Elliman, Irani and Jackson, 2007). In South Africa, a feasibility study into the implementation of FOSS in government was conducted between 2001 and 2003 (Mtsweni and Biermann, 2008). This study led to the proposal of a three-phased plan detailing how departments can implement FOSS over a period of three years. The three phases are: (a) the initiation phase, which entails dissemination of information; FOSS trial and development and the development of partnerships for FOSS; (b) the enhancement phase which entails the implementation of the FOSS project, the standardisation of software selection and the intensification of partnerships; and (c) the mature phase which entails standardising and monitoring, sustaining and enhancing systems and deepening the level of FOSS development. These researchers admit though that the plan does not specify how the tasks depicted within each phase should be accomplished.

Mtsweni and Biermann (2008) extend the foregoing model into a four-phase model with an elaboration of some of the detailed activities within each phase. The Planning Phase entails the dissemination of FOSS information amongst all interested parties including top management, ICT personnel, external ICT service providers, software vendors, end-users and business partners. Several awareness campaigns during this phase in order to reach everyone are recommended. This phase also entails deciding on the environment within which FOSS

will be deployed. It is recommended that initially, FOSS should be run side by side with proprietary software, with a team dedicated to the FOSS project.

They recommend that deployment should start with the server environment. Once the environment has been decided upon, an assessment of the functional and technological requirements for migrating to FOSS should be conducted. This assessment should be followed by the identification and auditing of available FOSS alternatives. Proper feasibility studies to ensure that identified alternatives fit the government environment should then be done. This should include an assessment of the total cost of ownership. The recommendation is also to ensure that all selected alternatives are based on open standards. During this phase, ICT personnel and other relevant officials should be trained. The choice of licence should be such that it is of benefit to the objectives of a department.

The Trial Phase entails the piloting of FOSS projects. It also covers the formalisation of FOSS procurement plans and other alternative selection standards. This selection should then be followed by trialing within a small environment. The recommendation is that pilots be performed in a live environment, but be kept small and non-disruptive. This should be accompanied by a thorough monitoring and documentation of pilot performances. It is recommended that pilots be of a short duration, not exceeding six months. The monitoring should culminate in an evaluation of whether the pilot projects can be implemented widely.

The Realisation Phase entails the deployment of successful FOSS projects within small manageable environments on a continuous basis. Realisation should include the integration of lessons from pilots in training, maintenance, upgrade, equipment and budget plans that were developed during phase one. For implementation, Mtsweni and Biermann (2008) recommend that departments opt for gradual implementation that allows for reverting to older systems should problems emanate. Training and support are important elements of this phase. This should include the intensification of communication and promotion campaigns.

The Development Phase entails the development of plans to eliminate additional non-compatibility issues. This phase largely relates to encouraging the development of in-house FOSS development capacity and re-training of in-house developers in order to enable them to customise FOSS solutions to a department. Following the successful installation of FOSS on both the server and desktop environments, the process of customisation and upgrading to newly released versions is an ongoing activity. This phase should also include the intensification of local and international partnerships, with developers encouraged to

participate in various FOSS activities, forums and global projects. In addition, it is recommended that tertiary institutions and private companies be encouraged to adopt FOSS. This will ensure a continuous flow of skilled FOSS users and developers into the system.

The recommendations from Mtsweni and Biermann (2008) present an opportunity for South African Government departments because the recommendations are derived from implementation experiences in South Africa. Caution should be exercised though in following their prescriptions because organisations differ and things may not work the same in all cases. The linearity of the recommendation also needs to be tempered by some flexibility and iteration between the phases. Another study in South Africa compared migrations by Novell South Africa, the Mossel Bay Municipality and Pinelands High School highlighting critical success factors for migrating to FOSS in the desktop. This study found strong evidence of the value of facilitating good communication between management and users about the FOSS project. This included the creation of user awareness early in the migration period. For instance Novell, created a website called OpenZone that contained information on the why, how and when of the project. This included discussion forums where participation was encouraged through incentives. In each department of Novell, a local advocacy expert was identified.

The seven critical success factors for successful implementation emanating from this study are: (a) financial motivation factors; (b) top management support; (c) user awareness and communication; (d) detailed planning, analysis and testing; (e) training; (f) pilot project; and partial migration; and (g) support. These factors closely mirror the phases identified by Mtsweni and Biermann (2008) in their study. The importance of effective communication and promotion as part of implementing FOSS is observed by Cook and Horobin (2006) in their examination of the implementation of e-Government in South East Asia. They note that in Cambodia, the National Information and Communication Technology Development Agency (NiDA) created an Internet Plaza, which provides free Internet access to members of the public and allows them to experiment with FOSS. This has seen the introduction of some FOSS applications such as Open Office, Firefox, Thunderbird and GAIM through the Plaza. Training programmes and user support are also made available in order to ensure that users are supported in gaining familiarity with FOSS.

In the case of Indonesia, an Indonesian Go Open Source (IGOS) community has been created. This is a collaborative initiative between the Ministry of Research and Technology, the Ministry of Communication and Information and the Indonesian Institute of Science. The aim

of this community is to promote FOSS throughout Indonesia by conducting workshops, holding FOSS development competitions and introducing FOSS to government departments. Part of this communicating on FOSS focuses on the value adds that FOSS can bring to users. The most important determining factor of whether IT is successfully implemented in the public sector is the extent to which end-users are convinced that the new technology adds value in helping them to perform their jobs (Cassell, 2008).

The German Federal Government has developed a FOSS implementation guideline to assist departments in their implementation efforts. This guideline recommends different migration routes, including partial migration, selective migration, one-step adoption and gentle migration (Mtsweni and Biermann, 2008). The City of Schwabisch Hall in the federal state of Baden-Wurtemmberg migrated its servers covering administration, e-mail, printers, files and group calendars incrementally (Casell, 2008). The migration of software used by employees on their desktops occurred simultaneously with the introduction of Open Office groupware.

To reduce resistance, the IT department in Schwabisch engaged the public sector labour unions and used them as partners in demonstrating the new FOSS to a large gathering of city employees. Secondly, it encouraged employees to take the new software home and install it on their systems. This was made possible by the absence of licence fees. The implementation of this project in the city was preceded by an assessment of applications that were being used, the availability of FOSS alternatives and a staff training needs assessment (Cassell, 2008). In many countries, there are selected institutions, which are charged with the process of implementing technology innovation in government. In Jordan, this responsibility has been given to the Ministry of Information and Communication Technology (MoICT). This ministry gives support for the introduction of e-Services, operation management, technology services and change management. Working with this ministry is the National Information Technology Centre, which supports the government with the implementation of MoICT policies and strategies relating to government adoption of ICTs (Elsheikh, Cullen and Hobbs, 2008).

The national innovation system is an important element in understanding how innovation happens in nations. These systems play an important part in the process of implementing technology development and innovations (Bagherinejad, 2006). A national innovation system is a system of interconnected institutions to create, store and transfer knowledge, skills and artifacts which define new technologies (Mishra, 2005). Part of understanding this system entails knowing how private and public-sector actors interact to create local institutions and relationships that encourage innovation and entrepreneurship (Wu, 2007). This is applicable

to the adoption of FOSS because it also requires the presence of an institutional base of support to entities that adopt FOSS.

The introduction of a technology innovation in organisations, including government requires that training forms part of the implementation. In approaching this training, a considerable challenge is that of obtaining buy-in from key organisational stakeholders including technicians, professionals, politicians and bureaucrats (Falivene and Silva, 2008). Of importance is ensuring that all key stakeholders understand the innovation and are not left behind, a scenario that Madsen and Ulhoi (2005) characterise as 'religious fundamentalism'. It is also important that technology innovation implementation be guided by an understanding of the context of the organisation within which this is happening. As Harris (2006) notes that research over the last three decades in IT and organisational change has shown that implementation of this technology is heavily influenced by the context of its introduction and by the strategic interests of actors on the ground. Sieverding (2008) suggests that the best approach to implementing FOSS is to do it in combination with proprietary software. This researcher concludes that FOSS and proprietary software will continue to exist side by side and thus it makes sense to combine them.

3.7 Conditions for Successful Technology Innovation and Implementation of FOSS

Research by Gonzales, Casco and Llopis (2007) into the implementation of technology innovations points to the importance of contextual conditions in facilitating or hindering success as noted below. For example, in a case study of e-Government success in Spain, these researchers observed that the progress that has been made in Spain with the implementation of technology innovation in the form of e-Government has been supported by greater disposition shown by potential users, as well as by the planning and legislative efforts made by the Spanish Government. These researchers further conclude that training of human resources is important for organisations that are introducing technology innovations. This point is corroborated by a study conducted in China focusing on the relationship between Human Resources Management (HRM) strategy and technology innovation. In this study, Li, Zhao and Liu (2006) found that it was important to improve technology innovation by advancing HRM. Employee training was found to have a direct and positive effect upon the success of technology innovation.

Li *et al.* (2006) also observe that efficient HRM can advance an organisation's technological innovation, improve an organisation's competitive advantage and increase performance. Evidence further shows that these HR factors can be strengthened through an organisational strategy that emphasises interaction, participation and culture development (Wang and Miao, 2006). Some of the HRM factors that are explored by Li *et al.* (2006) in their conceptual model include employee training, material incentive, outcome appraisal and control, non-material incentive and process appraisal and control. In testing their model amongst Chinese high-tech firms, these researchers found that employee training, non-material incentives and process appraisal are positively related to technological innovation. Material incentive and outcome appraisal and control have a negative relationship with technological innovation.

It is also important that organisations that are introducing innovation must have the capacity and the means to manage change. This is partly because any innovation has to be supported by processes and people (Orange *et al*., 2007). These aspects of an organisation often need to go through some changes in order to ensure success. For instance, when the West Sussex Local Government in the UK implemented technology innovation (e-Government), a major investment was not in technology but in change management. A director of community engagement and organisational development was appointed to attend to both technology innovation and organisational development (Akesson *et al*., 2008).

Writing about the adoption of e-Services in the US, Chen and Thurmaier (2008) observe that a failure to ensure that innovation responds to the needs of users is a factor that can reduce levels of adoption. In addition, they note that it is important that there is willingness by legislative bodies to appropriate funds for the development of the services. These observations are also relevant to the implementation of FOSS within the public sector. In the context of shrinking budgets for departments due to the current global economic downturn, there is likely to be a reluctance to divert funds from standard items to new projects like FOSS migration.

The importance of strong visionary leadership, accompanied by effective strategic planning and an atmosphere of open communication in the implementation of technology innovation is noted by Rapp, Schillewaert and Hao (2008). Internal organisational culture and values is an important factor in the success or failure of technology innovation in organisations (Cassell, 2008; Daniel and Ward, 2006; Ozgen and Olcer, 2007). Teams and interpersonal relationships within organisations are also important factors for effective technology innovation.

Freeman and Soete (1997) state that technological innovation must overcome four areas of uncertainty for it to succeed within an organisation. These are: technological uncertainty which means that innovation should be feasible based upon scientific and technological competencies of an organisation; commercial uncertainty meaning that an innovation needs to be commercially viable; organisational uncertainty which requires that an innovation should be appropriate; and congruent with the strategy and capabilities of an organisation, and societal uncertainty which requires that any side effects, externalities or societal concerns must be overcome. Some of these uncertainties apply equally to the public sector and need to be considered in developing a theoretical framework of innovation for government.

Bagherinejad (2006) presents a model of factors affecting organisations' technological innovation. Amongst the factors is what is referred to as an organisation's contextual variables including, managerial and employment structures, organisational structures, technological infrastructure and staff skills development. Other factors include an organisation's potential sourcing and networking, an organisational environmental conditions and the structure of the national innovation system. Broader national contextual conditions are also recognised as playing a role in encouraging a culture of innovation. The level of vitality of the national innovation system, which is a network of agents, policies and institutions that support the process of innovation is important. A culture of entrepreneurship, which supports experimentation, failure and recovery, is also an important condition (Wu, 2007).

The successful implementation of FOSS also depends on the availability of open standards that enable a modular and decentralised approach to the development of applications. Open standards serve as incentives to other parties to produce complements for applications and for end users who require certainty regarding the sustainability of the FOSS option (West, 2005). Other factors that are identified as prerequisites for the success of open innovation in the form of FOSS are: the feasibility of virtual teams as a way of organising innovation; a culture of open innovation through such teams and spanning different organisations; modularisation of projects (or application development efforts); formal intellectual property mechanisms that encourage collaboration; and economic prerequisites for effective collaboration including issues of appropriability and ease of abandonment of projects where they do not workout (West and Gallagher, 2005).

According to a survey that was conducted amongst large-scale UK industries, open innovation (collaboration on innovation) is strongest in industries with high appropriability

and weakest where there is low appropriability (West, 2005). This points to the need for an assessment of options for value creation and capture from FOSS initiatives in evaluating the adoption capacity of South Africa.

3.8 The Role of Culture in Technology Innovation and FOSS Adoption

The role of culture in the successful implementation of technology innovation has been recognised by a number of authors. Culture is important to consider both from the perspective of an organisation as well as from that of a broader national perspective. Hatch and Schultz (1997) as *cited* by Akesson *et al.* (2008) define organisational culture as the tacit organisational understanding that contextualise efforts to make meaning including internal self-definition. This definition is useful for an understanding of the intangible aspects of any strategic management model that needs to inform the process of technology innovation. It fails though to capture the full understanding of an organisation's culture, which is also represented by the tangible aspects of organisational life, including rules, practices, policies, observable behaviours and other organisational artefacts.

The significance of internal organisational culture in the successful implementation of technology innovation is recognised by a number of authors. Discussions on the type of culture that is key to success highlight amongst other things, the importance of a culture of openness and social inclusion. Further, it is important to create an empowering culture where people are not only the beneficiaries of technology but are themselves agents of technological change and innovation (Akesson *et al*., 2008; Tungade, 2008). The creation of an organisational culture is largely the responsibility of top management, which serves as a key driver of organisational behaviour (Rapp, Scillewaert and Hao, 2008; Malik and Malik, 2008). This latter observation is important but overlooks a key role played by sub-cultures constituted by individuals below top management.

In their study of innovation management practices of large scale manufacturing companies in Turkey, Ozgen and Olcer (2007) conclude that an innovation culture cannot be copied, but needs to be created. In their survey of 500 companies, they identified 15 management practices that are essential to the creation of an innovation culture (see Table 1). Although the characteristics they identify sound fairly generic, their applicability to the South African public service cannot be taken for granted. This is because of differences in national cultures and the focus of the study on large scale manufacturing companies. Organisations that operate within highly innovative industries recognise the significance of culture on performance.

Corning Technologies is a United States based company that focuses on doubling the rate at which technology breakthroughs are transformed into major businesses. It is a three-time winner of the National Medal of Technology. According to Oshiotse and O'Leary (2007), Corning has long recognised the value of diversity as important for establishing a culture of innovation. According to these authors, the individual is valued at Corning; so is diversity of thought and perspective.

Practices to Create Innovation Culture
Values are developed to foster innovation
Commitment to innovation is expressly included in the management's statements of policy
Provide opportunities for information sharing among staff
Company aligns innovation with business vision and allocates resources to funding the innovation process on an ongoing basis
The company takes on high technological risk aimed at long-term results
Create conducive physical environment for innovation activities
The results of innovation are assessed and rewarded
Management communicate innovation vision to its employees
Mistakes are fully accepted as an integral part of innovation
Any activity that promotes learning is encouraged, particularly teamwork
Organisation translates innovation values into practices supporting innovation
Company has a policy of systematically managing innovation as a project-based business process
Improving systematically project management skills
Organisation reviews practices to improve innovation culture
The creation of new concepts is planned according to the product life cycle

Table 1: Practices to Create an Innovation Culture (Ozgen and Olcer, 2007)

Other organisational culture traits that are recognised as important for innovation include openness to receiving new ideas, welcoming and giving honest feedback, recognition of differences including in working styles, transparency, formal and informal learning, teamwork, entrepreneurship, risk tolerance, and an acceptance of a balance between comfort and constructive conflict (Malik and Malik, 2008; Oshiotse and O'Leary 2007; Ozgen and Olcer, 2007; Newbold and Azua, 2007; Cooper and Kleinschmidt, 2007; Evangelista and Sweeney, 2006). These researchers do not give guidance on how such a culture can be created especially within bureaucratic and hierarchical organisations such as is the case in South African Government departments.

Schofield (2001) observes that in government departments, open source software is not being widely adopted because of comfort factors. Information Technology managers tend to stick to software with which they are familiar. This is an example of risk aversion that tends to characterise bureaucracies and which tends to reduce levels of innovating. It is noteworthy that some researchers acknowledge the reciprocal nature of influences between culture and the implementation of technology innovation. For instance, McIvor, McHugh and Cadden (2002) conclude that the introduction of Intranets and associated Information and Communication Technologies (ICT) has a potential for changing the internal culture of an organisation, including through improving internal communication, changing attitudes towards innovation, improved creativity and collaboration. This insight is relevant to the development of a management framework for IT migration to FOSS that is based on an organic model of strategic management.

The foregoing analysis of culture is limited in that it overlooks the impact of broader industry culture and/or national culture on innovation. Viljamaa (2007) addresses this limitation in a study of technology and cultural challenges in local innovation support activities in the motor sport cluster in Charlotte in the USA. The researcher concludes that the absence of closer interaction between the motor sport industry and research institutions in motor sport innovation in Charlotte, North Carolina, can be explained by understanding the perceptions and actions of different actors. In this instance, a long established culture of self-reliance and resistance to outside control partly explains the reluctance of the motor industry to work closely with research institutions.

In addition to introducing the concept of industry culture to the discussion of technology innovation, Viljamaa highlights the importance of path dependence (history) to the discourse. This means that a historical perspective also needs to form part of the analysis of technology innovation within organisations. The concept of path dependence is one of the key contributions of organic models to strategic management and needs to also inform any theoretical framework of strategic management for technology innovation (Farjoun, 2002).

National culture is also an important consideration in the implementation of technology innovation. Japan’s economic success after the ravages of war can largely be attributed to its culture of collectivism, which has spawned cooperation and collaboration (Westney, 1986). This has resulted in Japan adopting what Westney refers to as “innovation by imitation”, which is driven by a focus on international technology transfer. Reaffirming these observations are Malik and Malik (2008), who highlight the constraints of Pakistani societal

culture to knowledge sharing and hence innovation. The creation of an innovation climate in a country is a key consideration for the long-term successful implementation of technology innovation (Sharif, 1994).

Depending on their nature, aspects of national culture, which may include work style and discipline can either be enablers or barriers to innovation (Oshiotse and O'Leary, 2007). It is important to take note that the significance of technology innovation is also mediated by the manner in which individuals give it their own meaning. A meaning that is mediated by the cultural milieu of an organisation. Corea (2007) refers to this phenomenon as 'articulation'. There is not enough literature on how articulation works to either enhance or discourage innovation.

This analysis suggests that there are a number of dimensions of culture that are relevant to the development of a strategic management theoretical framework for technology innovation. It is not enough only to focus on internal organisational culture as has tended to be the general practice in management. For technology innovation initiatives to succeed, it is important that a fit be achieved between such initiatives and culture in its different manifestations. At an organisational level, employee behaviour, which is one of the key indicators of culture, and general organisational context need particular attention in the introduction of technology innovation (Madsen and Ulhoi, 2005; Chen, 2007).

3.9 The Role of Policy in Technology Innovation and FOSS Implementation

Technology innovation in the public sector, including the adoption of e-Government and FOSS, has been found to benefit from policy support. It has been noted by a number of researchers that policy and legislation are key in mandating the adoption of certain key technology innovations in government. For instance, the implementation of electronic benefit transfer in the United States of America was reportedly stimulated by the promulgation of the Electronic Funds Transfer Expansion Act of 1996 (Pirog and Johnson, 2008).

In South Africa, some of the policy measures directed at supporting the implementation of e-Government include the Minimum Information Security Standards (MISS), the Handbook of Minimum Information Interoperability Standards (MIOS) and the Electronic Communications Transaction Act of 2002. Other policies that are supportive of technology innovation around the world include legislating for preferential tax regimes and subsidies in

favour of innovative organisations or companies, support with marketing of innovations, support for research and development efforts and other means of support (Viktoria and Nadiia, 2007; Wu, 2007; Mishra, 2005).

Writing about the adoption of wireless mobile technology, Lu, Yu and Liu (2005) state that policies, regulations and the legal environment are critical for the acceptance of technology. They regard policy and regulation as also contributing to increasing levels of trust in a technological innovation, which in turn contributes to more acceptance and adoption. These authors regard this factor as more important than the availability of technological support. In the case of open innovation, Intellectual Property (IP) legislation plays an important role in that IP protection is regarded as providing organisations, particularly in the private sector, with the necessary assurance that it would be possible for them to appropriate the value that emanates from collaborating with other organisations (Chesbrough, Vanhaverbeke and West, 2006). This observation is particularly relevant for FOSS adoption by ICT companies since it provides companies with an opportunity to develop applications that are based on a combination of a freely available source code and one that is protected by IP.

The different EU member states have developed policies directed at encouraging the adoption of FOSS within their jurisdictions. For instance, the UK policy encourages; the consideration of FOSS solutions alongside proprietary ones, the avoidance of lock-in through encouraging open standards, access to full rights by government to the software code it purchases or the customisation of such software, that publicly funded research and development software projects shall be commercially exploited within the academic community or as open source software. Countries such as Iceland, Croatia and other EU states have similar policies (Bjorgvinsson and Thorbergsson, 2007). In addition, a several local governments have adopted FOSS migration policies. These include cities such as Vienna and Munich (Cassell, 2008; Comino and Manenti, 2005).

Brazil mandated the adoption of FOSS by municipal governments through policy. Singapore has a policy of offering tax breaks to companies that make use of the open source Linux operating system. Germany has a policy that subsidises IBM computers that are preinstalled with Linux (Comino and Manenti, 2005). According to these authors, the Philippines has adopted a policy to include a clause in its ICT bidding procedures that states that bids should ‘preferably be based on open source or open software systems’. They further conclude that policies can be used to create an enabling environment through taxation policies, subsidies and the provision of infrastructure.

Government in South Africa adopted a policy that mandates the adoption of FOSS in the case where FOSS has similar or better levels of functionality to proprietary software. In this case, departments are urged to choose FOSS or migrate to FOSS whenever alternatives to installed proprietary software exist. IT solutions that are developed for government should also be based on open standards and open source principles (Mtsweni and Biermann, 2008). These researchers note that this policy was adopted as early as 2003 yet there is little to show for it. This observation reveals that policy alone does not guarantee implementation, but that the answer lies in a combination of factors. For instance, whilst policy is important, it is also the purchasing behaviour of government that drives the adoption of FOSS (Cook and Horobin, 2006).

It must be noted that there may be legal challenges to the use of policy to favour FOSS over proprietary software. For instance, the use of public policy to favour FOSS in ICT procurement has been found to be illegal in certain jurisdictions (Sieverding, 2008). In Brazil, the Supreme Court voted to bar the enforcement of a law passed by the Rio Grande State legislature mandating that all state agencies favour FOSS over proprietary software. The need for procurement legislation to respect the principles of equality and non-discrimination was emphasised by the Belgian Supreme Administration Court in a legal opinion given to the Budget Commission of the Assembly of the French speaking community (Cocof). This committee had adopted a proposal that would mandate the Cocof administration to use FOSS exclusively. The court called for a neutral policy stance on matters of procurement including ICT procurement. The US Federal office of Management and Budget (OMB) also encourages a neutral stance (Sieverding, 2008).

From a policy and legislative point of view, Sieverding (2008) suggests that a better approach is for procurement decisions to be neutral in software procurement, and to consider two things: (a) the total cost of ownership during the full life of the software, including its servicing and maintenance; and (b) performance criteria and value of the software based on its ability to meet the specific needs of the state, including reliability, ease of learning, ease of use, security, privacy and interoperability. In South Africa, any policy should also pass the constitutional test, including equality and non-discrimination. In introducing a model for FOSS that can be used by developing countries to achieve their development goals, Camara and Fonseca (2007) present an approach for selecting information policies. According to these authors, the two factors to be considered in this exercise are levels of shared conceptualisation and levels of modularity of the FOSS application. Shared conceptualisation refers to the

number of developers who are involved in the development of a particular application. Modularity refers to the extent to which the development project can be broken down and assigned to different developers.

FOSS projects that have both high levels of shared conceptualisation and high level of modularity (high-high) are the most suited for adoption by developing countries because they are more sustainable and are not likely to be negatively affected by the dropping out of some developers. Cases where there is low shared conceptualisation but high modularity (low-high) are regarded as ideal and sustainable. These are thus safe bets for developing countries. The challenge associated with these types of projects would be the expertise needed in using this software product because they tend to consist of a high level of innovation because the modules are assigned to a few highly skilled developers.

An example of a project that has high shared conceptualisation and low modularity (high-low) are FOSS projects that are driven by private companies. In this case, although there is shared development by developers that are employed full-time by the company, the fact that all modules are developed by the same developers within one company increases the risk of lock-in as is the case in proprietary software. Should the company collapse; this would pose a challenge for developing countries. Projects with low shared conceptualization and low modularity (low-low) are not recommended because of their low levels of sustainability (Camara and Fonseca, 2007). The advice to policy makers is to consider only these only where there is a high likelihood of migrating them to low-high or high-low status.

3.10 The Management of the Process of Technology Innovation and FOSS Migration

Ozgen and Olcer (2007) define innovation management as a process of economic implementation and exploitation of new ideas and discoveries, and the implementation of an innovative culture in an organisation, to promote and make possible the development of new ideas and business opportunities. According to Orange *et al.* (2007), the management of innovation is a knowledge intensive process that requires the capture and use of knowledge, followed by integrating knowledge from diverse sources. In FOSS, a central challenge in the management of innovation is that of how organisations can be effective in practising the reuse of previously created knowledge across the different stages of the innovation process (Krogh, Spaeth and Haefliger, 2005). The establishment of learning structures in software innovation, for example, in FOSS migration, enables a software group to evolve work norms and

practices that are consistent with the requirements of the new software (Sherif, Zmud and Browne, 2006). Learning structures such as communities of practice are important components for knowledge management.

In the area of public management, some researchers are of the view that considering that learning and innovation are social processes, innovation must be thought of not only as a managed process but, in a more comprehensive sense also as a self organising process (Celino and Concilio, 2008). This observation emphasises the importance of organic models for understanding how innovation happens within public institutions. Maidique and Hayes (1984) conclude that large organisations need to manage the paradox of chaos versus continuity in order to be successful innovators. In their research on managing peer-to-peer conflicts in disruptive Information Technology innovations, Sherif *et al.* (2006) present a model to address conflicting goals between asset creators (software developers) and asset users (software users). The model identifies the importance of two interventions, viz. coordination and organisational learning structures and suggests that the use of these two interventions will reduce goal conflicts resulting in positive outcomes (Figure 1)

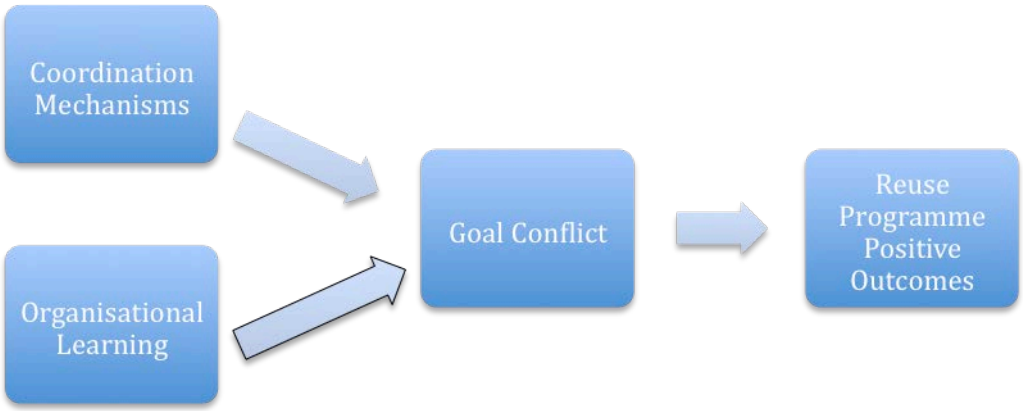


Figure 1: Managing Goal Conflict in Technology Innovation (Sherif *et al.*, 2006)

According to Sherif *et al.* (2006), amongst the coordination mechanisms that can support the reduction of goal conflicts between creators and users of software solutions are those discussed below.

- The first one is monitoring mechanisms that ensure that the creators and users make decisions that are consistent with the needs of the organisation. This monitoring should be directed at the process of creating software and that of developing solutions for users. It is important to monitor the behaviour of both asset creators and users and

to measure the effect of using reusable assets (e.g. reusable source code) in application development.

- Reward mechanisms that foster cooperation between asset creators and users are important. This includes incentive schemes that reward collective rather than individual outcomes, ensuring that rewards for creators are contingent upon the work outcomes of users and rewarding information sharing.
- Effective communication processes enable creators and users to become knowledgeable about each other's work roles and the status of assigned tasks. This encourages the coordination of effort. This also allows for the identification of alternative viewpoints and potential disagreements. The communication needs to be reciprocal ensuring that software users, who are nearest to clients, are involved in the analysis and design of software architecture. Software creators understand better the existence and internal structures of reusable assets and how these can best be adapted to fit the solution that is being designed for the client.

The organisational learning processes that Sherif *et al.* (2006) found as effective in ensuring the success of reusable assets deployment are listed below.

- Conceptual learning entails the specification of processes required to perform a task. In the case of software reuse, this refers to the definition of standards and guidelines for the development and integration of reusable assets, incorporating reuse in all phases of application development processes, developing domain specific architecture. Formal guidelines and standards are designed from lessons learnt from software reuse processes. These guidelines and standards are documented and facilitate generic solutions for recurring tasks, which in turn reduce goal conflict.
- Operational learning refers to changes that occur in the organisation's collective understanding through making use of lessons learnt and their integration into work processes. This entails the ongoing and organic process of evolving the already developed guidelines and standards on the basis of new experiences. This process entails the continual redesign of standards in order to respond to new problems and realise desired outcomes.

Sherif *et al.* (2006) conclude that successful disruptive innovation requires: management to examine the impact of architectural changes to work processes on the stakeholders involved; a shared vision of an initiative's nature and effects developed by, communicated to, and accepted by all stakeholders; and active attention to organisational learning. The importance of visioning must be accompanied by effective strategic management that ensures the

development and implementation of strategic plans for technology innovation (Roberts, 2007).

Roberts (2007) also observes that the management of technology innovation includes the organisation and direction of human and capital resources. This researcher posits that there are two primary issues that arise with regards to staffing technologically innovative organisations, and these are: what kinds of people need to be involved; and what managerial actions can be taken to maximise their productivity. To encourage open innovation and the diffusion of solutions into an organisation, there is a need for organisations to be designed to make it easy to access different sources of technical information, including open ICT solutions.

3.11 The Measurement of Technology Innovation and FOSS Success

The measurement of technology innovation success, including the success of FOSS projects has not been studied to a significant extent. There is little literature that covers this topic. The topic is nonetheless important in a theoretical framework for strategic management for FOSS migration. According to Orange *et al.* (2007), innovation efficiency is measured as the ability of an organisation to transform innovation inputs to outputs as calculated based on a ratio between the two. These authors state that innovation inputs include the following:

- innovation drivers indicators which measure the structural conditions required for innovation potential;
- knowledge creation indicators which measure the investment in R&D activities, which contribute to a successful knowledge based economy; and
- innovation and entrepreneurship indicators which measure efforts towards innovation at the level of organisations, for example, ICT expenditure, collaboration.

Innovation output measures include:

- application indicators which measure the performance, expressed in terms of labour and business activities and their added value; and
- intellectual property indicators which measure the achieved results in terms of successful know-how, for example, patents, trademarks and designs.

Tungande (2008) suggests that a shift from input measures to a performance driven culture that considers outputs, contribution and impact is important in order to ensure that government instruments are effective in addressing national priorities. In addition, Orange *et al.*, (2007) note that indicators of successful innovation can be employed for product/service

or process innovation. Product/service innovation indicators include improved quality of product/service and increased product/service range. Process indicators include reduced costs, improved flexibility and increased capacity of production/service process delivery.

The success of technology innovation in the form of e-Government can be measured by comparing the transaction costs between online and offline channels for service delivery (Jarvelainen, Koskivaara, Pihlaja, Salmela, Tankapaa, Kestila and Kinos, 2007). These researchers make the example of comparing the return of an early childhood education application by mail and electronically. Other technology based measures with specific relevance to FOSS include functional performance, acquisition cost, ease of use, operating costs, reliability, serviceability and system compatibility (Roberts, 2007).

Orange *et al.* (2007) developed a model for innovation value that determines innovation measures for the three important dimensions of innovation, viz. people, process and technology. The performances of innovations on these three dimensions are measured on the basis of either their social value, i.e. value that it delivers to individual users, or their public value. Crawston, Howison and Annabi (2006) present a model of information system success developed by Delone and McLean (1992) that is relevant to FOSS. This model has six measures of success. These are: system quality, information quality, use, user satisfaction, individual impact and organisational impact. They further report on a model developed by Seddon (1997) that includes system quality, information quality, perceived usefulness, user satisfaction and information system use.

System and information quality measures include code quality, number of defects per thousand lines of code and the quality of system documentation. User-satisfaction is measured through user ratings of system performance. Use measures include general system use, the actual or potential number of users, the number of downloads, packages inclusion in distributions, level of user interest, number of page views of information pages of projects, package dependency, which looks at other packages' levels of reliance on FOSS, and level of code re-use. Individual and organisational measures are said to be hard to define but tend to focus on economic implications.

Another model described by Crawston *et al.* (2006) is that of Hackman (1987). This model measures FOSS project effectiveness, which is conceptualised along multiple dimensions including task output, the teams' capability to continue to work together and the satisfaction of individual FOSS team members' personal needs. According to this model, measures of

outputs of system development include FOSS project completion and project's achievement of goals. Measures of process of system development include: the number of developers, their levels of activity, and the project development cycle time. Measures of the effects of the project on the project team include employment opportunities, individual developer reputation and project knowledge creation potential. This model by Hackman (1987) can assist managers to select which FOSS products to adopt based on the different products' levels of success on identified measurement criteria.

3.12 An Overview of Organic Frameworks for Strategic Management

This section presents a brief overview of strategic management frameworks that seek organic explanations to the process of strategy. The overview serves to highlight emerging thinking on strategic management. It also emphasises some of the key considerations to be taken into account in developing a strategic management framework for IT migration to FOSS.

According to Farjoun (2002), organic frameworks of strategic management are different from what he refers to as mechanistic frameworks. He claims that, mechanistic perspectives for strategic management consider strategy as a posture, a relatively stable configuration, fit or alignment between mutually supporting organisational elements such as activities and organisational structure.

Mechanistic perspectives also view strategy as a position and/or as a rational plan and strategies are realised as planned (Mintzberg, 1987). Amongst the models that fall within this perspective are the Structure-Conduct-Performance (SCP) model of Bain (1956) and the industry structure model of Porter (1980), which view the external environment as a key determinant of strategy and performance. The Strategy-Structure-Performance (SSP) of Chandler (1962) highlights the significance of factors that are complementary to strategy, such as organisational structure, to performance (Farjoun, 2002). The resource based view delineates a process theory of the role of resources in organisational performance (Penrose, 1959). At the heart of the mechanistic perspective is the view that strategic management entails the process of rational design, which consists of the process of strategy formulation and implementation.

Below is an overview of the perspectives or frameworks that seek to challenge the mechanistic view. These views, characterised as organic, represent a shift from underlying epistemological assumptions of the mechanistic perspective by introducing dynamic and

eclectic views of key constructs, highlighting the importance of strategy process and portray a more complex view of causality (Farjoun, 2002). This emphasis on the strategy process makes organic perspectives relevant to the development of a strategic management framework for Information Technology migration to FOSS.

Ansoff (1980) presents a model for strategic issues management, which represents a shift from strategic management approaches that focus on periodic planning and a response that typifies the mechanistic view. Rather, in his article, this author suggests a system, which responds to signals in 'real time'.

In another paper, this author further extends his views by developing a model that seeks to capture what he regards as the emerging paradigm of strategic management (Ansoff, 1987). His model for a new paradigm borrows from a number of disciplines including politics, sociology, psychology and cognitive logic. The model also focuses on interactions between strategic and operational behaviour, and seeks to integrate the activities of sensing, deciding and executing in strategy making.

Goold and Quin (1990) borrow from agency theory to suggest improving the effectiveness of planning processes through strategic control systems. In their paper, these authors acknowledge the importance of balancing between rigidity and looseness. Their view borrows from economics, and is somewhat akin to the unifying views of the organic school of strategic management, including complexity theories.

In their work, Caldart and Ricart (2003) seek an innovative approach to the field of corporate strategy by drawing on the theoretical tradition of behavioural evolutionism as enriched by complexity theory. They particularly focus on the application of the work of Kauffman (1993) in the field of biology, to organisational theory. These authors define a complex system as a system (whole) consisting of numerous interacting entities (parts) each of which is behaving in its local context according to some rule(s) or force(s). In responding to their own particular contexts, these individual parts can, despite acting in parallel without explicit inter-part coordination or communication, cause the system as a whole to display emergent patterns, orderly phenomena and properties, at the global or collective level.

Another author who explores complexity theory of strategic management is Grobman (2005). This author claims that complexity theory is revolutionising the way scientists look at the world, and has ontological implications as well. According to this author, complexity theory provides a framework for theorising about how there came to be an organisation and an

environment in the first place so that general systems theory could be applied. The author *cites* Cohen (1999) as stating that complexity theory is attracting much attention because of dramatic changes occurring in the structure and scope of business, government and non-profit organisations. In an environment that seems to be changing, organisations want to be more adaptable and better able to learn from experience in order to reconfigure themselves in the face of new demands

Grobman (2005) regards the dominant paradigm for strategic management that is driven by general systems theory as being reductionist in its suggestion that a system can be analysed by understanding each of its parts, and that there is a general linear relationship between inputs and outputs. The author *cites* Anderson (1999) as stating that complex systems on the other hand demonstrate nonlinearity because each component interacts with others via a web of feedback loops

A composite approach that differs from general systems theory is adopted by Spanos and Lioukas (2001). In their study, they seek to unify the industry organisation viewpoint of strategy on the one hand, and the resource based view on the other. Their study is an attempt at building a theory and model based on a composite approach between strategy, industry and firm asset effects. They have found that both organisation specific and industry effects are important in explaining organisational performance.

Synthetic thinking is also propounded by Ackoff in an interview by Allio (2003). In an interview with the Strategy and Leadership Journal, this author identified one of the characteristics of a new paradigm for strategic management as synthetic thinking. According to him, synthetic thinking provides a better understanding of complex systems than analytical thinking does. Synthetic thinking is a way of thinking about and designing a system that derives the properties and behaviour of its parts from the functions required of the whole. The whole has properties that none of its parts have (Allio, 2003).

Ginter and White (1982) contribute through developing a theory of learning that acknowledges the reciprocal influence of the environment on the one hand, and organisational behaviour on the other. This represents an early attempt at recognising the role of complexity in strategic management. The Social Learning Theory of Strategic Management (SLTSM) introduces an organic understanding and extends the general systems thinking, by including feedback loops to the conduct of strategy.

The purpose of the paper of Ginter and White is to present a theory that will permit existing strategy concepts to be synthesised in an integrated framework. It is an attempt at integrating a variety of theoretical schemas, including systems theory, contingency theory, operational and managerial role definitions. These authors state that these schemas have provided limited, if-then prescriptive models for strategic management. The SLTSM is premised on the view that behaviour results from the interaction of persons and situations, rather than from either factor alone. They state that social learning posits that the person and the environment do not function as independent units but instead determine each other in a reciprocal manner.

Authors who use the resource-based view to develop a unifying research programme are Mahoney and Pandian (1992). Their integrated research programme draws from economics, diversification strategy explanations and industrial organisation. Their economics perspective draws from agency theory, property rights, transaction costs, evolutionary economics and game theory. In this article, these authors introduce an evolutionary viewpoint concerning strategic management, and define strategy formulation as consisting of the constant search for ways in which the organisation's unique resources can be redeployed in changing circumstances.

Prahalad and Hamel (1994) emphasise the need for learning and for managers to change their dominant logic if organisations are to survive the radical environmental changes that characterise the current business environment. In their push for the re-examination of the traditional strategy paradigm, they emphasise the need for managers to be able to anticipate the future. In order to assist managers, these authors present checklists that list environmental factors that need to be anticipated. They point out that the old ways of doing strategy no longer work and that there is a need for new lenses, including the use of game theory, chaos theory, war and diplomacy.

The role of chaos theories in strategy processes is acknowledged by Hamel (1998), who claims that writings on the process of strategy making have tended to focus on the content of strategy and have overlooked the conduct of strategy. Industry structure analysis is one example of this limited focus.

In addressing the overemphasis of strategic thought on the content of strategy, Venkatraman and Cannilus (1984) present evidence of recent studies that have integrated the content and the process conceptualisation of the concept of fit in strategy. They demonstrate that it is possible to apply the concept of fit by looking at it from both an inter-organisational

(external) and a strategic choice (internal) perspectives. They also seek to move the application of the concept of fit beyond the traditional bi-variate interactions (strategy and culture, strategy and management style, strategy and structure) towards an understanding of fit as characterised by a broader array of elements. To this end, these authors apply the Mckinsey 7s model to show organisational congruence.

Munive-Hernandez, Dewhurst, Pritchard and Barber (2004) have developed a comprehensive model for defining a corporate strategy, constructing a strategy document and strategy implementation by applying a combination of methodologies and tools. This model seeks to make a break with the predominant focus on strategy content.

In the same vein, Caldart and Ricart (2003) developed a dynamic framework of corporate strategy based on three interlinked sets of processes which are: senior management cognition, which they refer to as framing the fitness landscape; corporate search strategy or strategic behaviour; and architectural design.

Farjoun (2002) also develops an organic model which takes account of the complex interactions and self-influences amongst key strategic management constructs of organisation, environment, strategy and performance. This presents a holistic view of strategy that replaces the conventional distinction between content and process.

The concept of strategy emergence, which represents another significant break with prescriptive views, is promoted by Mintzberg (1987). This view acknowledges that strategy evolves over time as intentions accommodate reality. This author acknowledges the definition of strategy as plan, pattern, position, perspective and ploy, and suggests that multiple definitions can help practitioners and researchers alike to manoeuvre through the field of strategic management. Farjoun's O-E-S-P model also extends the concept of strategy by recognising the existence of emergent strategies, which may not be a result of deliberate planning.

3.13 Critical Review of Some of the FOSS Migration Literature

Pirog and Johnson (2008) and Elliman, Irani and Jackson (2007) highlight the importance of policies that mandate the adoption of FOSS for successful migration. What these researchers do not consider is that such policies may nullify the benefits of choice, competition and innovation that arise from technical solutions that are based on multiple interoperable sources (Sieverding, 2008). This researcher posits that such policies may not simply be bad public

policy, but that they may also be illegal, as shown by court decisions in Brazil and Belgium that found such policies to be illegal. This observation suggests that policy prescriptions as mechanisms for encouraging FOSS adoption need to be considered with some caution. Sieverding (2008) suggests that the most prudent approach is to have policies that are neutral with respect to specific technologies or software platforms.

An area of research that Drozdik, Kovacs and Kochis (2005) find to be controversial relates to FOSS cost benefits. Amongst the researchers who found that the total cost of ownership (TCO) of FOSS is lower than that of proprietary software are Mtsweni and Biermann (2008), Brown and Adler (2008), Mosoval *et al.,* (2006) and Waring and Maddocks (2005). According to Drozdik *et al.,* (2005), findings on TCO omit to consider other possible areas of cost for FOSS migration. These include uncertain time requirements for migration and levels of stress amongst staff. Other unforeseen cost-related problems may include insufficient existing hardware, difficulties with migrating data, and the difficulties of quantifying the costs of inadequate skills and discomfort within an organisation. Researchers who emphasise cost advantage seem to overlook some aspects of FOSS migration that may not be easy to quantify.

The emphasis on cost advantage as the main driver for innovation to FOSS is also contradicted by findings from a study of FOSS innovation in four cities of the United States conducted by Cassell (2008). This researcher concludes that the overriding reason for migrating to FOSS by government is out of concern for autonomy, independence and self-determination from the private sector rather than cost reduction. This researcher also concludes that the desire to maintain capacity in order to resist potential future threats may be behind state efforts at innovation, including FOSS migration. These findings reflect that the literature on drivers for migration may tend to reflect concerns of the private sector, which do not adequately account for the uniqueness of public sector organisations.

Research on the influence of culture on technology innovation, including FOSS migration by Malik and Malik (2008), Oshiotse and O'Leary (2007), Newbold and Azua (2007), Cooper and Kleinschmidt (2007), Evangelista and Sweeney (2006), and Waring and Maddocks (2005) illustrate that research on conditions for success in technology innovation and FOSS migration tends to be based on mechanistic perspectives with their emphasis on designing organisations for success. These researchers explain the relationship between culture and technology innovation in a linear, prescriptive and mechanistic manner. According to this perspective, successful technology innovation depends on the existence of a favourable

culture. This means that the relationship is that of technology innovation as a dependent variable; and culture as an independent variable. This perspective regards technology innovation and FOSS migration as functions of conceptual design, where an organisation's culture must be designed in a particular manner in order to achieve success (Mintzberg, 1990).

This mechanistic perspective is challenged by McIvor *et al.* (2002) who found that the introduction of technology innovation has a potential for changing the internal culture of an organisation, including through improving internal communication, changing attitudes towards innovation, improved creativity and collaboration. This insight suggests that the direction of the relationship between technology innovation and factors for its successful implementation may be complex, with successful technology innovation also affecting the internal culture of an organisation. An organic model for the strategic management of technology innovation and FOSS migration that does not consider such complexities may fail to provide proper guidance to organisations. According to Grobman (2005), an organic model for strategic management acknowledges elements of complexity that demonstrate nonlinearity because each component in the relationship interacts with others via a web of feedback loops (Anderson, 1999).

Other examples of simplifications in dealing with the topic of technology innovation are revealed in the various perspectives and theories used to explain adoption. Amongst these are the economic rationalistic perspective applied by Wang and Miao (2006) and Mishra (2005), the socio-cognitive perspective applied by Elliot and Fu (2008), the social-relational perspective applied by Wang and Miao (2006) and the reasoned action theory applied by Elliot and Fu (2008) as well as Gao and Damsgaard (2007). These theories tend to use single factors to explain adoption (Venkatraman and Cannilus, 1984). For example, using these perspectives and theories, these researchers perceive the adoption of a technology by an organisation either as a function of economic returns including: (a) the number of users of a technology (network externalities); or (b) perceptions of success by organisations that have adopted a technology (social-relational); or (c) social pressure and social norms (reasoned action). These perspectives and theories are reductionist in their use of single factor based dyadic relationships to explain the complex process of technology adoption (Grobman, 2005)

Another weakness with mechanistic perspectives is in their emphasis on the content aspect of the relationship between technology innovation and the factors for its success (Hamel, 1998). For example, writings on the relationship between culture and technology innovation

emphasise the type (or content) of culture necessary for successful innovation (Malik and Malik, 2008; Oshiotse and O'Leary, 2007; Newbold and Azua, 2007; Cooper and Kleinschmidt, 2007; Evangelista and Sweeney, 2006; Waring and Maddocks, 2005). This focus on content ignores the importance of the process dimension of the relationship. The understanding of the process of interaction between the factors that contribute to successful technology innovation and FOSS migration is an important consideration in the development of a holistic framework for strategically managing migration. Such a holistic view would take into account the complex interactions and self influences amongst all key strategic management constructs of an organisation, including its culture, its strategy and its performance (Farjoun, 2002).

3.14 Research Questions

The research questions that will guide the development of a strategic management framework for Information Technology migration to FOSS within the South African public service are set out below.

Main Question

How can a framework be developed to help manage the migration to FOSS to ensure less impact on the strategic plan?

Sub-Questions

- Which factors are important in ensuring that government departments in South Africa succeed in IT migration to FOSS?
- How do the factors that are important in ensuring that South African Government departments succeed in IT migration to FOSS interact with one another?
- How do the factors that are important in ensuring successful IT migration by South African Government departments contribute to such success?
- How will the framework be compiled to ensure that the migration will be successful?

3.15 Conclusion

This chapter has presented the literature on technology innovation, with a focus on FOSS migration. The review covers the definitions of terms including technology, innovation and FOSS. The chapter has presented the literature on technology innovation and FOSS migration covering nine themes. These include literature on benefits, technology adoption, barriers, implementation, conditions for successful implementation, the role of culture, the role of

policies, management and the measurement of successful technology innovation and FOSS. The chapter has also presented a brief review of organic frameworks for strategic management. A critical review of the presented literature has also been conducted. The chapter ends with a presentation of research questions.

From the literature, a number of conclusions can be drawn including that the benefits of technology innovation and FOSS migration have been well documented, although very little research on the benefits of FOSS has been conducted in South Africa. The literature also shows that levels of FOSS adoption in the South African Government lag those in countries that adopted FOSS policies later than South Africa. This is in spite of the extensive documentation in the literature of factors that support and/or hinder successful technology innovation and FOSS migration. One reason for these poor levels of FOSS adoption may be the absence of frameworks and literature on how the process of migrating to FOSS can be strategically managed by organisations. Most literature on technology innovation and FOSS migration tends to be written from mechanistic perspectives that are prescriptive and take little considerations of the complexities that confront organisations. It is this absence of a framework on the strategic management of Information Technology migration to FOSS that has motivated this study.

The value of this review is the fact that it highlights some of the important factors that a strategic management framework for Information Technology migration to open source software should consider. It also informed the finalisation of the methodology for the conduct of this study as outlined in the next chapter. The review can also be used by managers in both the public and private sectors to raise their levels of understanding of the value of technology innovation and FOSS migration. It also highlights key considerations to be taken into account in order for technology innovation and FOSS migration to succeed. The critical review highlights where current research on technology innovation and FOSS migration falls short, especially in its failure to adopt organic perspectives.

The next chapter will present the methodology that was followed in developing a strategic management framework for Information Technology migration to open source software. The chapter outlines how a combination of the case study method and grounded theory was used as the method for data collection. It also outlines the approach that was applied in the analysis of data, including the units of analysis and tools for data analysis.

CHAPTER 4
RESEARCH METHODOLOGY

4.1 Introduction

This study is conducted within the context where South Africa's adoption of a FOSS policy in the public sector in 2003 has not resulted in significant levels of FOSS usage in government. According to Mtsweni and Bierman (2008), levels of adoption in South Africa remain lower than those in countries that adopted such policies later than South Africa. Webb (2010) claims that, although more than half of all South African Government departments have FOSS implementation plans, only about 25% use FOSS web servers, about 40% use FOSS in some form at the back end and only 12% use some form of FOSS on the desktop.

The absence of documented cases of successful FOSS adoption, coupled with the absence of a strategic management framework for FOSS migration could explain this low level of adoption. Managers in the public sector do not know how to go about migrating to FOSS. This chapter presents a research methodology that was used to develop a strategic management framework for IT migration to FOSS in the South African public sector.

The main research question that guided the research methodology is: How can a framework be developed to help manage the migration to FOSS to ensure less impact on the strategic plan? The sub-questions are: (1) Which factors are important in ensuring that government departments in South Africa succeed in IT migration to FOSS? (2) How do the factors that are important in ensuring that South African Government departments succeed in IT migration to FOSS interact with one another? (3) How do the factors that are important in ensuring successful IT migration by SA Government departments contribute to such success? (4) How will the framework be compiled to ensure that the migration can be successful?

The next two sections present the importance and significance of the study respectively. This is followed by a discussion of the nature of research methodology. A discussion of the research methodology used for this study then follows. The grounded theory research method is then presented in some detail, followed by a discussion of a philosophical stance informing this study. Issues of bias in research and how it was dealt with in this study are then discussed. The chapter ends with a summary and conclusions.

4.2 Significance of the Study

A strategic management framework for Information Technology migration to FOSS will assist the Government of South Africa with the better implementation of its FOSS policy. The framework will provide guidance to public sector managers regarding how the process of migrating can best be managed.

By helping to accelerate the introduction of FOSS in South Africa, such a framework may make a contribution towards ensuring that South African society takes advantage of the value that open source software can deliver. This includes its contribution to the attainment of South Africa's developmental goals, including improving the efficiency and reach of government service delivery; improving national competitiveness; supporting local innovation and investment; broadening BEE participation in the economy; and building a better world.

The study may also further extend knowledge in the field of strategic management by extending the scope of frameworks to cover Information Technology innovation to FOSS. The framework can then be verified from different perspectives by researchers in the field.

4.3 The Nature of a Methodology

A scientific methodology should form the basis of any academic research project, which claims to add something of value to the body of knowledge. Chadwick *et al*. (1984) *cited* by Lubbe (1994) describe scientific methodology as a systematic observation of nature. These authors define method as a way of assessing the validity of ideas about reality and existence through systematic study and observation, together with the recording of observations and how these were obtained so that the resulting factors may be checked and modified by others.

Remenyi, Pather and Klopper (2011) state that science is just one human way of looking at the world of reality. This way of thinking suggests that science interprets and it is not neutral. However, scientific theories are open to endless revision and current scientific ideas are nothing more than human work in progress. Remenyi *et al.* (2011) further state that scientific methodology is a system of explicit rules and procedures upon which claims of knowledge as a result of the research are evaluated.

Scientific understanding proceeds by way of constructing and analysing models of the segments or aspects of reality under study. The purpose of these models is not to give a mirror

image of reality, nor to include all its elements in their exact sizes and proportions, but rather to single out and make available for intensive investigation those elements, which are decisive (Baran and Sweezy, 1970).

A methodology may serve as a set of rules for reasoning whereby evaluation of facts can be used to draw inferences. Haug (1996) noted that the field of evaluation is not static. Remenyi (1990) observes that the use of a methodology infers some competence in logical reasoning. The researcher might be able to establish or verify some theories and must be validated by some form of empirical evidence. The primary benefits of a scientific methodology are therefore noted below.

1. It facilitates communication between scientists allowing them to share experiences. It also makes replication of the research easier. Replication of research is always necessary to safeguard against unintentional errors as well as deception or fraud.
2. It ensures that an acceptable logical structure is being used. Scientific research requires both empirical observation and valid logical reasoning. The methodology is an articulation of valid logical reasoning. The rules of classification, definition, deduction, and indirect sampling, if used, must be articulated in the methodology.
3. It institutionalises conceptual frameworks for communication, rules of reasoning, procedures and methods for observance and verification. Methodology demands conformity. However, care must be taken that methodology does not hinder new discoveries and, by implication, scientific progress (Nachmias and Nachmias, 1992).

Methodology is an issue facing the social scientist in conducting research in that it provides a basis on which the researcher may assert the validity of his/her findings. Scientific knowledge, according to Remenyi (1990), is knowledge provable by both reason and observation and methodology must address both issues in terms of logic validity and empirical verification. These two criteria are translated into a research process.

4.4 Research Methodology for this Study

The following sections present the research methodology selected for this study. A detailed outline of the approaches selected is also included. The presentation follows the sequence of the phases of the research exercise including sampling, data collection, data analysis and report writing.

The method that was used to develop this framework is a case study method combined with grounded theory. Grounded theory is selected because it has been identified as an appropriate

tool for theory development (Glaser and Strauss, 1967). Grounded theory is consistent with the organic perspective because it allows for the emergence of a framework from data.

Grounded theory is described as a general methodology for developing frameworks that are grounded in data systematically gathered and analysed. The framework evolves during actual research, and it does this through continuous interplay between analysis and data collection (Strauss and Corbin, 1997; Glaser and Strauss, 1967).

Bakir and Bakir (2006) state that grounded theory is often used where a totally fresh approach to the existing theory or framework is warranted because existing theories or frameworks do not adequately explain a phenomenon (as is the case with the dominant rational strategy discourse and its critiques) or when existing frameworks or theory on the phenomenon being studied is minimal. Grounded theory is recognized as one of the strategies of inquiry or traditions that could be used to design qualitative research (Creswell, 1998). The approach for grounded theory used by Glaser and Strauss (1967) are still applicable and have been applied in recent studies (Mouton, 2009; De Vos, Strydom, Fouche and Delport, 2009). The following sections give a brief outline of the case study approach and grounded theory.

4.4.1 Case studies as research strategies

The approach of the case study methodology to gathering data with which to develop grounded theory was selected for several reasons. This will become clear from the description below of the methodology of the case study.

The term case study refers to two entirely different issues. As a teaching-learning device, it is a highly effective end well-established technique for use in the classroom to simulate real life situations. The way to handle case studies is similar to the way business issues are mostly handled. The classroom and the syndicate groups provide the simulated business meetings in which the participant can learn both the skills of listening and presenting a point of view. The environment in which the case study is used helps participants to develop a degree of confidence in their judgment, as well as a degree of humility (Edge and Coleman, 1986).

4.4.2 Definition of a case study as a research methodology

A case study as a research strategy is a technique that is preferred when who, why and how questions are posed, when the investigator has little control over events and when the focus is on contemporary phenomena within some real life context (Yin, 2003). The use of multiple evidences in case studies allows the researcher to provide a convincing argument as an answer

to the questions. A case study allows the investigator to retain the holistic and meaningful characteristics of real life events such as organisational and managerial processes.

It is not essential to the validity of the case study research method that a case study should be able to be generalised. According to Yin (2003), case studies, like experiments, are generalisable to theoretical propositions and not to populations or universes. Scientific facts are rarely based on single experiments. They are usually based on multiple sets of experiments that have replicated the same phenomenon under different conditions. The same approach applies in the case of multiple case studies. In this case, the case study, like the experiment, does not represent a sample and in doing a case study, the goal is to expand and generalise theories and not to enumerate frequencies.

In this research generalisation is not a central issue. The relevance of a case study is more important than its generality. When a case study is carried out both systematically and critically, and aimed at the improvement of understanding; then it is relevant, and if any publication of its findings extends or expands the boundaries of existing knowledge of the subject area, then it is a valid form of research. As the case study methodology can produce excellent results in the hands of a skilled investigator, its use is on the increase in most areas of the social sciences.

Stake (1994) identifies three types of studies using the case study method. In the first, he identifies intrinsic case studies in which the study is undertaken because the researcher wants a better understanding of the particular case. Using the instrumental case study as the second example, a particular instance is examined to provide insight into an issue or refinement of theory. In the third example he used the term collective case study. In these, researchers may jointly study a number of case studies in order to inquire into the phenomenon, population, or general condition. The importance of it is that case studies are frequently discussed and analysed, and subsequently courses of action are agreed upon in large and small groups.

From a research strategy point of view, the case study methodology is a way of establishing valid and reliable information or research findings which add to the accumulated knowledge of the processes by which businesses and many other organisations function. It is a research strategy for the social scientist in the same sense as experiments are a research strategy for the natural scientist.

According to Bell (1987), the case study methodology has also been described as an umbrella term for a group of research methods which have in common the decision to focus an inquiry

around a specific instance or event. The philosophy behind the case study is that sometimes just by looking carefully at a practical, real life instance, a full picture can be obtained of the actual interaction of variables or events. The case study allows the investigator to concentrate on specific instances in an attempt to identify interactive processes that may be crucial but which are transparent to the large-scale survey. Thus, the aim of the case study is to provide a three dimensional picture of the situation. It should illustrate relationships, corporate political issues and patterns of influence within a particular context.

Case studies are being used to a larger extent by social science as both a research and a teaching vehicle (Lee, 1989). The scope of the case study is extensive, ranging from individuals, to organisational groups, and also to national policies or events. Cases are compared and their characteristics are studied and behaviour patterns noted. It is important to bear in mind that, despite their apparent clarity, most cases are aggregates of complex behaviour (Stake, 1994). From a research point of view, the case study methodology describes the total situation as a combination of different factors. The case study may focus on the description of the process or sequence of events in which the behaviour occurs, the study of individual or group behaviour in its total social setting, and the comparison of cases leading to the formulation or confirmation of hypotheses as claimed by Stake (1994).

By means of the case study method it is possible to establish the number and variety of properties, qualities and habits combined in a particular instance. The depth of the inquiry possible through the case study method is significantly greater than any other research method such as a survey (Galliers, 1991). For example, although attempts are made to ascertain attitudes by means of questionnaires, the results are sometimes unsatisfactory as one cannot do justice to an attitude by ticking yes or no, or rating an issue from 1 to 5. The case study can go much further than this superficial analysis and can discuss greater variations and reasons for attitudes (for example, if a respondent is asked to rate a service rendered in a case study context, he or she may reply with both a score on a preset scale and a list of explanations and/or caveats qualifying the score). The additional information is beneficial to the researcher who may use it either as explanatory notes to the findings produced from the questionnaire or as raw material for further content analysis.

Because the case study follows the logic of the experiment rather than the logic of the survey, it is not necessary to repeat a case study many times (Yin, 2003). This is because the experiment starts with the formulation of a theory and then attempts to find evidence that will either support or disprove the theory while the survey attempts to gain a general view of

something. The experimental approach is used in the case study method of research. The reason why it is not necessary to repeat the experiment or case study many times, as is achieved with a survey, is the same as why it is not necessary to experiment with the boiling point of water many times to support or contradict the theory of transformation of liquids into gases at a certain temperature. However, it is important to bear in mind that the case study methodology is not designed to measure the frequency of occurrence of events but rather to support or reject theoretical propositions or to develop new propositions.

4.4.3 The different types of evidence on which a case study may be based

From a case study research strategy point of view, the case study methodology implies a comprehensive and intensive study of the subject. Thoroughness is thus one of the first requisites. Facts must be ascertained from the entities under study and then carefully interpreted. These may be obtained from documents, archives, interviews with any person who has knowledge of the subject, the observations of the investigator, participant-observer interaction, and also physical artifacts. This information must be weighed, tested and sifted to eliminate fictitious and false statements as well as, where possible, personal opinions.

4.4.4 Bias in the case study

Case studies can rarely be objectively complete due to the bias of both the supplier and the recipient of the information. Stake (1994) regards this area of research as fraught with danger, primarily due to the problem of subjectivity in interpreting the data after it has been written down. Bias is everywhere, but can be minimised. It is the primary function of the researcher to minimise the bias level in which he/she is working. According to Yin (2003), there are at least three obstacles in obtaining unbiased testimonials from observers and these are:

1. the difficulties encountered by individuals in their being able to remember accurately;
2. the inhibitions individuals have in disclosing important feelings; and
3. the suspicion individuals have about revealing information that might reflect poorly on them or their superiors.

However, the use of multiple sources of evidence can help substantially in improving the validity and reliability of the research. By studying every aspect of the problem from as many angles as possible, and by using various sources of evidence, the case study research strategy is a powerful research tool in the hands of a skilled investigator (Stake, 1994). The case study's emphasis on detail, which is secured from multiple sources of information, provides

valuable insight for problem solving, evaluation and strategy. It further allows evidence to be verified and avoids missing data, thus reducing bias (Cooper and Schindler, 2003).

4.4.5 The significance of uniformity when recording data

In multiple case study research, where several cases are involved, uniformity of recording should be sought as it facilitates comparison between enterprises and situations, which allows similarities and differences to be highlighted. Unless there is some uniformity in recording, it can be extremely difficult to recognise similarities; and much of the usefulness of the case study method, as well as its scientific value, may be eliminated (Yin, 2003).

4.4.6 The formality of the case study research methodology

The case study research methodology is often mistakenly thought to be rather informal (Stake, 1994). This is because it is confused with case writing from a teaching-learning point of view. In fact, the case study research strategy methodology requires a distinctly formal approach. Before the research can begin, protocols must be drawn up. The protocol is a formal and detailed master plan for the research. It is a document in which full details of the case study research design, including details of the questions to be asked, field procedures for the researcher, details of all types of evidence required, as well as the structure of the final research must be specified.

4.4.7 The case study protocol

The case study protocol is both the instrument with which the case study is conducted, as well as the general rules and procedures with which the work is carried out.

4.4.7.1 Interview Protocol

The following interview protocol for this study in Table 2 is a primary tactic in increasing the reliability of the case study procedure. At the centre of the interview protocol is a set of questions reflecting the actual inquiry. There are two characteristics that distinguish such a set of questions from those used in a survey. First, the protocol questions are set for the investigator and not the respondent. The questions are reminders or prompts to the investigator concerning the information that has to be collected. Second, each question should be accompanied by a list of probable sources of evidence that cover documents, observations and interviewees comments.

The purpose and significance of the study

The purpose of this study is to develop an emergent strategic management framework for Information Technology migration to FOSS by the South African Public Service. Such a framework may make the following valuable contributions.

- It may support the growth of the field of strategic management. It will do this by contributing knowledge and insights that can be applied to technology innovation in general and migration to FOSS in particular.
- The framework may assist the Government of South Africa and by extension, other entities and governments with the effective management of FOSS migration.

It is intended to allow the informants as much freedom in the interviews as possible as it is crucial to ensure that the interviewer does not in any way prejudge the evidence offered by informants. Nonetheless, a list of discussion topics that the interviewer may use as an interview schedule has been developed. The topics are available to assist the interviewer if the discussion requires some prompting or guidance.

Research Question	Survey Questions	Variable(s) and/or Relationships measured	Statistical Tests
1. Which factors are important in ensuring that government departments in SA succeed in IT migration to FOSS?	**1. CONDITIONS FOR SUCCESSFUL MIGRATION** 1.1 What factors are responsible for your success in migrating your organisation's IT to FOSS? 1.2 What difficulties are you encountering during the process of migrating to FOSS? 1.3 What factors are responsible for the difficulties you are experiencing with migrating to FOSS?	These will be identified through the coding of interviews transcripts, observation schedules and document reviews.	Content Analysis Correspondence Analysis
2. How do the factors that are important in ensuring that South African Government departments succeed in IT migration to FOSS interact with one another?	**2. ACTION/INTERACTION BETWEEN MIGRATION SUCCESS FACTORS** 2.1 How do the factors that are responsible for your success in migrating to FOSS influence one another? 2.2 How do the factors that are responsible for the difficulties you are experiencing influence one another? 2.3 What is the relationship between factors that account for your success and those that account for your difficulties?	These will be identified through the coding of interviews transcripts, observation schedules and document reviews.	Content Analysis Correspondence Analysis
3. How do the factors that are important in ensuring successful IT migration by South African Government departments contribute to such success?	**3. ACTION/INTERACTION BETWEEN MIGRATION SUCCESS FACTORS AND SUCCESFUL MIGRATION** 3.1 How do the factors that account for successful migration to FOSS contribute to such success? 3.2 How do the factors that account for difficulties in migrating to FOSS contribute to such difficulties?	These will be identified through the coding of interviews transcripts, observation schedules and document reviews.	Content Analysis Correspondence Analysis
4. How will the framework be compiled to ensure that the migration can be successful?	**4. THE FRAMEWORK** 4.1 What is important to consider in migrating IT to FOSS? 4.2 How should the process of migrating IT to FOSS be managed? 4.3 What should be the roles of different stakeholders within the organisation in ensuring successful migration?	These will be identified through the coding of interviews transcripts, observation schedules and document reviews.	Content Analysis Correspondence Analysis

Table 2: Interview Protocol

4.4.7.2 Field Procedures Protocol

The investigator has to work in the real world and thus cope with real world situations during the data collection plan, including the possibility of the respondent dropping out of the experiment or case study. Similarly, corporate documents may not always be available. Field procedures need to emphasise issues such as:

- defining who should be interviewed;
- gaining access to the right people;
- having adequate resources available such as time, paper, and tape recorders;
- developing a procedure for discussing the research with other researchers; and
- making a schedule of the required data collection activities and providing for contingencies.

Table 3 displays the protocol for the field procedures that was followed to conduct the case studies.

A Protocol for Field Procedure	
1.	Find at least three informants for each case study. This is for purpose of data validation.
2.	At least two informants should be senior managers, i.e. individuals who are either accounting officers or reporting directly to the accounting officer of a government entity.
3.	Obtain access to informants through a trusted intermediary wherever possible.
4.	Make initial contact with the subject organisation at the highest level possible.
5.	Find a friendly gatekeeper or guide as soon as possible.
6.	Tape record all interviews.
7.	Support verbal information with documentary evidence where possible.
8.	Attempt to secure several interviews per site to reduce traveling time.
9.	Attempt to interview informants in their offices rather than interview rooms.
10.	Engage as many members of the staff as possible, such as secretaries and support people, in general conversation about the organisation.

Table 3: A Protocol for Field Procedures

4.5 Grounded Theory

As the established literature in Chapter 3 did not reveal the existence of a strategic management framework for migrating to FOSS, this study employed a method of induction referred to as grounded theory to establish a theoretical framework within which to conduct the research. Glaser and Strauss (1967) define grounded theory as an inductive, theory

discovering methodology that allows the researcher to develop a theoretical account of the general features of a topic while simultaneously grounding the account in empirical observations or data.

When applying grounded theory, it is essential for the researcher to approach the inquiry with a reasonably open mind as to the kind of framework that will emerge from the research (Stake, 1994). Of course preconceptions cannot be entirely avoided but, where possible, they should be minimised.

In grounded theory research, the aim of the researcher is to obtain an accurate description of the phenomena under investigation. Once this is achieved, the researcher may begin to hypothesise about the nature of the relationships between the observed variables. The grounded framework emerges through the process of concept discovery whereby the researcher moves from data to abstract concepts and categories. This is achieved by the processes of description, definition and specification of relationships. The result could be that the researcher moves to a level of representation where the concepts form a theoretical framework (Miles and Huberman, 1994). It is important to note that, in research, concepts are simply more or less useful and not more or less true and valid (Cohen and Nagel, 1984).

4.5.1 Grounded Theory methodology for generating the framework

The general methodology that grounded theory employs for generating theoretical frameworks is referred to as comparative analysis. According to Glaser and Strauss (1967), comparative analysis is a general method; just as are experiments and surveys. Furthermore, comparative analysis can, like those other methods, be used for social units of any size. This method was used to deal with evidence emanating from the study in the manner described below.

4.5.1.1 Accuracy of evidence

Glaser and Strauss (1967) state that evidence collected from other comparative groups is used to ascertain whether the initial evidence was correct. Is the fact a fact? Comparative analysis was used in this study to replicate the facts with comparative evidence within the study. In the context of generating a theoretical framework, even if some of the evidence was not entirely accurate, this would not be a problem, because in generating a framework, it is not the facts upon which one stands but the conceptual category that was generated from it.

4.5.1.2 Empirical generalisations

Another standard use of the method of comparative analysis is to establish the generalisability of facts. This study's purpose of developing a theoretical framework also subsumes the establishment of empirical generalisations. According to Glaser and Strauss (1967), generalisations not only help delimit a grounded theory's boundaries of applicability; more important, they help broaden the framework so that it is more generally applicable and has greater explanatory and predictive power. By comparing where the facts are similar or different, it is possible to generate properties of categories (or concepts) that increase the generalisability and explanatory power of the categories.

4.5.1.3 Generating the framework

The comparative analysis method serves the main goal of assisting a researcher with the purposeful and systematic generation of theoretical frameworks from data. According to Glaser and Strauss (1967), the discovery using this method results in theoretical frameworks that fit or work in a substantive or formal area since the framework has been derived from data, not deduced from logical assumptions. Since accurate evidence is not so crucial for generating theoretical frameworks, the kind of evidence, as well as the number of cases, is also not so crucial. A single case can indicate a general conceptual category or property, and a few more cases can confirm the indication.

This methodology can be used to generate two types of theoretical frameworks: substantive and formal. By substantive, it is meant a theoretical framework that was developed for a substantive or empirical area of inquiry such as the public service in South Africa. Here the term formal means a theoretical framework developed for a formal or conceptual area of inquiry that is applicable to organisations of different types and in different geographic locations. In the case of this study, the methodology will be used to develop a substantive framework that applies to IT migration to FOSS in the South African public service.

4.5.1.4 Elements of the framework

Using this methodology, the elements of the theoretical framework that were generated are first, conceptual categories and their conceptual properties, and secondly, propositions or generalised relations among the categories and their properties were generated.

According to Glaser and Strauss (1967), a category stands by itself as a conceptual element of a theoretical framework. A property, in turn, is a conceptual aspect or element of a category. Both categories and properties are concepts indicated by the data and both vary in degree of conceptual abstraction. Once a category has been conceived, a change in the evidence that indicated it will not necessarily alter, clarify or destroy it. It takes much more evidence, usually from different substantive areas, as well as the creation of a better category to achieve such changes in the original category. A category and properties have a life apart from the evidence that gave rise to them.

The comparison of differences and similarities among groups not only generates categories, but also speedily generates generalised relations among them. These propositions have at first the status of suggested, not tested, relations among categories and their properties, though they are verified as much as possible during the course of the research. Generating propositions requires evidence enough only to establish a suggestion, not an excessive piling up of evidence to establish a proof, and the consequent hindering of the generation of new propositions.

4.5.2 Sampling

Sampling for this study was based upon theoretical sampling, which is in line with the grounded theory methodology. According to Glaser and Strauss (1967), theoretical sampling is the process of data collection in order to develop a theoretical framework whereby the analyst jointly collects, codes and analyses data and decides what data to collect next, and where to find it in order to develop the theoretical framework as it emerges. The process of data collection is controlled by the emerging framework.

The selection of the three cases that were included in this study was guided by theoretical sampling. The four case studies were therefore selected using judgmental sampling. According to Cooper and Schindler (2003), judgmental sampling occurs when a researcher selects sample members to conform to some criterion. Glaser and Strauss (1967) state that the basic criterion for selecting comparison groups for discovering theoretical frameworks is their theoretical relevance for furthering the development of the emerging framework. The four organisations were selected because they would help in generating the strategic management framework for FOSS migration in the public sector in South Africa, to the fullest extent and would also support the generation of the properties of emerging categories. They would also help relate the categories to each other and to their properties. This is so because the selected

organisations are well advanced in migrating their IT to FOSS. They are also all drawn from within the South African public sector. Because of this relative similarity between these cases, the theoretical framework generated is substantive and applies only to the South African public sector.

Within each case study, it was planned that a minimum of three informants would be interviewed. Data gathering also included a review of documents and observations. The use of theoretical sampling meant that the final number of interviews and the respondents depended on the requirements of the emerging theoretical framework. The final number of respondents and interviews could therefore not be known until the research was complete. The emerging theoretical framework was used to point to next steps. The basic question that guided theoretical sampling was: What groups or sub-groups does one turn to next in data collection? For what theoretical purpose? This exercise guided the selection of multiple comparison units within the cases (Glaser and Strauss, 1967).

Sampling for respondents and more data continued until there was theoretical saturation. According to Glaser and Strauss (1967), theoretical saturation means that no additional data is being found whereby the investigator can develop properties of the category. As the investigator sees similar instances over and over again the researcher becomes empirically confident that the category is saturated.

4.5.3 Data gathering

For data gathering purposes, triangulation of methods was used. According to Love, Holt and Li (2002), methodological triangulation is where multiple methods of data collection and analysis are used. Methods for data gathering included interviews with key informants, documents reviews and observations of interactions within the selected organisations. Glaser and Strauss (1967) believe that research aimed at discovering a theoretical framework requires that data collection be undertaken simultaneously with data coding and analysis.

For interviews, the interview protocol that is presented in Section 4.5.7.1 of this chapter was used. Interviews were open ended and guided by the discussion, with the questions contained in the protocol serving as prompts for the researcher. In accordance with theoretical sampling, the number of interviews and the final set of questions discussed during interviews were guided by the emerging theoretical framework. At the beginning of data collection, interviews consisted of open-ended conversations with respondents allowed to talk with no imposed limitations of time, allowing them to tell their stories. Later interviews were directed by the

emerging framework, with questions bearing on the emerging categories.

In field studies, theoretical sampling usually requires reading documents, interviewing and observation at the same time (Glaser and Strauss, 1967). The reading of documents and the conduct of observations for this study was therefore done simultaneously with the conduct of interviews.

4.5.4 Data analysis

The constant comparative analysis method was used to analyse the data and to generate the theoretical framework. The analysis followed the four stages of the constant comparative analysis method as outlined by Glaser and Strauss (1967). This study makes use of the classical approach to content analysis although there are different flavours that have not been standardised.

Phase 1: Comparing incidents applicable to each category (open coding)

During this stage, data from each incident (interview, observation and document) was coded into as many conceptual categories as possible, as the categories emerge or as data emerge that fit the existing category. During this phase, coding only consisted of making notes in the margins of the field notes. In this way, the coding kept track of the comparison group in which the incident occurs. During this coding of each incident for categories, comparisons were made with previous incidents in the same organisation and different organisations coded in the same category (Glaser and Strauss, 1967).

Glaser and Strauss (1967) claim that this constant comparative analysis will result in the generation of theoretical properties of categories. The full range of types and continua of the category, its dimensions, the conditions under which it is pronounced or minimized, its major consequences, its relations to other categories and other properties will start to emerge.

After coding for the same categories three or four times, a memo on the category was recorded. A memo is a theoretical explanation or notion that begins to form from the emerging categories and their properties. The interruption of coding with the writing of memos ensured that emerging theoretical notions are captured whilst still fresh. This effectively constituted a time for reflection during the analysis phase. After recording ideas on the emerging framework systematically, coding was resumed with more constant comparison (Glaser and Strauss, 1967).

Phase 2: Integrating categories and their properties (axial coding)

Glaser and Strauss (1967) state that during this phase of the constant comparative analysis, coding continues but the constant comparative units move from comparing incidents with incidents to comparing incidents with the properties of the categories that resulted from the initial comparisons of incidents, that is, comparing an incident with the accumulated knowledge on properties of categories. This resulted in the accumulation of knowledge pertaining to a property of the category to become integrated and related in ways that resulted in a united whole. The process of integration through constant comparisons between incidents and the properties of categories resulted in the emergence of integration between categories where relationships between categories were identified. The framework thus started to emerge as different categories and their properties become integrated.

Phase 3: Delimiting the theory (selective coding)

This entailed curbing what could become overwhelming pieces of information. According to Glaser and Strauss (1967), delimitation occurs at two levels, i.e. at the level of theory and at the level of categories. The delimitation of theory happens when modifications become fewer and fewer as incidents of a category are compared to its properties. Later modifications at this stage related to clarifying the logic, removing non-relevant properties, integrating and elaborating details of properties into the outline of interrelated categories; and to reduction. Reduction happened through the discovery of underlying uniformities in the original set of categories or their properties, which resulted in the formulation of the framework using a smaller set of higher-level concepts.

Further reduction of terminology resulted in the discovery that the framework could be generalised so that it pertained to all cases of IT migration to FOSS that can be applied broader than in the cases being studied. This phase thus resulted in the achievement of two major requirements of a theoretical framework: (a) parsimony of variables and formulations; and (b) scope in the applicability of the framework to a wider range of situations (Glaser and Strauss, 1967).

The reduction in the number of categories happened through the development of a commitment to the emerging framework, which resulted in the possibility of reducing the original number of categories for collecting and coding data according to the present boundaries of the framework. This also led to a selective and focused coding and analysis of incidents. The theoretical saturation of categories also further delimited them (Glaser and Strauss, 1967).

Phase 4: Writing the framework

Glaser and Strauss (1967) report that this is a stage where the researcher possesses coded data, a series of memos and a framework. The discussion in the memos provides the content behind the categories, which become the major themes of the framework later presented in the final report of the study. In order to aid the writing of the framework, the memos were collated on each category. The final framework was written in the form of a discussion and a set of propositions for the effective strategic management of IT migration to FOSS within the South African public service. Figure 2 is a visual representation of the phases of the analysis.

4.6 Philosophical Stances

DeSanctis (1993) argues that theoretical frameworks are useful systems to study; but that they do not provide insight into causality or other underlying phenomena. He notes that theoretical thinking on the relationship between Information Technology (IT) investment and organisational effectiveness could lead to fresh streams of empirical work.

The empirical investigation conducted by this study adopted an eclectic approach combining some of the elements of positivism and some of the elements of interpretivism. Rosenthal and Rosnow (1991) define positivism as the philosophical view that only by supporting explanations with positive facts is it possible to attain an acceptance of objective understanding. Questions and/or hypotheses are stated during the positivist stance and subjected to empirical tests to verify them.

Next, an interpretist viewpoint was then adopted with the evidence supplied by the focus group and the opinions of the IT executives in the public sector being subjected to the investigator's interpretation through the development of categories (Miles and Huberman, 1994).

4.7 Bias in Research

On the issue of bias, it is naive to assert that any form of research, or perhaps human activity generally, is without bias. Even in the physical and life sciences the researcher's bias is reflected in the subject researched, the experiments chosen, as well as the way the experiment is conducted. Thus bias cannot be totally eliminated but should be recognised and its implications acknowledged and accepted.

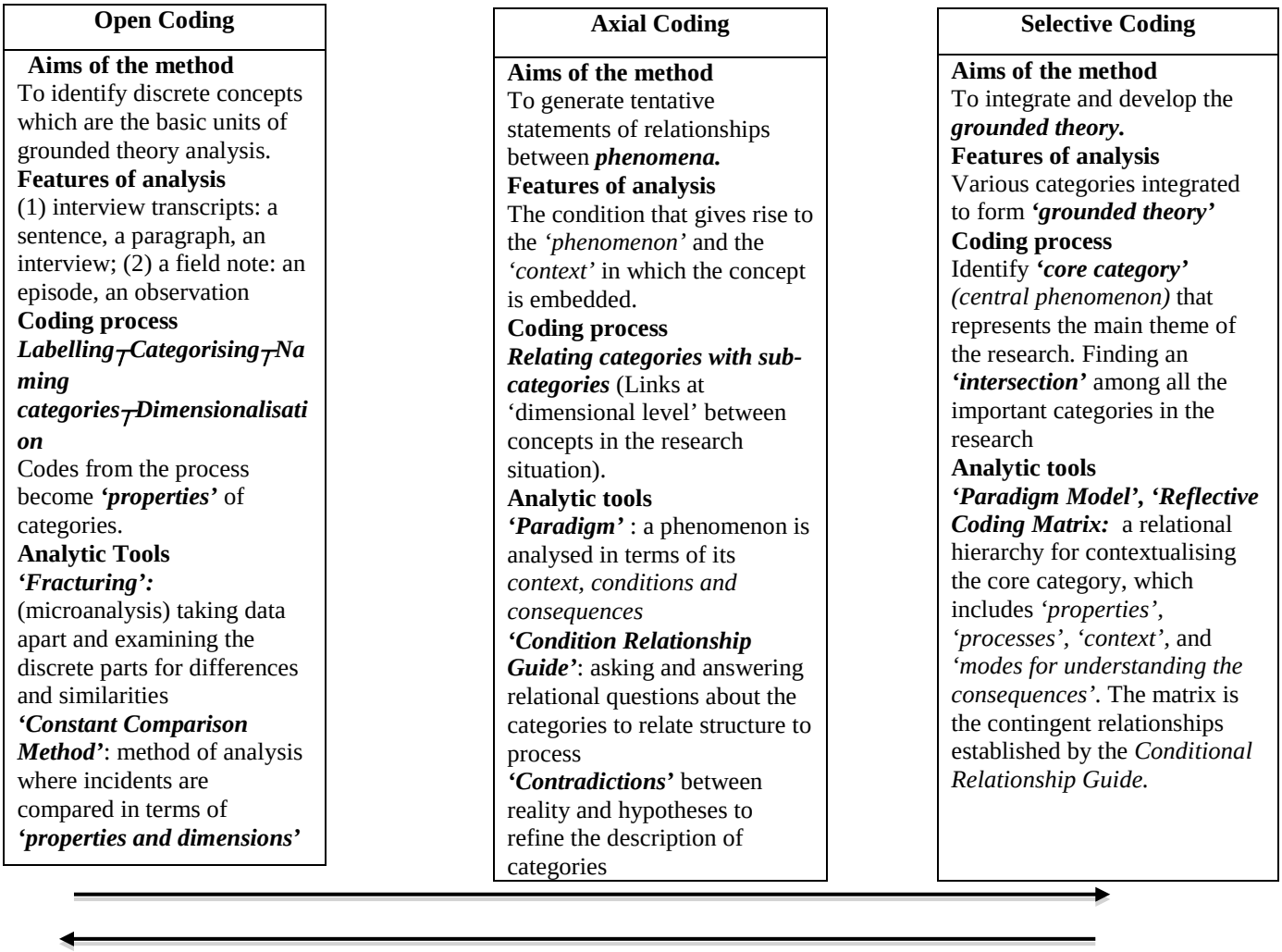


Figure 2: Coding procedure in data analysis process (Daengbuppha, Hemmington and Wilkes, 2006)

Sub-conscience bias on the part of the researcher is a problem. Triangulation may be used to help in this respect, but in the final analysis an argument based on a judgment is always required in research (Collins, 1994). This may not be easy to make, with personal prejudices playing an overtly influential and important role.

With regard to research findings, it is important that these are honestly presented and not produced in such a way as simply to support the opinions or prejudices of the researcher. This is indeed hard to accomplish. Ideally the researcher is trying to apply "disinterested intellectual curiosity" (Trevlyan, 1942), but this is almost always impossible because science is not an objective, truth-directed machine, but a human activity that is affected by passion, hopes, and cultural biases. Cultural traditions of thought strongly influence scientific theories.

Sometimes, if not frequently, personal bias is so subtle that the researcher is not even aware of

it. In fact many would argue that a researcher should not attempt to compensate for this bias, but should simply state clearly the possible biases involved and allow the readers to compensate for these themselves.

4.8 Soundness of the Research (Validity)

According to Lincoln and Guba (1985), there are four constructs that accurately reflect validity assumptions in the qualitative research paradigm. The factors that are discussed below were applied in ensuring the validity of this study.

Credibility

Lincoln and Guba (1985) identify this as the alternative to internal validity where the goal is to demonstrate that the inquiry was conducted in a manner that ensures that the subject was accurately identified and described. To ensure credibility, this study presents an in-depth description that shows the complexity of the variables and their interactions and such a description was derived directly from, and embedded with, the data derived from the setting.

Transferability

Lincoln and Guba (1985) propose this as an alternative to external validity or generalisability. In this case, the burden of demonstrating the applicability of one set of findings to another context rests more with the investigator who would make the transfer than with the original investigator. In the case of this study, triangulation or data from different sources was used, including multiple cases, multiple interviews and documents review. According to Love *et al*. (2002), data triangulation is where data is collected at different times or from different sources. Data from different sources was used to corroborate, elaborate and illuminate the research questions. This enhances this study's usefulness for other settings.

Dependability

In qualitative research, dependability is an alternative to reliability (Lincoln and Guba, 1985). In this case, the researcher tries to account for changing conditions in the phenomenon being studied as well as the changes in the design as a result of an increasingly refined understanding of the setting. This approach was applied in this study. It is different from assuming an unchanging universe as would be the case in quantitative research.

Confirmability

This construct, which, according to Lincoln and Guba (1985), captures the concept of objectivity, was applied to this study. In this case, the important consideration is to ask whether the findings of the study could be confirmed by another, and in so doing, placing the

evaluation of the study on the data itself rather than on the characteristics of the researcher. In this case, the question was whether the data helps confirm the general findings and lead to the implications.

4.9 Summary and Conclusions

This chapter has presented the importance of the study as well as the research methodology that was used. The case study method, combined with grounded theory are the two methods that were used and they have both been presented in this chapter. The philosophical stance informing the study was also discussed. Finally, the chapter discusses bias and the manner in which it was dealt with in this study.

In conclusion, the author wishes to state that conducting this research study required that a considerable amount of time and attention be devoted to the issue of methodology. Methodology is deemed to be the foundation on which the credibility of the research stands. Further as a DBL is primarily an apprenticeship in research, the author believes that as many different approaches to the research problem should be applied as possible.

A strategic management framework for Information Technology migration to FOSS will assist the Government of South Africa with the better implementation of its FOSS policy. The framework will provide guidance to public sector managers regarding how the process of migrating can best be managed.

The next two chapters present the results emanating from data collection using the methodology outlined in this chapter. It also provides an analysis of the data, emerging concepts and their properties, relationships between the concepts, an emerging category and how all this information is used to develop a strategic management framework for FOSS migration.

CHAPTER 5

THE RESEARCH

5.1 Introduction

The problem that the study seeks to address is the lack of guidance for managers in the South African public sector regarding how to go about managing the process of migrating to FOSS. This lack of adoption results partly from the absence of documented cases of the successful implementation of the FOSS policy by any sphere or department of government in South Africa. It can also be attributed to the absence of a strategic management framework for migrating to FOSS. This is in spite of the documentation of factors for and barriers to successful adoption of FOSS as discussed Chapter 3. A failure to address this problem will continue to delay the take-up of FOSS, in spite of all its stated benefits.

The main research question for this study focuses on developing a framework to help manage migration to FOSS to ensure less impact on South African Government institutions' strategic plans. In order to develop such a framework, the study establishes which factors are important in ensuring that government departments in South Africa succeed in IT migration to FOSS. Once these factors have been established, the manner in which these factors interact with one another is determined. This is then followed by a determination of the manner in which these factors contribute to successful IT migration to FOSS. Having answered the foregoing questions, the study then compiles a framework for IT migration to FOSS that will ensure successful migration. This chapter describes how the case study research was conducted. It also provides a summarised account of the organisations from which the respondents to this case study were drawn.

5.2 Choice of Research Participants

In order to conduct a research project, which would add to the body of knowledge concerning FOSS migration within the South African public sector, it was decided to explore empirically actual cases of migration amongst a selection of public sector organisations. As mentioned in Chapter 4, a case study research strategy was chosen as the approach to this. The author approached 4 organisations and they all agreed to allow their managers who were involved with FOSS migrations to be interviewed about their experiences with migrating. According to Yin (2003), case studies are generalisable to theoretical propositions and not to populations or

universes. In this sense, a case study does not represent a sample. The important consideration is therefore not sample size but the number of case replications required. In this instance, even a two case design is a worthy objective. The organisations chosen include three forms of state organisations, viz. a Government Department of Communications (PNC on ISAD), a public entity (SITA), another public entity (NLSA) and a public-private partnership (eNaTIS) within the Department of Transport (DoT). All these organisations have either completed migrating to FOSS or are at advanced stages of migration. Table 4 shows a list of the state organisations included in the case study, their sectors and type of organisation.

Name of Organisation	Organisation type	Sector
Presidential National Commission on Information Society and Development (PNC on ISAD)	Government Department	Information and Communications Technology
Electronic National Traffic Information System (eNaTIS)	Public Private Partnership	Transport
National Library of South Africa (NLSA)	Public Entity	Arts and Culture
State Information Technology Agency (SITA)	Public Entity	Information and Communications Technology

Table 4: Organisations, organisation types and sector from which case studies were conducted

5.3 The question of confidentiality

None of the organisations participating in this study objected to having their names used in the case study. All participating individuals were prepared to speak freely about their experiences of migrating to FOSS. The only challenge was that some of the organisations were not at liberty to share some of their documentary records with the researcher. Only two

organisations did so, viz. NLSA and the PNC on ISAD. The others either referred to confidentiality of written material (SITA) or failed to provide the material, although they had initially agreed to do so (eNaTIS). The data is therefore presented with the names of the participating organisations included as well as the designations of the interviewees.

5.4 Selecting the Organisations for the Grounded Theory Study

With the objective of developing a strategic management framework for FOSS migration in the South African Public Sector using grounded theory, the author has undertaken four case studies. The case study method was employed because it allows the use of a wide range of research techniques including interviewing, document reviewing, and direct observation as well as the forming of a focus group for data validation. The original plan was to interview at least three individuals per organisation. The four organisations were visited at least three times for the purposes of conducting interviews and collecting documentation. The interviews were structured following a scientifically designed discussion list for the author's own use although informants were allowed as much freedom as necessary within this loose structure. Each interview lasted approximately 60 minutes. The case study methodology was selected because the author needed to find answers to WHY and HOW questions. Lee (1989) supports this research methodology and further posits that case studies reflect reality in greater detail and allow analysis of more variables than is possible using any other method.

In order to obtain introductions to these organisations as case study subjects, the author contacted the Head of the Free Open Source Programme Office (FPO) at SITA with the aim of obtaining a list of those organisations that have either migrated or are at an advanced stage of migrating. In addition to recommending the organisations, the head of this office also provided the author with contact details of key individuals within these organisations who have been instrumental in their migration. Organisations that were identified in this manner are the PNC on ISAD, SITA and the eNaTIS. The NLSA was included because of the author's professional association with this organisation through his consulting work and the discovery that it has migrated its IT to FOSS. In addition to these organisations, the author also interviewed other key stakeholders within the South African public sector IT environment. These are the Chairperson of the FOSS standing committee of the Government Information Technology Officer's Council (GITOC), the Head of the Free Open Source Programme Office at the SITA and the Communications Officer of the Free Open Source Programme Office at the SITA.

The ease with which access to these organisations was gained was varied. In some organisations it was relatively easy to schedule interviews with the key individuals, whilst in others, it took a number of phone calls and visits for an interview to be granted finally. In at least one instance, the respondent who was also the key person in FOSS migration became reluctant to continue cooperating with the study after the first interview, without providing any reasons. However, the interviews, once granted, proceeded with ease; with respondents speaking freely and some supplying organisational documents.

5.5 Evidence collected

Evidence collected includes project internal documents such as project charters, progress reports, change readiness assessment reports, communication plans, project closure reports, change management strategies, FOSS migration plans, training plans, project budgets, software audit findings reports and other documentation (i.e. SITA's FOSS newsletter). As stated before some of the organisations were not prepared to submit any evidence at all.

5.6 The Main Participants

In-depth case studies were conducted on four organisations. The author believes that four detailed case studies could be considered an appropriate number in terms of the time and limited resources available. The four case studies for this research represent quite different types of state organisations in South Africa. The names of the organisations concerned are:

- a programme in a government department (ICT sector): Presidential National Commission on Information Society and Development (PNC on ISAD);
- a public-private partnership (Transport sector): Electronic National Traffic Information System (eNATIS);
- a public entity (ICT sector): State Information Technology Agency (SITA); and
- another public entity (Arts and Culture sector): National Library of South Africa (NLSA).

5.7 Analysis of Case Study Evidence

The main approach to the analysis of the evidence obtained from the case studies was to use content analysis, correspondence analysis and the reduction-data display technique described by Miles and Huberman (1994). Because content analysis was used, a positivist approach was followed supported by a realist and interpretive approach towards discussing the results and

interpreting them in order to formulate the conclusions. These techniques require the researcher carefully to comb through the extensive evidence collected from the case study interviews and supplied documents in order to find patterns that display general principles applying to these organisations. As a result of detailed work, empirical generalisations and a framework were developed. These were corroborated using correspondence analysis. Content analysis and correspondence analysis are explained in Chapter 6.

5.8 Testing the Theoretical Framework

Because only a relatively small number of organisations were visited as part of the case study phase of the research, it was decided to test the framework developed against a focus group. To this end the focus group was assembled with experts in the South African public sector. In addition, the findings of the focus group were taken to some of the original case study participants as well as the people with whom the author had discussions during the research.

No attempt was made to establish a random sample. Rather, it was believed that the individual organisations, people and other people consulted constituted a population in which there was a degree of awareness and knowledge of FOSS migration in the South African public sector. This approach is justified on the grounds that the author was attempting to establish what constitutes good practice as opposed to average practice in the field.

5.9 Work Conducted in Collecting the Case Study Evidence

Each organisation was visited at least three times. These visits were to collect evidence by means of semi-structured interviews or discussions, and other documentary evidence. The author met with a minimum of two participants from each organisation. Different participants were deliberately sought in order to obtain a degree of triangulation, which assists in the corroboration of the facts supplied. The average length of the interviews was 60 minutes. Table 5 shows the number of interviews conducted in each organisation. Participants were a mixture of individuals who were in the employ of the case study organisations as well as people from service provider organisations that had assisted the case study organisations with their migration.

The entry points into each organisation were, with only one exception, senior executives. In addition to the case study participants, the author also spoke to the chair-person of the FOSS standing committee of the GITOC, the head and the Communications Officer of the Free

Open Source Project Office of SITA in order to establish their views concerning the general state of FOSS migration in the South African public service.

5.10 The interview schedule

The interviews or discussions were given only a minimal amount of direction by the author. The reason for this was to allow informants to select for themselves the issues which they thought were important to the successful migration to FOSS. Nonetheless in order to be able to control the direction of the interview if it strayed off the subject the author had prepared an interview schedule. The questions used were based on some of the ideas reviewed in Chapter 2.

Number of Organisational Cases	State organisation type	Sector	Title of persons Interviewed	No of Persons Interviewed
1	Public Entity (SITA)	ICT	-Linux Engineer -Skills Development Officer for the FOSS Programme Office	2
1	Public Entity (NLSA)	Arts and Culture	-General manager for ICT, -Deputy Manager for ICT, -CEO of service provider company -Business Development Director of Service Provider Company	4
1	Department (PNC on ISAD)	ICT	-IT manager -FOSS consultant of the service provider company	2
1	Public Private Partnership (eNatis)	Transport	Project Manager	1
Other				
1	Council	ICT	Chairperson of the FOSS standing Committee of the Government Information Technology Officers' Council	1
1	Public Entity (SITA)	ICT	-Head of the Free Open Source Programme Office -Communications Officer for the Free Open Source Programme Office	2
		Total		12

Table 5: The number of persons interviewed with participating organisations

As most of the interviews did not stray off the point that was under discussion, the interview schedule was only occasionally consulted by the author. The questions in the interview are reflected in section 4.5.7.1 of this report.

5.11 A Synopsis of the Case Studies

A brief synopsis of the case studies is reported in the following sections. The full transcripts of the interviews are included as Appendix 2.

5.11.1 Case 1: SITA (ICT sector public entity)

The State Information Technology Agency (SITA) is a public entity that was established by the South African Government in 1999 in terms of Chapter 6 of the Public Finance Management Act No. 1 of 1999 (PFMA). Its mandate is to provide effective and efficient ICT products and services across the three spheres of government, viz. national, provincial and local government. This agency has been given a mandate to establish a FOSS Programme Office to coordinate the implementation of FOSS in Government and to administer the migration to FOSS. The FOSS Programme Office has drafted a project charter which presents a governance structure for the management of the FOSS project (Webb, 2010).

SITA decided to migrate its own IT to FOSS in 2005, but only started the project in earnest in February 2009. The migration started with the back-end, including web pages content management, the mail server from Microsoft Exchange Server to Zimbra and faxing from Righfax to Hylafax. Back-end migration has been completed and now SITA has commenced a process of migrating all its users to open source. At the time of the research, the SITA had just started its front-end migration processes through the establishment of a test laboratory consisting of about seven machines. The intention is to migrate all users to Ubuntu Linux. SITA had a total of 2623 employees at the time of the study, and the number of desktops to be migrated was estimated at around 1500.

5.11.2 Case 2: National Library of South Africa (NLSA) – Arts and culture sector public entity

The National Library of South Africa (NLSA) was established in terms of the National Library of South Africa Act 92 of 1998, through the amalgamation of the South African Library and the State Library. It is a Public Entity registered in terms of Schedule 3A of the PFMA. The mandate of the NLSA is to collect, record, preserve and make available the national documentary heritage and promoting an awareness and appreciation thereof, by fostering information literacy, and by facilitating access to the world's information resources.

During the time of the fieldwork, the NLSA had a total number of 167 employees in Cape Town and Pretoria.

Migration at the NLSA took place in 2008 and entailed the migration of 130 desktop end users and 360 public kiosks from Microsoft Windows to a Novell SUSE Linux Enterprise Desktop (SLED) environment. The total number of computers involved was about 500. The NLSA procured the services of an external ICT service provider company to assist with its migration, viz. Meso Technologies. Migration at the NLSA started on the front-end with the users and was later followed by back end migration to SUSE Linux Enterprise Server (SLES).

5.11.3 Case 3: Presidential National Commission on Information Society and Development (PNC on ISAD) – ICT sector programme in the Department of Communication

The PNC on ISAD's mission is to build an inclusive information society in which human rights, economic prosperity and participatory democracy are fully realised through optimising the usage of ICT for a better life for all. Its mandate derives from the Government Gazette notice 187 of 2002 and it is tasked with:

- advising the President on the use of ICT to optimise the pace and extent of addressing South Africa's developmental challenges and enhancing South Africa's global competitiveness;
- advising the President on South Africa's contribution to, and benefit from, the development of an inclusive Information Society in Africa and the world;
- facilitating the coordinated and integrated development of an inclusive Information Society in South Africa; and
- supporting efforts aimed at making South Africa and Africa integrated and equal members of the Global Information Society.

The PNC started to migrate its IT in 2007; the process was concluded in 2008. It included the implementation of Impi Linux 7.05 on all its workstations and the implementation of Impi Linux server components on servers. Migration at the PNC on ISAD was supported by a service provider. Initially this service provider was Impi Linux (PTY) Ltd. This company was later taken over by Business Connexions (BCX) who completed the migration. At the time of migration, the PNC had only 40 staff members.

5.11.4 Case 4: Electronic National Traffic Information System (eNaTIS): A public private partnership in the transport sector

eNaTIS is an electronic traffic management system for South Africa that was launched in 2007. The contract for the creation, implementation and maintenance of the system was granted to Tasima (PTY) Ltd in 2001. The project is managed as a public private partnership between this company and the Department of Transport.

The system is used as a register that supports the National Road Traffic Act 93 of 1996 and its regulations. The eNaTIS includes registers of the following:

- motor vehicles;
- vehicle manufacturers, importers and builders;
- motor trade numbers;
- temporary and special permits;
- operators;
- driving licences and professional driving permits;
- infrastructure: authorised officers, instructors, driving licence testing centres, vehicle testing stations;
- accidents;
- contraventions; and
- vehicle fitness (roadworthiness).

It also provides personal and financial information as well as system monitoring and evaluation. The original system was built on dispersed database architecture with no possibility for integration, and evolved from different manual systems that had been computerised in a very basic format. The eNaTIS provides a platform for integration and is scalable, based on open standards, open source software and is internationally benchmarked. It is used as a national asset to improve road safety and crime management.

eNaTIS is largely run using open source software both on the front-end and at the back-end. The system integrates the work of municipalities, provinces, national departments of transport and other private agents in the value chain, including driving schools, car dealerships, banks and other places that handle motor vehicle related transactions. The system has been rolled out to 3000 workstations at 1274 sites around the country.

5.12 Why the Above Organisations Were Chosen

The SITA, NLSA, PNC on ISAD and eNaTIS were chosen as case studies because they represent examples of migration of IT to FOSS in the South African public sector. With the exception of the SITA, all these organisations have completed the migration of both their front and back ends to open source. In the case of the SITA, back-end migration had been completed and the migration of the front-end was at an early stage during the period of this research. The four cases represent a mixture of small, medium and large sized organisations, judged by the number of workstations, ranging from only 40 centrally located workstations at the PNC on ISAD, to 3000 geographically distributed workstations for the eNaTIS. They also represent different institutional forms in the South African public sector, including two public entities, a programme in a government department and a public private partnership.

No attempt was made to establish a random sample; a theoretical sample was used. The author is aware that this sampling technique does not necessarily lend itself to being able to generalise the results to all government organisations in South Africa, but rather, the generalisation is to a theoretical framework.

5.13 Summary and Conclusions

This chapter has presented the approach used to conduct the case study research. This includes the presentation of the choice of research participants, how the organisations were selected and how confidentiality was dealt with. The evidence collected, and how the case study evidence was analysed, and how the theoretical framework was tested, are also presented. The chapter also presents details of the work done in collecting the case study evidence, including the use of an interview guide. The chapter ends with a synopsis of each of the cases and a presentation of reasons for selecting the organisations.

Developing a strategic management framework for Information Technology migration to FOSS will assist the Government of South Africa with the better implementation of its FOSS policy. The framework will provide guidance to public sector managers regarding how the process of migrating can best be managed.

The next chapter presents the results of the study including the results of the content analysis, the theoretical generalisations, the theoretical framework, the thesis and the results of the correspondence analysis.

CHAPTER 6

THE DEVELOPMENT OF THE THEORY OR THESIS

6.1 Introduction

The previous chapter has presented the approach used to conduct the case study research. This includes the presentation of the choice of research participants, how the organisations were selected and how confidentiality was dealt with. The evidence collected, and how the case study evidence was analysed, and how the theory was tested, were also presented. The previous chapter also presented details of the work done in collecting the case study evidence, including the use of an interview guide. It ended with a synopsis of each of the cases and a presentation of the reasons for selecting the organisations.

The objective of this chapter is to describe how the case study evidence was analysed and how the thesis was developed. In addition this chapter discusses how correspondence analysis was used to help validate the findings of the content analysis.

6.2 Analysing the Case Study

Having transcribed the tapes of the interviews and analysed the documentation received, the author was in possession of over 120 pages of textual transcripts. It was therefore necessary to analyse the data, which had been collected in order to discover the general themes that relate to IT migration in the South African public sector. The main process used for this analysis and synthesis was content analysis.

According to Lubbe (1994), content analysis may be defined as the process of determining or establishing a fuller, detailed meaning of a document, manuscript, speech or any type of communication in a way which is both reliable and replicable. Berelson (1952) describes content analysis as a research technique for the objective, systematic and quantitative description of the manifest content of communications.

It is a process of investigating the frequency and intensity with which concepts are addressed in the text. It is a simple but laborious process of closely examining the transcript for concepts, particularly those which are repeated several times. It is by nature a subjective process, which relies on what Kerlinger (1969) refers to as manifest content categories being set up by the researcher, and the researcher then counting the number of occurrences of these categories. In this instance a computerised version of the process was used. The establishment of the manifest content categories is one of the main areas of possible subjective bias. The initial categories used in this research were the main issues of discussion raised by informants a number of times during the research interviews, and as such were the ones to choose.

According to Berelson (1952), content analysis may be used with different units of analysis including words, themes, characters, items, and space-time measurements. In this case the unit used was themes. This is regarded as one of the more difficult units as a theme can be raised or alluded to in several different ways. For example, during the interviews user acceptance as a driver was sometimes referred to as staff commitment to the migration, and sometimes the words change readiness for migration are used.

The result of the content analysis was divided into two main sets of issues, FOSS migration drivers and FOSS benefits identified. Frequency tables showing the number of occasions in the discussion of the main themes which occurred during the case study interviews were drawn up. In this study only themes which were raised by informants more than ten times were included in the frequency tables.

6.3 Summary Results of the Content Analysis

In the following figures a list of the themes raised by the case study informants and their frequencies are shown. These frequency tables are based on the analysis as described in 6.2. All the drivers are located within an organisational context (i.e. they all express conditions within an organisation that are required for successful migration) and their nature is different, as some of them originate from the top of the organisation (e.g. business cases) while some originate from the bottom layers of the organisation (e.g. user acceptance). It should also be mentioned that the informants specifically named each group, and although some of the themes could be included in both groups, it was decided to keep the groups separate as the informants did not mention the topic under two headings and the author did not want bias to influence the research.

	Theme	Abbr.	Total	%	Cumulative %
1	Change management	CM	58	21	21
2	Migration plans	MP	47	17	38
3	SW/HW	SH	45	16	54
4	User acceptance	UA	44	16	70
5	IT	IT	42	15	85
6	Challenges	CH	15	6	91
7	Impact of FOSS	IF	13	5	96
8	Business Cases	BC	12	4	100
	Total		276		

Table 6: Content Analysis showing relative frequencies and percentages of FOSS migration drivers

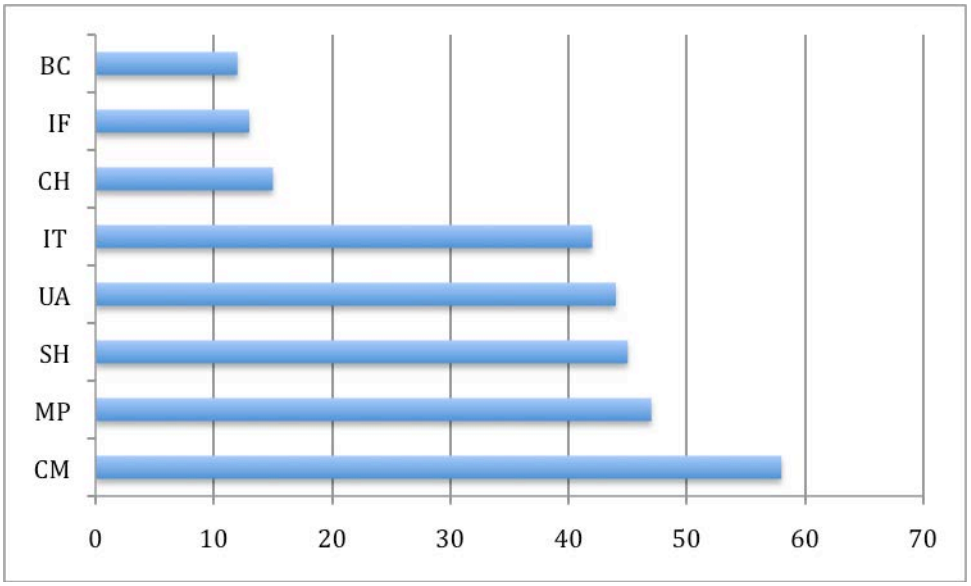


Figure 3: Bar chart of the frequency table of the results of the Content Analysis – Migration Drivers

Table 6 shows that in the transcript of the case study interviews there were 58 major references to the importance of change management during migration to FOSS in the South African public service, and 47 major references to migration plans as well as 45 major references to software and hardware (SH). FOSS migration driver descriptions could be formulated in the ways set out below.

Change management: This theme relates to the importance of implementing processes of managing the change from the use of existing proprietary technologies to FOSS within South

African public sector organisations. Change management helps to reduce levels of user anxiety about FOSS and its functionality. Users often worry about the degree to which FOSS migration might affect their levels of productivity. Change management during FOSS migration is managed in a formal manner. This entails the establishment of inclusive change management teams or reliance on project steering committees. These structures are established in order to plan and implement change interventions as well as to identify change champions within the organisation. Change interventions are more important during front-end migration and less so during the migration of the back-end.

Change interventions take a number of forms, including: the use of different communication and marketing tools; training of users on FOSS; the initiation of competitions for the project name; facilitation of workshops addressing user concerns; telling positive stories about FOSS, putting FOSS in the hands of users and allowing them to experience it; and addressing frequently asked questions amongst others. All these are directed at raising levels of excitement for FOSS amongst the users. Change processes are driven from the top of the organisation by senior management. The lifespan of change management interventions is often long, starting before the actual migration and continuing even after the actual migration of IT to FOSS has been completed.

Migration plans: The informants viewed the development of a migration plan as being important in migrating IT to FOSS within South African public sector organisations. The migration plan addresses amongst other things: how a FOSS feasibility study will be conducted to check upon the level of organisational readiness (from a technical perspective). The plan also focuses on how the various FOSS solutions will be tested for functionality before being adopted by the organisation. The establishment of laboratories to test the functionality of FOSS products and application, and how these laboratories are managed, form part of the migration plan. The plan should also reflect an appreciation of stakeholders in the organisation's value chain and network externalities in product choices. For instance, it might make more sense to adopt products and applications that are used by more members of the organisation's value chain.

Another aspect that informants suggested the plan should reflect is strategic choices about how migration will be implemented, whether it will be gentle (i.e. implemented in phases starting with either the front or back-end) or radical (i.e. both front and back-ends implemented simultaneously). In making such decisions, the plan is informed by, the size of the organisation and the number of users, with larger organisations better migrated in phases.

The migration plan also addresses whether FOSS will be run initially parallel to proprietary software for a time or whether there will be a wholesale migration. Such decisions are informed by organisational peculiarities and, in cases where proprietary software is more functional, it may be necessary to run the two simultaneously. Other sub-elements of the migration plan are the change management plans, training plans and communication strategies.

Software and hardware: According to the informants, migration from proprietary software to FOSS is facilitated when current proprietary software licenses have expired or are about to expire. This means that the organisation does not run the financial risk of having to pay licenses for software it no longer uses. The installation of FOSS is also facilitated where the current hardware lifespan has come to an end. The timing of FOSS migration coincides with the end of both the software licence periods and the useful life of the hardware.

User acceptance: The informants noted that user acceptance is important for successful migration to FOSS. The need to secure user acceptance is especially important where an organisation is migrating front-end applications. User acceptance is facilitated where users' concerns about possible losses of productivity from having to work in a new and unfamiliar FOSS environment are dispelled. To achieve this, users are exposed to FOSS applications through the setting up of test laboratories within an organisation. Test laboratories are made available for users to use at their leisure and to try out FOSS applications. This enables them to compare FOSS to proprietary applications and helps them realise that FOSS is easy to use and that what they had under proprietary software is also available in FOSS. Users also need to be educated about the philosophy behind FOSS: that it is not only about adopting free software as in free beer, but entails the pursuit of the principle of freedom as in free speech.

Other ways of securing user acceptance include: actively involving users in the project through activities such as competitions to name the migration project; identifying project champions from amongst the users; and ensuring that migration is implemented gradually. User acceptance generally determines the pace with which an organisation can migrate to FOSS, with organisations that achieve early user acceptance able to migrate faster than those where user acceptance takes time.

Information Technology (IT): IT was mentioned as a driver for FOSS migration because organisations, while evaluating FOSS, could identify key IT benefits in the use of FOSS, one of which is improved interoperability due to the use of open standards. The use of FOSS as

an IT solution also has the benefit of facilitating innovation in that it enables the organisation to develop and/or customise applications to its own needs. This driver is particularly relevant for IT staff inside organisations.

Challenges: The process of migrating to FOSS has a number of challenges that, if left unaddressed, may lead to the failure of migration projects. Amongst the challenges that informants mention is the lack of adequate technical support for FOSS. They also mention inadequate high-level buy-into FOSS within the organisation. Failure to respond quickly to users' frequently asked questions and a lack of availability of FOSS alternatives for some core applications are some of the other factors mentioned. For FOSS migration to succeed, it is important that these challenges be attended to.

Impact of FOSS: Informants mentioned this driver as being important in facilitating migration. The ability to convince decision makers within the organisation about the positive impacts of FOSS on the organisation is regarded as important in ensuring successful migration. Initiatives for migration to FOSS often emerge from IT units of organisations and demonstrating the impact of FOSS is one way of convincing the rest of senior management that it makes sense to migrate.

Business Cases*:* Informants mentioned the importance of having good business cases for migrating to FOSS. Business cases for migration serve as key drivers for motivating organisations to migrate. Within the South African public sector, in addition to possible cost savings through the elimination of license fees, migration to FOSS is motivated by its contributions to organisation's strategic intents. The intention to be regarded as a technological leader in the public sector dominates business cases in South African public sector organisations. Another important part of the business case includes the need to be compliant with government's FOSS policy.

Table 7 shows that in the transcripts of the case study interviews there were 64 major references to the importance of training as one of the benefits during FOSS migration and 55 major references to strategy. Of course there were numerous other issues discussed during some of the interviews, such as the benefits to IT research and development and improved security, but these were mentioned fewer than ten times by informants and are therefore not included in the above list. It was believed by the author that the list of themes to be considered should not be overwhelmingly long. Theoretical frameworks only incorporate a limited

number of themes and in this case, only those that were mentioned more than ten times are included. FOSS migration benefits are discussed below.

	Theme	Abbr.	Total	%	Cumulative %
1	Training	TR	64	24	24
2	Strategy	ST	55	21	45
3	Skills	SK	30	11	56
4	Support	SU	26	10	66
5	Resources	RE	24	9	75
6	Marketing	MA	22	8	83
7	Tangible benefits (e.g. communication).	TB	21	8	91
8	Cooperation	CO	13	5	96
9	Information	IN	12	4	100
Total			267		

Table 7: Content Analysis showing relative frequencies and percentages - Migration benefits identified

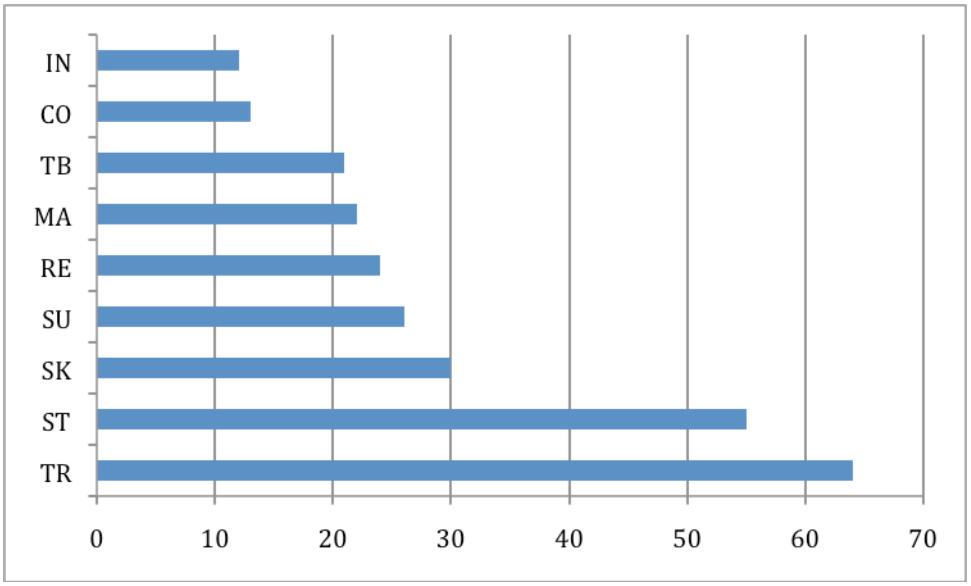


Figure 4: Bar Chart of the frequency table of the results of the Content Analysis - Migration benefits identification

Training: was described by informants as an important benefit that is derived from FOSS migration. Organisations that migrate to FOSS benefit from the implementation of the training programmes that are aimed at raising the levels of knowledge and skill in the use of FOSS. Training in support of FOSS migration is often delivered by qualified training providers

whose training is accredited and who are able to issue certificates on their training. This type of training has direct benefits to the organisation through associated productivity gains.

Strategy: FOSS migration was viewed by informants as benefiting public sector organisations' pursuit of their strategies. This is achieved largely through satisfying the migrating organisations' needs to achieve strategic positions of leadership in ICT and innovation. In addition, long-term cost savings strategies of public sector organisations in South Africa also benefit from FOSS migration primarily through the elimination of license fees.

Skills: FOSS migration supports the development of FOSS skills inside migrating organisations. Because it is essential to train staff and to ensure that there is adequate internal technical capacity to support FOSS, migration assists organisations to enhance their levels of IT capability. FOSS migration by public sector organisations in South Africa would also stimulate general FOSS skills enhancement as the market gears up to support government with FOSS programmes and applications.

Support: Like skills, informants are of the view that the level of FOSS support available in the open market in South Africa will be stimulated by more public sector organisations migrating to FOSS. As the biggest buyer of ICT services in South Africa, migration by public sector organisations will have the long-term effect of widening and deepening the level of support available for FOSS. Migration to FOSS by public sector organisations in South Africa will thus serve to catalyse the private sector and training institutions to increase the levels of support available to the FOSS market.

Resources: This was identified by the informants as a benefit because they felt that FOSS migration contributes towards enhancing the resources available to the organisation. This includes both financial resources through the achievement of savings, and improved human resources through the delivery of FOSS training programmes. Other forms of resources include access to a wide network of developers who can support the organisations with the further enhancement of their IT capabilities.

Marketing: Informants indicated that organisations that migrate to FOSS are able to gain by being profiled as pioneers in ICT innovation. Such public sector organisations are not only able to market themselves not only as technology leaders, but also as first movers in the implementation of government policy.

Tangible benefits: This theme covers a range of other tangible benefits including cost savings and an enhanced ability to communicate. These are achieved due to the high levels of inter-operability that FOSS facilitates because is it developed using open standards.

Cooperation*:* Migration to FOSS encourages cooperation between system developers and programmers that are employed by the organisation and those in the wider market that are working on FOSS projects. This level of cooperation benefits the organisation that has migrated through the ability to appropriate some of the value that is derived from this level of cooperation or open innovation.

Information*:* Informants are of the view that as more public sector organisations migrate to FOSS, more information is likely to be available about FOSS and its benefits, which will in turn benefit organisations that wish to migrate. Public sector organisations that have migrated are often willing to share their experiences with the rest of the public sector.

The histograms in Figure 3 and Figure 4 show that some themes were addressed more frequently than others. The migration drivers and migration benefits identified themes contained in these histograms were discussed 10 times or more during the interviews.

It was felt reasonable that a theme must be very important to the informants if it was to be incorporated into the theoretical framework developed by this research. A definition of the importance of a theme to the informants was established pragmatically by asserting that if the theme was mentioned 10 times or more it would be included in the framework. As only eight major migration drivers themes and nine major migration benefits themes were identified during the content analysis by the author, it was deemed enough and allowed all the results of the research to be included. According to Lubbe (1994), this complied with the view that the number of themes in a theoretical framework ought to be limited.

6.4 The Theory or Thesis

The primary purpose of conducting the case study research was to collect evidence with which to build a framework or thesis about how South African public sector organisations migrate their IT to FOSS. Thus the case study work was exploratory leading to a theoretical framework, which could then be tested using a focus group approach. The framework or thesis is essentially the core of the dissertation. All work in the earlier chapters leads to the thesis and the subsequent chapters establish its validity.

There are a number of different concepts of theory or theoretical frameworks (Bailey, 1987). For the purposes of this research a theoretical framework may be defined as the explanation of a particular phenomenon, or a mechanism, which will allow the prediction of how certain matters will interact. To be useful in the social sciences, a theoretical framework must be sensible, logical, useful and testable. According to Lubbe (1994), the test requirements relates to Popper's (1975) suggestion that a theory must be falsifiable. A theoretical framework consists of concepts which are related in statements known as propositions. A set of propositions may be combined to form a theoretical framework (Nachmias and Nachmias, 1989). It is therefore the purpose of this part of the chapter:

- to establish the themes which are important to understand during the migration of IT to FOSS;
- to state these themes in the form of propositions; and
- to combine these propositions into a theoretical framework.

These issues relate directly to the research questions in Chapter 3 which could be summarised to relate to how South African public sector organisations migrate their IT to FOSS.

6.5 Formulation of the Theoretical Framework

In this section, the theoretical framework for IT migration to FOSS in the South African public sector is formulated. The first sub-section presents a conceptual outline that is used to guide the development of the framework for migration. This is then followed by the presentation of the framework for IT migration to FOSS. This section ends with the development of the thesis for IT migration to FOSS in the South African public sector.

6.5.1 Conceptual Outline for Developing the Theoretical Framework

The purpose of developing the theoretical framework is to explain how management in South African public sector organisations goes about migrating their IT to FOSS. The development of a satisfactory explanation of this process could provide a basis for evaluating FOSS migration management and facilitate a better grasp of the likely success of FOSS migration projects in different public sector organisations in South Africa, based on whether or not the migrating organisation complies with the procedures expressed in the framework.

From the results of the content analysis of migration drivers, it can be deduced that change management, migration plans, hardware and software considerations, user acceptance and Information Technology are important drivers for FOSS migration. Other migration drivers that are important and need to be incorporated into the theoretical framework are challenges, the impact of FOSS and business cases.

From the results of the content analysis of FOSS migration benefits, it can be concluded that training and strategy are the two most important benefits that can be derived from migration. The other migration benefits of skills, support, resources, marketing, tangible benefits, cooperation and information are also important and must be incorporated into the theoretical framework.

In order to assist with the interpretation of the results of the content analysis three diagrammatic conceptual frameworks were developed which indicate how these themes are linked. These are shown in Figures 5, 6 and 7.

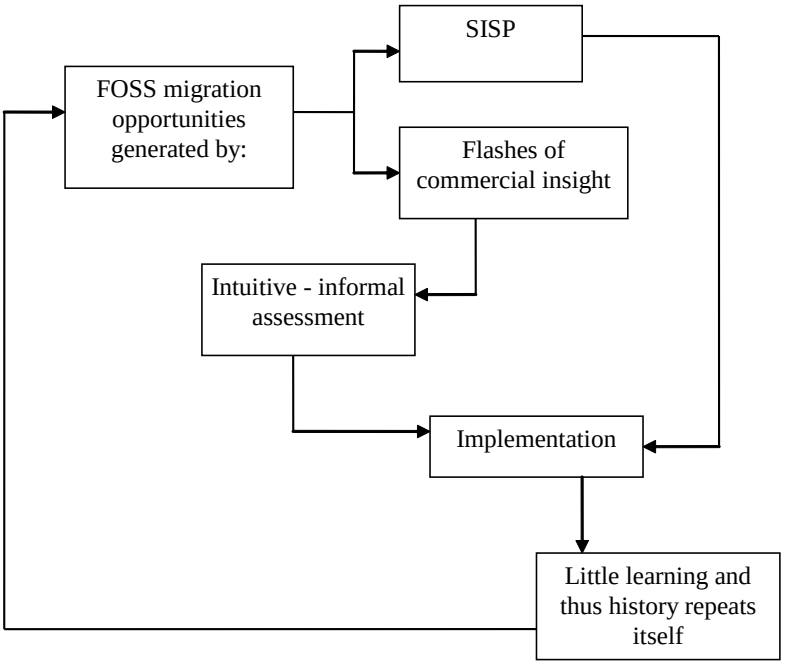


Figure 5: A traditional view of migration in South African public sector organisations based on Lubbe's model (1994)

Figure 5 addresses the traditional FOSS migration as it is surmised to occur currently in some public sector organisations that may be intending to migrate. It is an adaptation of Lubbe's (1994) IT investment model. This model is used because there was no strategic management model available for FOSS migration. This diagram shows how migration originates. Some

migration can be viewed as emanating from decisions taken during the strategic Information Systems planning process (SISP) but also sometimes they can be a result of gut-feeling processes (“flashes of commercial insights”).

According to this model, FOSS migrations are therefore assessed during an informal process. After this assessment, the migration is implemented with little learning taking place and history just repeats itself. The process is thus likely to be repeated by most of the organisations, resulting in less than optimal.

The thesis for IT migration to FOSS that is developed in this section is based on the Paradigm and Conditional/Consequential Framework of Corbin and Strauss (2008). According to these researchers, the data that qualitative researchers work with is complex and consist of multiple concepts that exist in complex relationships that are often difficult to tease out of the data. The paradigm presents a way to think about those relationships. The paradigm is a perspective, a set of questions that can be applied to data to help the analyst draw out the contextual factors and identify relationships between context and process.

The following are three basic components of the paradigm.

1. There are conditions. According to Corbin and Strauss (2008), these allow a conceptual way of grouping answers to questions about why, where, how and what happens. These reveal circumstances or conditions that lead to certain action. In the case of the present study, the drivers for IT migration to FOSS emanating from the content analysis can be regarded as constituting the conditions (or context) that must be satisfied for successful migration to FOSS.
2. There are interactions and emotions. These are the responses made by individuals or groups to situations, problems, happenings and events. In this case, interactions and emotions represent the actual process of migration to FOSS.
3. There are consequences. These are the outcomes of the interactions (or actual migration process). Consequences answer the questions about what happened as a result of those interactions. The migration benefits identified through content analysis represent the consequences of migration.

The Conditional/Consequential Framework complements the Paradigm and contains the ideas set out below

1. Conditions/Consequences do not exist in a vacuum. They are always connected through action/interaction/emotional responses. Since events often lead to one another

like links in a chain, the relationships between events are often complex and difficult to sort through. Furthermore, the relationships between conditions and subsequent inter/action and consequences rarely follow a linear path. The relationship between conditions and consequences can lead to consequences that are not always predictable in advance (Corbin and Strauss, 2008). This means that in the case of FOSS migration, the fulfilment of the drivers for migration that serve as conditions cannot always be expected to result in predictable benefits due to the complex nature of the relationship between the drivers and the benefits.

2. The distinction between micro and macro conditions is artificial. Most situations are a combination of micro conditions (those closer or internal to the migrating organisation) and macro conditions (those that are more distant or external to the organisation). The latter include social, political, historical and other conditions. When appropriate, the analyst should trace the relationships between micro and macro conditions to the situation, problems and events. Analysts are interested in the interplay between macro and micro conditions, the nature of their influence on each other and subsequent inter/action, and the full scope of consequences that result, and also on how those consequences feed back into conditions that become part of the situation and subsequent inter/action or emotional responses (Corbin and Strauss, 2008). Content analysis for this study has highlighted micro conditions for FOSS migration because the focus of the study is more on internal organisational conditions for FOSS migration.

3. The full range of possible interrelationships between macro and micro conditions is not always visible to individual research participants. Each participant comes to the situation from their standpoint or perspective and rarely has a grasp of the whole situation. It takes listening to a number of voices to gain an understanding of the whole.

4. Conditions and consequences usually exist in clusters and can associate or covary in many different ways, both to each other and to the related inter/action. With time and the emergence of contingencies, the clusters of conditions and consequences can either change or rearrange themselves so that the nature of the relationships or associations that exist between them and inter/actions also changes.

5. Actions/interaction and emotional responses to events are not confined to individuals.

They can be carried out by representatives acting on behalf of nations, organisations, and social worlds. Furthermore, inter/action and emotional responses can be directed at individual or groups representative of nations, organisations, and social worlds.

Figure 6 is a diagrammatic representation of the Condition/Consequence Framework, which is used to develop the framework for FOSS migration. In this figure, the arrows represent the intersection of conditions and consequences and the resulting chain of events. Conditions move towards and encircle the inter/actions to create a conditional context or drivers of migration. In this figure, broader conditions including the community, national and international are not shown because the level of analysis in this study only extends up to the organisational level.

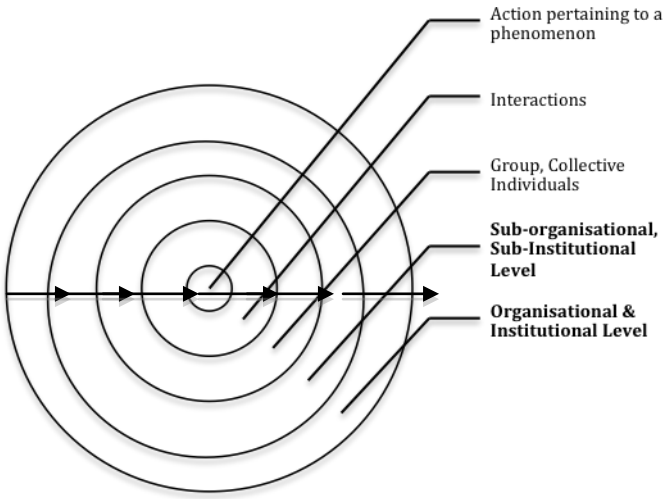


Figure 6: The Conditional/Consequential Framework (Corbin and Strauss, 2008)

Other arrows move away from Inter/action, representing how the consequences of any inter/action move from inter/action to change, or add to conditions in often diverse and unanticipated ways. The arrows may give the impressions of a linear process, whereas the interactions are more complex and unpredictable. This matrix is applied in the development of a theoretical framework for FOSS migration in the South African public sector.

6.5.2 The Theoretical Framework for IT Migration to FOSS in the South African public sector

Figure 7 shows that IT migration happens in phases, viz. strategic planning phase, operational planning phase, implementation phase and monitoring and evaluation phase. These phases are

identified by Thompson and Strickland (2003) as collectively constituting the strategic management process.

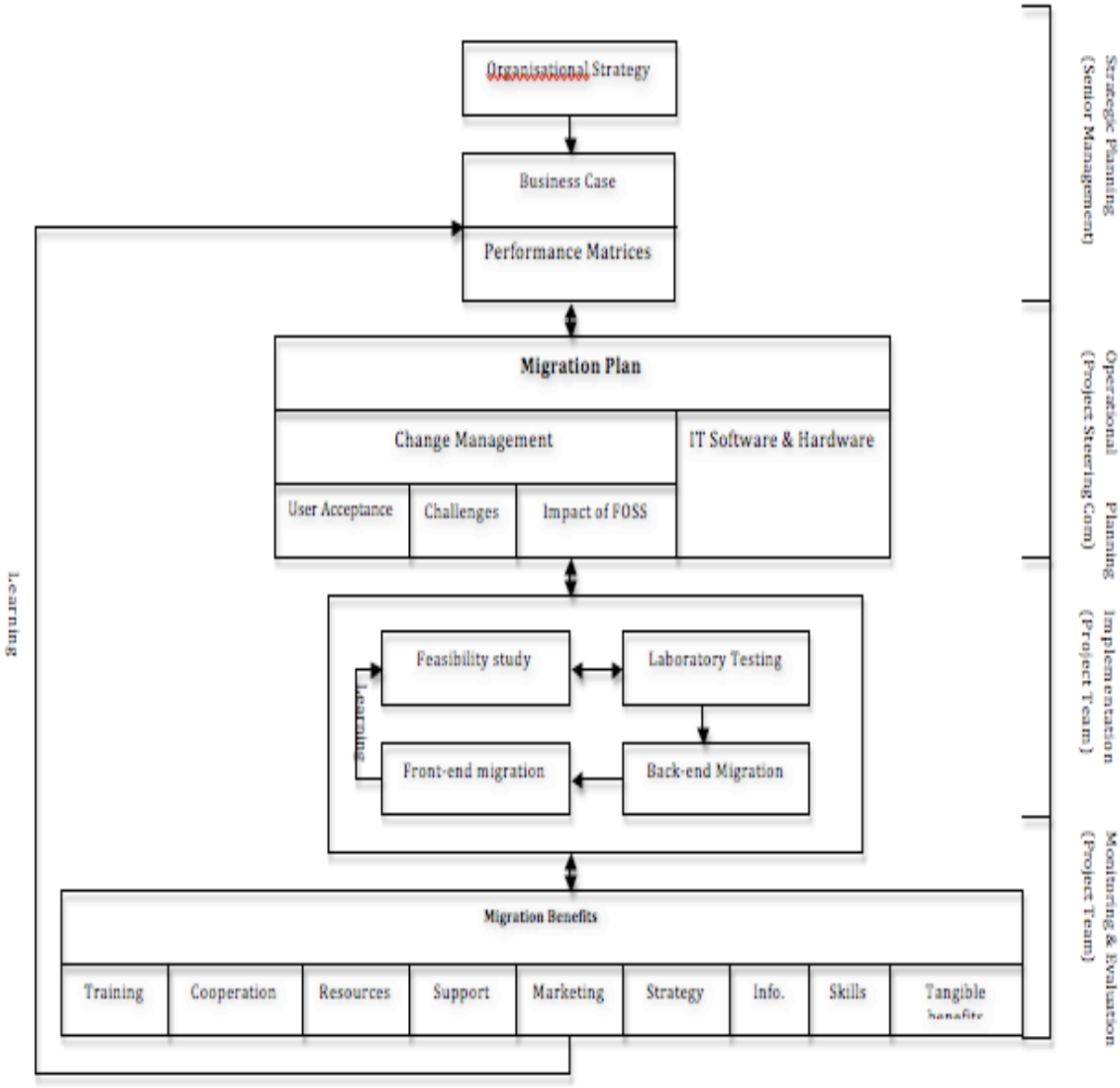


Figure 7: The proposed IT migration to FOSS framework

The Strategic Planning Phase

Figure 7 presents the framework for FOSS migration that emerges from the content analysis. The framework is informed by the paradigm model as well as the conditional/consequential matrix. Migration is undertaken successfully within a context where there is a compelling organisational need to pursue a particular strategy. In the South African public sector, this strategy often relates to the need for an organisation to achieve and/or consolidate a strategic position to be regarded either as technology leader, a leader in information management or an early adopter of government's FOSS policy. The achievement of cost savings is often

secondary to this need for strategic positioning. The view of strategy as position is highlighted by Mintzberg (1987). Decisions regarding a public sector organisation's strategic position are taken at the top of an organisation's hierarchy, by senior management.

Another key condition is the development of a clear business case for migrating IT to FOSS. The business case reflects how migration will assist the organisation to achieve its strategic intent as presented in its strategy. It highlights how migrating will assist the organisation's internal IT environment to achieve fit with its strategy through FOSS migration. This perspective is more akin to the Strategy-Structure-Performance (SSP) framework of Chandler (1962). This framework highlights the significance of factors that are complementary to strategy in order to improve performance. It is also in line with the views of Vankantraman and Cannilus (1984) that the concept of fit can also be applied from a strategic choice or internal perspective, in addition to the inter-organisational or external perspective.

The business case also highlights the performance outcomes that IT migration to FOSS is expected to achieve. These constitute performance matrices that are derived from the FOSS migration benefits that have been identified through the content analysis. Measures and performance standards for tracking the contributions of the migration process to different areas of organisational performance are included in the business case. These areas include staff training and skills development, achievements in relation to the strategy of the organisation and the levels of support for FOSS that are achieved. Other areas are the enhancement of organisational resources, contributions to marketing the organisation, improvements in internal communication and expected levels of cooperation and improvements in information flow. These are used as performance targets that are the basis for judging the success or failure of the migration project. These performance matrices serve as strategic control systems that are used to improve the effectiveness of the migration exercise (Goold and Quinn, 1990). It is the responsibility of senior management in the organisation to develop the business case.

Operational Planning Phase

Figure 7 shows that the operational planning phase entails the use of the business case to develop a migration plan. This plan addresses how the migration process will be implemented in a manner that ensures that the performance outcomes contained in the business case are produced. The development of a migration plan is a condition that is used to plan: (i) how change will be managed in such a manner as to secure user acceptance of the FOSS; (ii) how

anticipated and unanticipated challenges will be addressed; and (iii) how the impact of FOSS migration on aspects such as staff productivity will be managed. The migration plan also gives an indication of how hardware and FOSS choices will be made during the migration. This includes ensuring that migration coincides with the period of refreshing the hardware as well as the expiry of proprietary software licences.

Figure 7 also shows that the relationship between the migration plan and the business case is reciprocal rather than linear. The development and implementation of the migration plan will also have implications for the business case. As the migration plan unfolds, there may be a need to adjust the business case based on insights gained during the development and implementation of the plan. This connection between the strategic planning and operational planning phases is in keeping with a model for strategic management that was developed by Ansoff (1987). This model highlights interactions between strategic and operational behaviour, and seeks to integrate activities of sensing, deciding and execution in strategy making. During IT migration to FOSS, the operational planning phase is the responsibility of a project steering committee. This committee is made up of senior managers and representatives from the team that has been tasked with assisting with the migration. This project team usually includes middle management and an external service provider.

Implementation Phase

Figure 7 shows that the implementation phase follows the operational planning phase, but that planning and implementation are reciprocal and often run concurrently. The relationship between the two constructs is therefore not linear. This is shown by the arrows in both directions in figure 7. Lessons from implementation are used to adjust the operational plan. The adjustment of the operational plan as a result of insights emerging from implementation may in turn lead to adjustments in the business case. This is an ongoing and iterative process, which is in keeping with the view of Farjoun (2002) of an organic model, which takes account of the complex interactions and self-influences amongst key strategic management constructs. In this case, the constructs are planning and implementation. This way of representing the migration process also takes account of the view of Nichols (2000) that strategy evolves over time as intentions accommodate reality.

Implementation represents interaction and emotions in the paradigm model, and generally starts with the conduct of a feasibility study that identifies all the IT applications and programmes that are currently running within the organisation. This part of implementation

considers whether there are existing FOSS alternatives for proprietary applications that the organisation currently uses. Where there are no acceptable FOSS alternatives, decisions are made, including the possibility of virtualising proprietary applications.

The next step in implementing FOSS migration is that of establishing a test laboratory where all the FOSS applications that would have been identified are tested for functionality. The laboratory is also used for representatives of the different functional areas in an organisation to test the functionality of applications with relevance to their respective areas of work. These representatives also officially sign-off on those FOSS applications that they believe are ready for use within their functional areas. The laboratory is also used to encourage staff (users) to practice and become familiar with FOSS, as part of the their training and in order to achieve user-acceptance. During the implementation phase, plans for change management and IT hardware and software replacement are implemented. Experiences from laboratory testing also result in the adaptation of the feasibility study as intentions again accommodate reality.

Testing is then followed by actual migration, which often starts at the back-end, but may also be done concurrently for both the back and front-ends. The decision on whether to migrate both ends simultaneously or in phases often depends on the size of the organisation and the complexity of its IT applications. Larger organisations and organisations with complex applications often require gentle migration where the introduction of FOSS is implemented in phases from the back-end to the front-end.

There is a learning loop that exists between actual back-end and front-end migration and the feasibility of migrating, with insights emanating from actual migration resulting in adaptations in the understanding of what is feasible. The context or conditions for migration that include change management, the migration plan, software and hardware plans, user acceptance, Information Technology requirements of the organisation, other organisational challenges that impact on migration, the impact of FOSS on aspects such as productivity and the overall business case all determine how the implementation phase is managed.

Monitoring and Evaluation

Figure 7 shows that the monitoring and evaluation phase entails tracking the extent to which the benefits of migration that have been identified through content analysis are produced. All the nine benefits are tracked; and performance is compared with the targets in the business case. There is a reciprocal influence between monitoring and evaluation on the one hand, and

implementation on the other. Findings from monitoring and evaluating regarding the delivery of the benefits of FOSS migration are used to adjust the implementation. The purpose of this adjustment is to ensure that implementation aspects that hinder the production of the benefits are rectified so that these benefits can be produced.

There is a learning loop between the monitoring and evaluation phase and the strategic planning phase that reflects adjustments that are made to the business case as a result of insights gained from tracking the delivery of the benefits. This tracking exercise may suggest that the performance standards and targets contained in the business case may need to be adjusted either downwards or upwards.

This framework contains evidence of the application of the theory of learning of Ginter and White (1982). According to these researchers, the social learning theory of Strategic Management acknowledges the reciprocal influence of the environment on the one hand and organisational behaviour on the other. In the case of the present framework for FOSS migration, it is the internal environment of the organisation that is of importance. These researchers state that, the social learning theory introduces an organic understanding and extends the general systems thinking by including feedback loops to the conduct of strategy.

6.6 Empirical Generalisations

Using the above content analysis (Tables 6 and 7), as well as the evidence suggested by the various informants, the following generalisations have been derived or synthesized.

- IT migration to FOSS by the South African public sector organisation follows a strategic management process that includes strategic planning, operational planning, implementation and monitoring and evaluation as shown in Figure 7.
- IT migration to FOSS by South African public service organisations is implemented in order to achieve a particular strategic position, with financial considerations playing a secondary role. This strategic positioning is identified by top management within an organisation.
- The link between the migration plan and the act of migrating to FOSS on the one hand and the organisation’s strategy on the other is mediated through the development of a business case for IT migration to FOSS. This business case outlines the performance outcomes and targets for FOSS migration based on the benefits of migration that have been identified through the content analysis as shown in Table 7.

- The context or conditions under which migration takes place in order to succeed include responding to all the themes that have been identified as migration drivers, including the business case, a migration plan, change management, hardware and software decisions, IT related decisions, the impact of FOSS and user acceptance as shown in table 6. These conditions influence and are in turn influenced by the process of migrating IT to FOSS.
- The process of migrating IT to FOSS within South African public sector organisations can be explained by using both mechanistic and organic perspectives of strategic management. The process of migration thus lends itself to an eclectic explanation that borrows from different strategic management perspectives.

These propositions have been expressed in this way because, unlike hypotheses which are required to be stated in a testable form, which allows the relationship between two or more variables to be examined, empirical generalisations do not have this format requirement. Lubbe (1994) suggests that an empirical generalisation is a proposition, which is derived as a result of an exercise in deduction whereby propositions are constructed after observing themes and relationships in a real life. They do not necessarily have to be expressed in terms of the relationship between two or more variables. According to Lubbe, in the same way as hypotheses may be tested, empirical generalisations may also be tested to see if they have the significant support of practitioners in the field. These empirical generalisations will be tested using a panel discussion to see whether they can be applied in a more general way.

6.7 The Thesis

The five empirical generalisations may now be combined into a theoretical framework that offers an explanation as to how IT migration to FOSS in South African public sector organisations is formulated and implemented.

> *IT migration to FOSS by South African public sector organisations follows a strategic management process that includes strategic planning, operational planning, implementation as well as monitoring and evaluation as shown in Figure 7. Within the South African Public Service, the process of migration is implemented in order to pursue a quest to achieve a particular strategic position, with financial considerations playing a secondary role. This strategic positioning is identified by top management within an organisation.*

The link between the migration plan and the act of migrating to FOSS on the one hand and the organisation's strategy on the other is mediated through the development of a business case for IT migration to FOSS. This business case outlines the performance outcomes and targets for FOSS migration based on the benefits of migration that have been identified through the content analysis as shown in Table 7.

The context or conditions under which migration takes place in order for it to succeed include responding to all the themes that have been identified as migration drivers, including the business case, a migration plan, change management, hardware and software decisions, IT related decisions, the impact of FOSS, user acceptance and addressing the challenges of IT migration to FOSS as shown in Table 6. These conditions influence and are in-turn influenced by the process of migrating.

The process of migrating IT to FOSS within South African public sector organisations can be explained by using both mechanistic and organic perspectives of strategic management. The process of migration thus lends itself to an eclectic explanation that borrows from different strategic management perspectives.

The above thesis and empirical generalisations comply with the requirements of sensible, logical as well as testable or falsifiable. As the framework is developed directly from the empirical generalisations, to establish the acceptance of this framework, all that is necessary to be done is to test the empirical generalisations. This was done by using a focus group. Chapter 7 considers the results of the focus groups and practitioner presentations.

However, while proceeding with the focus group to test the empirical generalisations, correspondence analysis was used to help corroborate how the findings of the content analysis interpret the theory. Lubbe (1994) posits that, as correspondence analysis provides a perceptual map of the data, it can provide a deeper insight into the multivariate nature of the data.

6.8 Correspondence Analysis

Greenacre (1984) claims that correspondence analysis was developed in France, being the brainchild of Jean-Paul Benzecri. The English word, correspondence, has been taken over directly from the French word correspondence, which has a different meaning of system of association. Thus in English the term association analysis might in fact be more appropriate.

Correspondence analysis is an exploratory data analysis technique for the graphical display of contingency tables and multivariate categorical data (Green *et al.*, 1989 *cited* by Lubbe, 1994). It is a method of factoring categorical data variables and displaying them in a property space, which maps their association in two or more dimensions. It is often used where a tabular approach is less effective due to large tables with many rows and/or columns (Garson, 2008). According to Greenacre (1984),

> *Correspondence analysis is a technique for displaying the rows and columns of a data matrix (primarily, a two-way contingency table) as points in dual low-dimensional vector spaces.*

It is a mathematical procedure which uses categorical data in the form of two-dimensional rectangular matrix of non-negative numbers as a two contingency table for the geometric mapping of frequency or binary data. The two-dimensional matrices actually used was the frequency tables in Table 6 and Table 7 showing the occurrence of themes discussed during the case study interviews. The primary result of the correspondence analysis is a map identifying the row and column attributes as points in a space of two or more dimensions. This is a graphical display or perceptual map which represents the relative positions or grouping of the various themes listed in the matrix or frequency table. The perceptual map may be presented in two or more dimensions. However, it is the objective of correspondence analysis to present the results in as simple a form as possible (Lubbe, 1994).

Correspondence analysis is similar in style to principal component analysis, but in correspondence analysis the total variation in the data matrix is measured by the usual Chi-squared statistic for the two-column independence, and it is this quantity, which is decomposed along the principal axis (Greenacre, 1984).

6.9 The Use of Correspondence Analysis

6.9.1 Introduction to correspondence analysis

In Section 6.2, it was judged that content analysis revealed that the case study participants were concerned mainly about eight major themes as drivers for migration and nine identified migration benefits. The next step in the theory formulation was to establish how these themes related to each other. Correspondence analysis is an excellent vehicle for this.

6.9.2 The use of Correspondence Analysis to analyse FOSS migration drivers

Table 8 shows the result of the content analysis detailed for migration drivers. The scores of each of the eight respondents in the case study research are shown separately. Note the abbreviations used for the different themes, that is, CM for change management, MP for migration plan, SH for software and hardware, etc.

	Theme	Abbr.	1	2	3	4	5	6	7	8	Total	%	Cummulative %
1	Change management	CM	3	2	9	5	11	3	20	5	58	21	21
2	Migration plans	MP	0	8	8	2	7	7	4	11	47	17	38
3	SW/HW	SH	4	10	0	2	18	2	9	0	45	16	54
4	User acceptance	UA	1	15	4	2	9	8	0	5	44	16	70
5	IT	IT	3	18	3	4	3	4	0	7	42	15	85
6	Challenges	CH	0	2	0	3	1	5	4	0	15	6	91
7	Impact of FOSS	IF	5	1	0	0	0	6	1	0	13	5	96
8	Business Cases	BC	0	0	2	0	3	7	0	0	12	4	100
	Total										276		

Table 8: Summary results – FOSS migration drivers (Source: Interviews)

Table 9 is a table defining the different government sectors by number of interviews.

Government Sector	No of interviews
ICT	4
Arts and Culture	3
Transport	1

Table 9: Government sector and number of interviews

All sections of Table 8, that is, rows 1 to 8 for all columns were extracted for processing using SPSS. SPSS produced four tabular reports and one graph for FOSS migration drivers. In addition to Table 8 that shows summary results for the different migration drivers themes, Table 10 shows eigenvalues explained by the different dimensions (or factors) for migration drivers that were extracted by SPSS. Each eigenvalue is the amount of inertia (variance) a given dimension explains in the correspondence table. Eigenvalues reflect the relative importance of the dimensions (Garson, 2008). The percentage of inertia explained by each dimension in Table 10 is the eigenvalue divided by the total inertia.

This report from SPSS determines the number of dimensions required to explain the original data set. The Kaizer criterion for selecting the number of dimensions was used. According to Kaizer (1960) *cited* by Field (2009), only factors with eigenvalues greater than 1 should be retained. This criterion is based on the idea that eigenvalues represent the amount of variation explained by a factor and that an eigenvalue of 1 represent a substantial amount of variation. It may be seen from table 10 (FOSS migration drivers) that only two dimensions have eigenvalues greater than 1. One dimension will explain 54% of the total data variability and that two-dimensions will explain 83% of the variability. Therefore by using two dimensions more than three quarters of the variability may be explained.

No	Inertias (Eigen values)	Percentages
1	4.337	54
2	2.382	29
3	0.72	9
4	0.524	7
5	0.036	1
6	0	0
7	0	0
8	0	0

Table 10: Inertia or Eigen values – FOSS migration drivers (Source: Interviews)

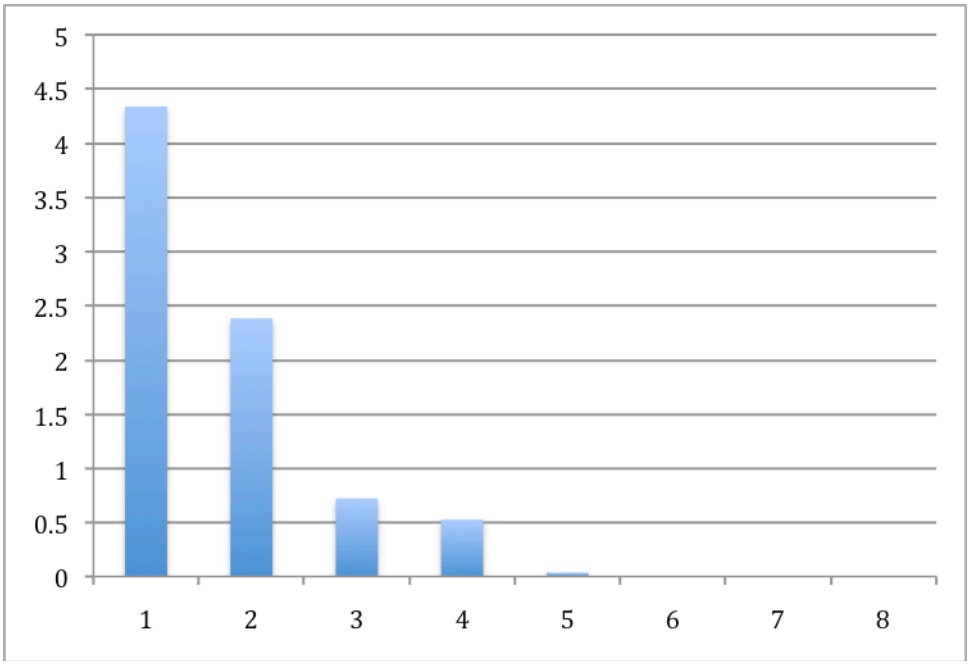


Figure 8: Histogram – FOSS migration drivers

Figure 9 is the perceptual map or graphical display, which shows the relative position of the different themes. This is displayed on the next few pages. The numbers of the points on the correspondence map represent the different themes as numbered in Table 6, that is,1 is CM (change management), 2 is MP (Migration plans) and so on.

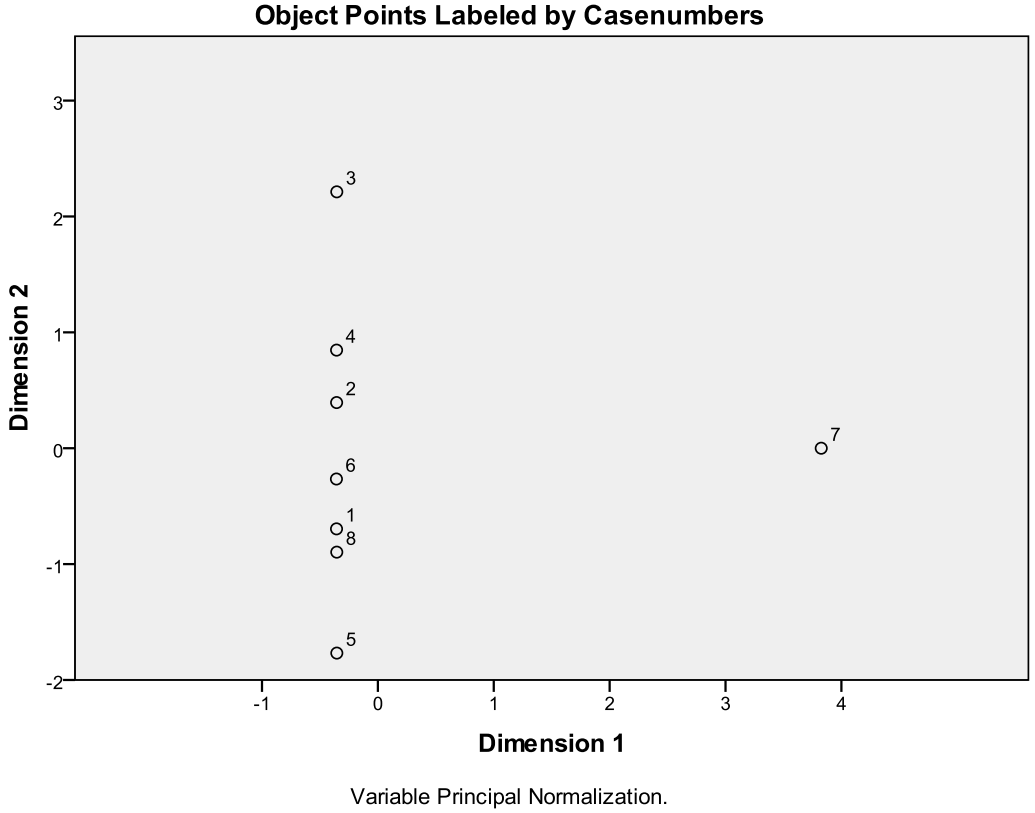


Figure 9: The perceptual map showing relative distances – FOSS migration drivers (Source: Interviews)

The axes in Figure 9 represent the relative Chi-squared distances of the data points in the frequency matrix from the centre of gravity of the original data set or matrix. The centre of gravity is the arithmetic mean profile of both the rows and the columns of the original data set. The Chi-squared distance is a measure of the deviation of the observed distances from the expected distances under some assumed model which is frequently a no association model. The axes are purely numerical scales which are produced to show the relative distance from the centroid in a graphical way. These axes may be thought as two artificial variables synthesised from the original data set which provide the maximum explanation of the differences and the similarities between the originally observed values. The position of the row data points is determined by both row data values and the influence of the column values associated with that row variable (Lubbe, 1994). The perceptual map is the key product of

correspondence analysis which shows how the row variables may be grouped. It is up to the analyst using the correspondence analysis to actually attribute meaning to these axes.

From Figure 9 it can be seen that, with the exception of one theme (Impact of FOSS), all the other themes are clustered closely on the first dimension. This figure also shows that themes 2, 3 and 4 can be grouped together on the second dimension as they lie on the same side of the centroid. Similarly themes 1, 5, 6, and 8 lie on the opposite side and can be grouped together on this dimension. In order to improve interpretation, variable principal normalisation was applied to the variables (Table 11 and Figure 10). This entails factor rotation such that associations between the variables are optimised.

Discrimination Measures

	Dimension		
	1	2	Mean
1	1.893	1.081	1.487
2	1.925	1.169	1.547
3	.079	.661	.370
4	.095	.957	.526
5	.111	1.234	.672
6	1.941	1.177	1.559
7	1.893	.674	1.283
8	.063	.412	.237
Active Total	8.000	7.365	7.683

Table 11: Discrimination measures (Source: Interviews)

From Figure 10 below it is possible to see that some of these themes may be conveniently grouped together. For example, the four themes of software/hardware (3-SH), user acceptance (4-UA), Information Technology (5-IT) and Business cases (8-BC) can be grouped together and can be described as being of a technological orientation. The four themes of change management (1-CM), migration plans (2-MP), challenges (6-CH) and the impact of FOSS (7-IF) can also be grouped together and described as being of a management orientation.

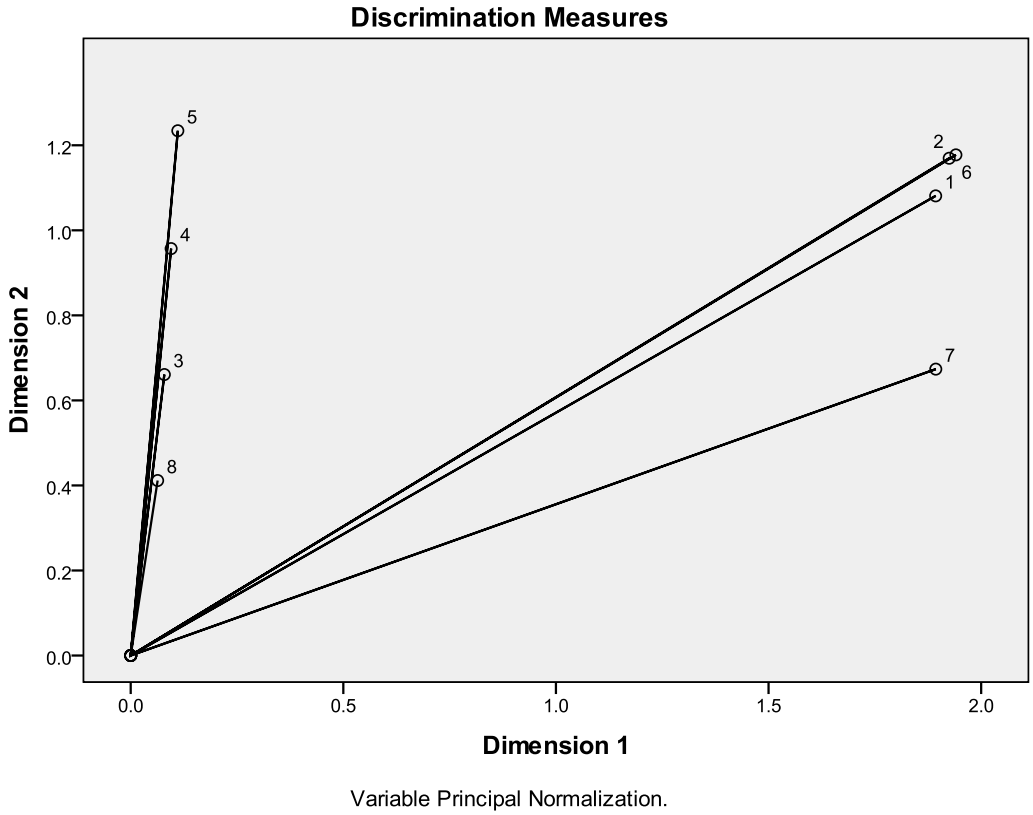


Figure 10: Variable Principal Normalisation – FOSS migration drivers (Source: Interviews)

6.9.3 The use of Correspondence Analysis to analyse migration benefits identified

Table 12 shows the result of the content analysis detailed for migration benefits. The scores of each of the eight respondents in the case study research are shown separately. Note the abbreviations used for the different themes, that is, TR for training, ST for migration strategy, SK for skills, etc.

	Theme	Abbr	1	2	3	4	5	6	7	8	Total	%	Cummulative %
1	Training	TR	7	13	15	2	13	8	5	1	64	24	24
2	Strategy	ST	2	17	5	2	14	7	7	1	55	21	45
3	Skills	SK	1	7	3	0	3	6	6	4	30	11	56
4	Support	SU	2	7	1	3	6	4	0	3	26	10	66
5	Resources	RE	1	9	1	2	4	2	3	2	24	9	75
6	Marketing	MA	0	0	0	0	1	2	19	0	22	8	83
7	Tangible benefits (e.g. communication).	TB	0	2	6	0	3	2	1	7	21	8	91
8	Cooperation	CO	2	4	0	0	0	3	4		13	5	96
9	Information	IN	0	1	0	0	0	0	4	7	12	4	100
	Total										267		

Table 12: Summary results – migration benefits (Source: Interviews)

All sections of Table 12, that is, rows 1 to 9 for all columns were extracted for processing using SPSS. SPSS produced four tabular reports and one graph for migration benefits. In addition to Table 12 that shows summary results for the different migration benefits themes, Table 13 shows eigenvalues explained by the different dimensions (or factors) for migration benefits that were extracted by SPSS. Each eigenvalue is the amount of inertia (variance) a given dimension explains in the correspondence table. Eigenvalues reflect the relative importance of the dimensions (Garson, 2008). The percentage of inertia explained by each dimension in Table 13 is the eigenvalue divided by the total inertia.

This report form SPSS determines the number of dimensions required to explain the original data set. The Kaizer criterion for selecting the number of dimensions was used. According to Kaizer (1960) *cited* in Field (2009), only factors with eigenvalues greater than 1 should be retained. This criterion is based on the idea that eigenvalues represent the amount of variation explained by a factor and that an eigenvalue of 1 represent a substantial amount of variation. It may be seen from Table 13 (FOSS migration benefits) that only two dimensions have eigenvalues greater than 1. One dimension will explain 72% of the total data variability and that two dimensions will explain 85% of the variability. Therefore by using two dimensions more than three quarters of the variability may be explained.

No	Inertias (Eigen values)	Percentages
1	5.794	72
2	1.054	13
3	0.583	7
4	0.458	6
5	0.064	1
6	0.028	0
7	0.015	0
8	0.004	0

Table 13: Inertia or Eigen values – migration benefits (Source: Interviews)

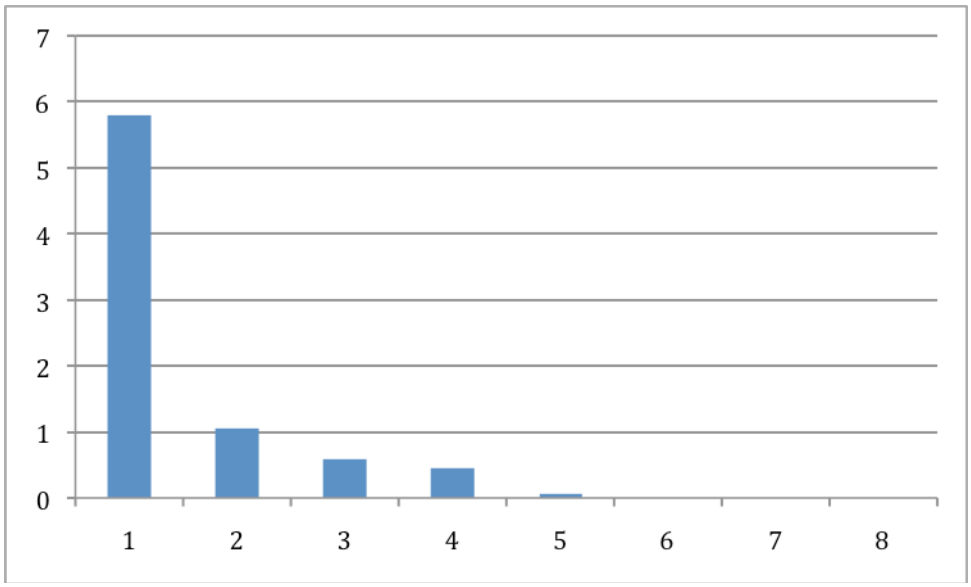


Figure 11: Histogram – FOSS migration benefits (Source: Interviews)

Figure 12 is the perceptual map or graphical display, which shows the relative position of the different themes. The numbers of the points on the correspondence map represent the different themes as numbered in Table 13, that is, 1 is TR (training), 2 is ST (strategy) etc.

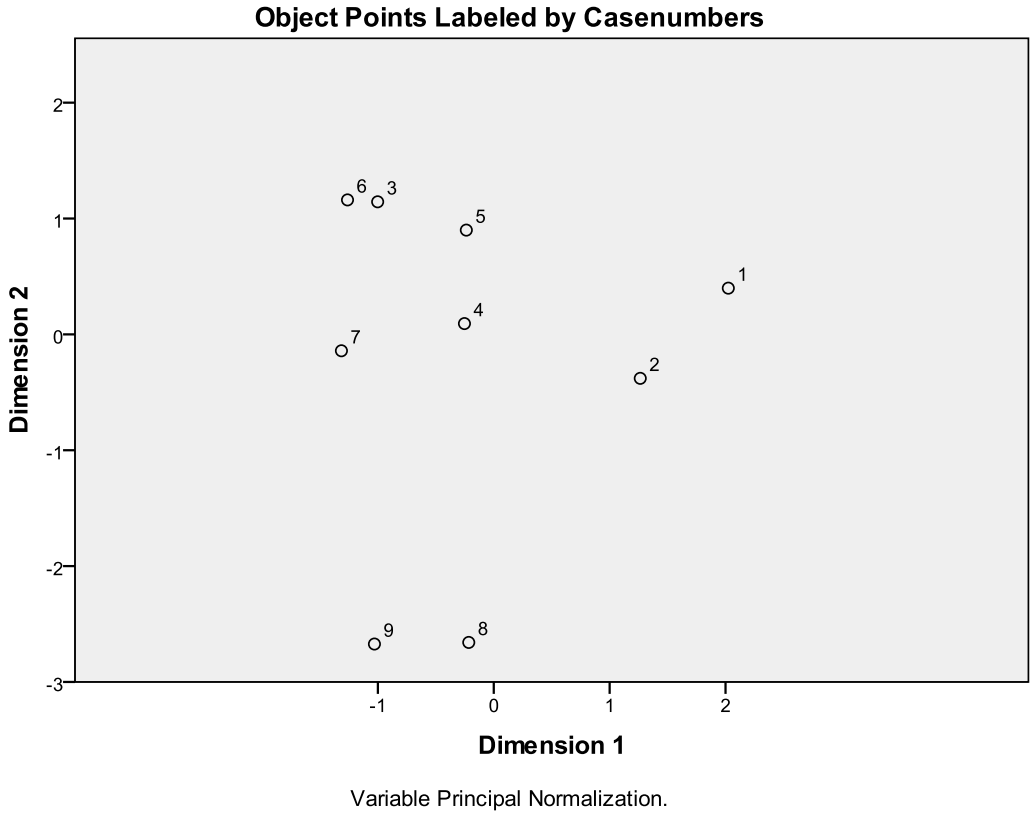


Figure 12: The perceptual map showing relative distances – FOSS migration benefits (Source: Interviews)

The axes in Figure 12 represent the relative Chi-squared distances of the data points in the frequency matrix from the centre of gravity of the original data set or matrix. The centre of gravity is the arithmetic mean profile of both the rows and the columns of the original data set. The Chi-squared distance is a measure of the deviation of the observed distances from the expected distances under some assumed model, which is frequently a no association model. The axes are purely numerical scales, which are produced to show relative distance from the centroid in a graphical way. These axes may be thought of as two artificial variables synthesised from the original data set, which best explains the differences and the similarities between the originally observed values. The position of the row data points is determined by both row data values and the influence of the column values associated with that row variable (Lubbe, 1994). The perceptual map is the key product of correspondence analysis, which shows how the row variables may be grouped. It is up to the analyst using the correspondence analysis to actually attribute meaning to these axes.

From Figure 12 it can be seen that themes 1 and 2 can be grouped together on the first dimension as they lie on the same side of the centroid. The remainder of the themes (3 to 9) can also be grouped together because they lie on the opposite side of the centroid for the first dimension. On the second dimension, themes 1, 3, 4, 5 and 6 can be grouped together because they lie on the same side of the centroid and themes 2, 7, 8 and 9 can also be grouped together as they lie on the opposite side. In order to improve interpretation, variable principal normalisation was applied to the variables (Table 14 and Figure 12). This entails factor rotation such that associations between the variables is optimised.

Discrimination Measures

	Dimension		
	1	2	Mean
1	.564	.571	.567
2	1.042	1.790	1.416
3	.950	.236	.593
4	.352	.032	.192
5	1.121	.330	.726
6	1.050	1.102	1.076
7	1.206	2.000	1.603
8	1.031	.676	.854
Active Total	7.315	6.739	7.027

Table 14: Discrimination measures (Source: Interviews)

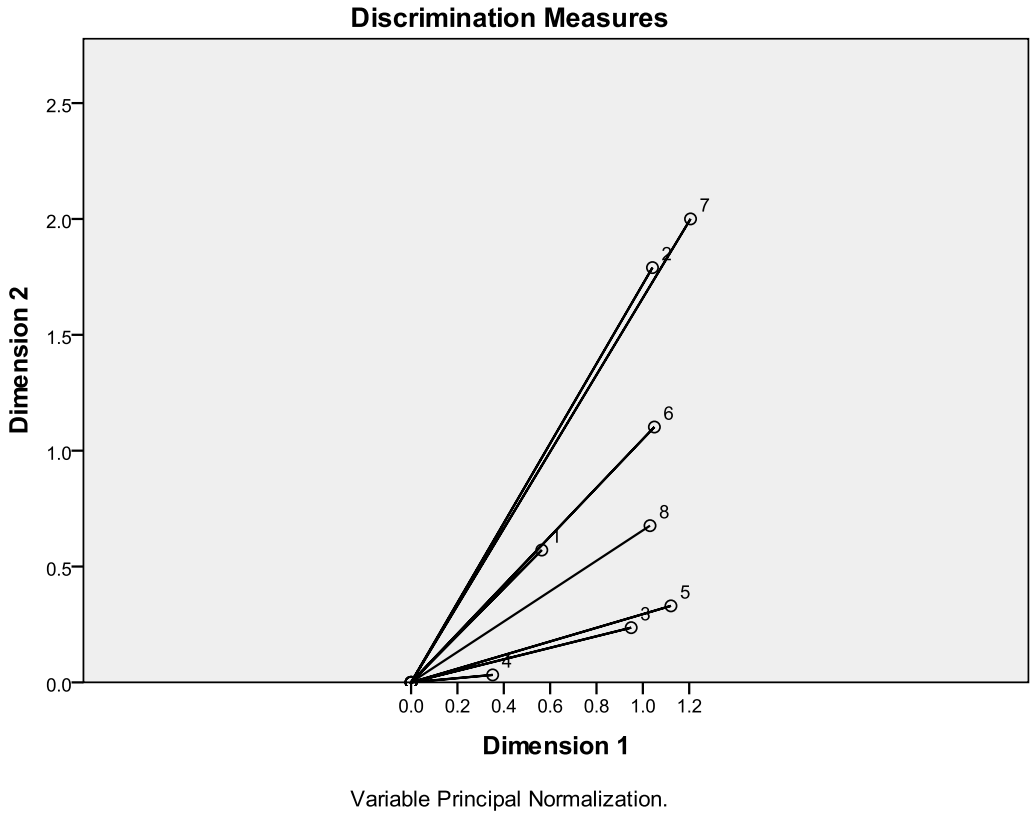


Figure 13: Variable Principal Normalisation – FOSS migration benefits (Source: Interviews)

From Figure 13 it is possible to see that some of these themes may be conveniently grouped together. For example, the two themes of strategy (2- ST) and tangible benefits (7-TB) can be grouped together and can be described as being of a strategic nature. The four themes of skill (3-SK), resources (5-RE), marketing (6-MA) and cooperation (8-CO) can also be grouped together, and can be described as benefits being of an organisational capacity nature. The two themes of training (1-TR) and support (4-SU) can also be grouped together and described as being of a FOSS maintenance nature.

6.10 Interpretation of the Correspondence Analysis results

It is clear from the perceptual map (FOSS migration drivers - Figure 10) that the themes could be grouped together into two groups, that is, technological orientation and management orientation, which largely match the empirical generalisations derived from the content analysis earlier in this chapter. The correspondence analysis, by perceptually placing on the horizontal the values for SH, UA, IT and BC close together suggests that these activities are associated. The themes of CM, MP, CH and IF can also have horizontal and vertical axis values which are close, and thus the suggestion is that these themes are also associated. These groupings may be interpreted as being supportive of both the empirical generalisations and the

thesis derived there from. It is also interesting to note that the correspondence analysis suggests a bi-polarity in these groups of themes. Thus managers may be either technologically-orientated or management-oriented. Correspondence analysis in the current context has been used only to corroborate the thesis, which it has effectively done. Further research is required to test the findings of the content analysis in a more rigorous way and this has been achieved through the use of a discussion panel.

On the other hand, it is clear from the perceptual map (migration benefits - Figure 13) that the themes for migration benefits can be clustered into a number of groups. These are strategic orientation, organisation capacity orientation and FOSS maintenance orientation, which also largely match the empirical generalisations derived from the content analysis earlier in this chapter. The correspondence analysis, by placing the horizontal and vertical axis values for ST, TB, closely together on the perceptual map, suggests that these activities are associated. These two themes have the strongest orientation. The themes of SK, RE, MA and CO have horizontal axis values, which are close, and thus the suggestion is that these themes are also associated. The same thinking applies to the themes of TR and SU that are close together on the horizontal axis. These groupings may be interpreted as also being supportive of both the empirical generalisations and the thesis derived from this (as was also stated previously). It is also interesting to note that the correspondence analysis suggests a triple-polarity in these groups of themes. Thus managers may be either strategy-orientated, organisational capacity orientated or maintenance-orientated. This polarity will thus apply while implementing IT migration to FOSS in the public sector. Correspondence analysis in the current context has been used only to help corroborate the thesis that was developed and by the explanations above it can be noted that it has effectively done so. Further research is required to test the findings of the content analysis in a more rigorous way and this has been achieved through the use of a focus group.

6.11 Conclusion

In Chapter 6 the analysis of the case studies was described and it was shown how empirical generalisations and a framework were developed. The use of correspondence analysis to help authenticate the empirical generalisations and the theory was shown. The correspondence analysis was also used to gain a greater understanding of the data. This was specifically achieved by looking carefully at the configuration of the data on a perceptual map, which helps to verify and assign meaning to relationships and associations between the data points.

The next two chapters address how the empirical generalisations were tested using a focus group of practitioners.

CHAPTER 7

PRESENTATION OF THE THEORETICAL CONJECTURE TO A FOCUS GROUP AND REFINEMENT OF CONCLUSIONS

7.1 Introduction

The previous chapter described how the case study evidence was analysed and how the thesis was developed. In addition the chapter discussed how correspondence analysis was used to help validate the findings of the content analysis. This chapter discusses the presentation of the theoretical conjecture to a focus group. The aim of the chapter is to describe the feedback obtained from the focus group (IT people and public sector consultants) and their reaction to the theoretical conjecture and the framework suggested by the research. The reactions of these expert informants are also interpreted and the conclusions of the research refined. This has taken the form of a cross-validation procedure.

7.2 The Reasons for Using a Focus Group

In order to verify whether the theoretical framework derived from the evidence collected during the case study phase of the research commands support from practitioners in the public sector, it was decided to discuss the theoretical conjecture and the framework with expert informants. The focus group also provided an opportunity to falsify the empirical generalisations which the author generated. Chapter 6, which contains the framework and empirical generalisations was emailed to them for perusal. This was followed by a meeting at the National Treasury where the framework and generalisations were presented and feedback received. This discussion was initiated by the researcher, but he allowed the people to discuss the ideas generated by the research freely because he did not want to influence the outcome of the focus groups. Notes were taken and summarised and subsequently drafted into the dissertation.

The focus group consisted of practitioners and consultants. The group consisted of several persons, that is.

- A person with over 30 years experience in IT, who is currently a Chief Director for IT

at a National Government Department and who has previously worked as an SAP Project Manager for one of the major Parastatal organisations in South Africa,

- An IT consultant in government with over 20 years experience including in defense related IT systems,
- A public technical advisor with over 20 years experience in the education and skills development sectors, with a background in Mathematical Statistics and Computer Science. She formerly served as the chairperson of Council for one of the major South African Universities. She was also Director for Research at a major human science research institute in South Africa,
- A public health expert with over 20 years experience and has previously served as a senior manager in the National Department of Health, with extensive experience in public health management and financing and
- A development planner with over 15 years of experience and who heads a division in a SA public sector entity that provides technical assistance to government departments in the SA that focus on infrastructure delivery and economic development.

The frameworks presented in Figures 6 and 7 present the conceptual outline used to develop the framework and the theoretical framework for IT migration to FOSS in the South African public sector. The empirical generalisations relate to the following IT migration issues:

- migration following a strategic management process;
- migration in response to a need for strategic positioning as defined by top management;
- the business case with matrices for the benefits of migration as a link between the migration plan, the act of migrating and the organisation's strategy;
- drivers as conditions under which migration takes place; and
- the use of mechanistic and organic perspectives of strategic management to explain IT migration to FOSS in the South African public sector.

The people who constituted for the focus group agreed to critically review the document and the framework. The review was in the form of a discussion. As a result of the feedback obtained from these individuals, minor changes were made to the framework.

7.3 Feedback from the Focus Group

The focus group informants were from the IT industry, education, health and infrastructure

and economic development sectors and all have extensive South African public sector experience.

7.4 Results of the Focus Group discussion

Empirical generalisation 1:

- *IT migration to FOSS by South African public sector organisations follows a strategic management process that includes strategic planning, operational planning, implementation and monitoring and evaluation as shown in Figure 7.*

The focus group agreed that the principle should apply as it was stated.

Empirical generalisation 2:

- *IT migration to FOSS by South African public service organisations is implemented in order to achieve a particular strategic position, with financial considerations playing a secondary role. This strategic positioning is identified by top management within an organisation.*

Again, the focus group agreed with this generalisation, but expressed surprise at the observation that the quest to achieve strategic positioning outweighs financial considerations in migration. They felt that this might be a reflection of the types of public sector organisations that were included in the research and that this observation needed to be explored further in future research.

Empirical generalisation 3:

- *The link between the migration plan and the act of migrating to FOSS on the one hand and the organisation's strategy on the other is achieved through the development of a business case for IT migration to FOSS. This business case outlines the performance outcomes and targets for FOSS migration based on the benefits of migration that have been identified through the content analysis as shown in Table 7.*

The focus group agreed that the process above should be followed. They felt that the need to link migration to FOSS to the needs of business within public sector organisations needed to be emphasised. They also felt that the business case should also include the preliminary findings of a feasibility study. They were of the opinion that the reference to the feasibility study during the implementation phase should be replaced with the term 'implementation modelling'. The term feasibility study in Figure 7 was thus replaced by the term

implementation modelling in Figure 14.

Empirical generalisation 4:

- *The context in, or conditions under which migration takes place in order to succeed include responding to all the themes that have been identified as migration drivers, including the business case, a migration plan, change management, hardware and software decisions, IT related decisions, the impact of FOSS and user acceptance as shown in Table 6. These conditions influence and are in turn influenced by the process of migrating IT to FOSS.*

The group agreed with this generalisation.

Empirical generalisation 5:

- *The process of migrating IT to FOSS within South African public sector organisations can be explained by using both mechanistic and organic perspectives of strategic management. The process of migration thus lends itself to an eclectic explanation that borrows from different strategic management perspectives.*

The group agreed with this process and felt that combining both the mechanistic and organic perspectives had facilitated the development of a logical, sensible, easily understandable and useful framework for IT migration to FOSS in the South African public sector that would help demystify the process.

The focus group was satisfied with the findings in general, the theoretical framework and empirical generalisations derived from the framework.

One of the focus group members was excited about the inclusion of the operational planning phase in the framework, stating that one weakness in South Africa's public sector is that people jump from policy making to implementation, without spending time on operationalising the policies that are adopted. She stated that the operational planning phase should be a key phase in any large system change process.

Therefore, no changes were required by the focus group to the theoretical framework created by the study. The framework accepted was thus:

> *IT migration to FOSS by South African public sector organisations follows a strategic management process that includes strategic planning, operational planning,*

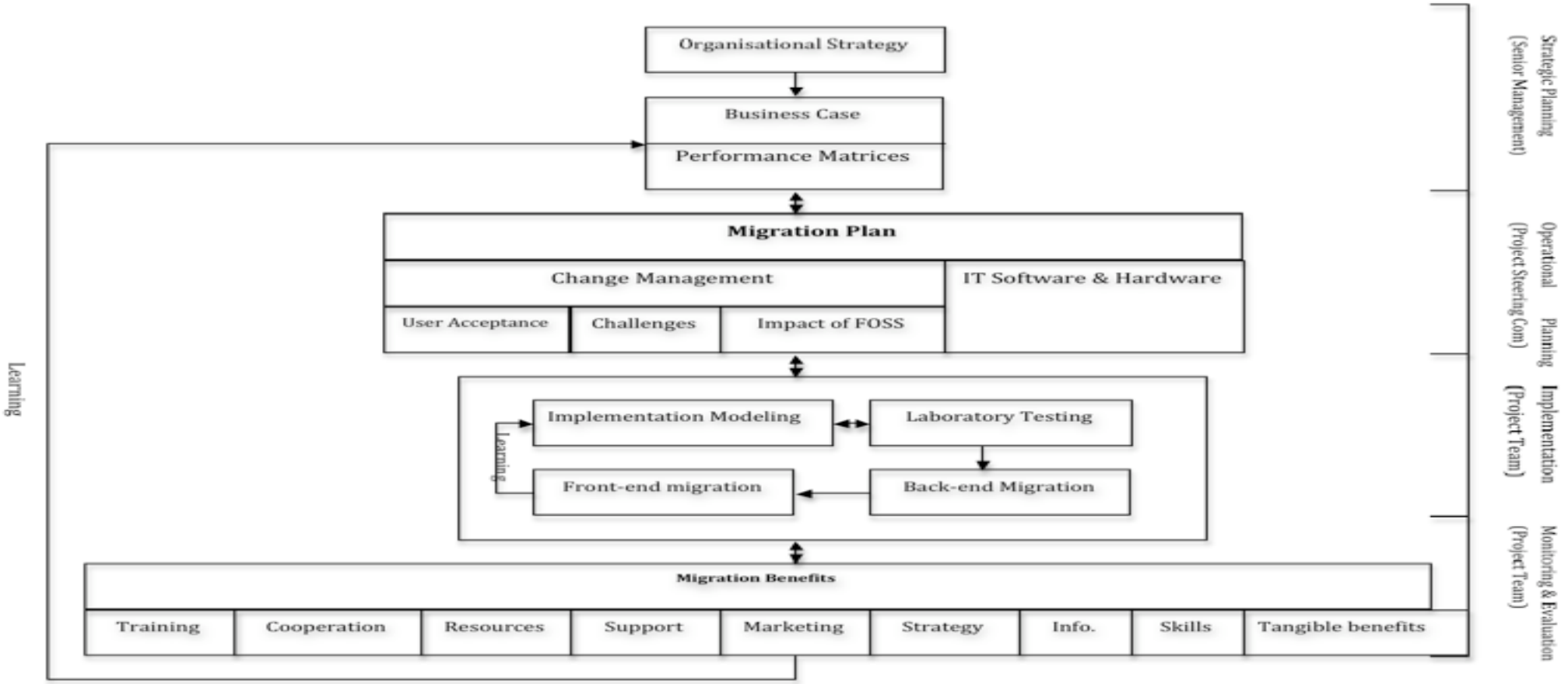
implementation as well as monitoring and evaluation as shown in Figure 7. Within the South African public service, the process of migration is implemented in order to pursue a quest to achieve a particular strategic position, with financial considerations playing a secondary role. This strategic positioning is identified by top management within an organisation.

The link between the migration plan and the act of migrating to FOSS on the one hand, and the organisation's strategy on the other, is achieved through the development of a business case for IT migration to FOSS. This business case outlines the performance outcomes and targets for FOSS migration based on the benefits of migration that have been identified through the content analysis as shown in Table 7.

The context or conditions under which migration takes place in order for it to succeed include responding to all the themes that have been identified as migration drivers, including the business case, a migration plan, change management, hardware and software decisions, IT related decisions, the impact of FOSS, user acceptance and addressing the challenges of IT migration to FOSS as shown in Table 6. These conditions influence and are in turn influenced by the process of migrating.

The process of migrating IT to FOSS within the South African public sector organisations can be explained by using both mechanistic and organic perspectives of strategic management. The process of migration thus lends itself to an eclectic explanation that borrows from different strategic management perspectives.

Figure 14: Strategic Management Framework for IT Migration to FOSS in the South African Public Sector with suggested changes



7.5 Practical Management Guidelines

As well as developing a theoretical framework as to how IT migration to FOSS should be managed, the research also has an objective, which is to create a series of management guidelines which will assist public sector organisations in South Africa in migrating IT to FOSS.

These guidelines have been developed from the theoretical framework as well as from the results of all the different evidence gathering activities undertaken by the author during the research. The 11 principles so formulated reflect all the key elements of the framework further developed in the form of practical management guidelines for IT migration to FOSS.

In order for IT migration to FOSS to be managed in an effective manner, the practitioner should carry out the actions listed below.

1. Ensure that senior management has a compelling strategic rationale for migrating IT to FOSS. This strategic rationale could entail a need to position the organisation as a technology leader, the need to achieve cost savings, or other reasons. The view of strategy as position is supported by Mintzberg (1987).

2. Based on the strategic intent for migrating, senior management should develop a business case that will ensure that migration is driven by business needs. This business case should translate the benefits to be derived from FOSS migration into clear performance matrices and targets that migrating to FOSS will seek to achieve. These matrices should also demonstrate how migrating will assist the organisation to achieve its strategic intent. This is more akin to the Strategy-Structure-Performance (SSP) framework of Chandler (1962) and the concept of fit by Vankantraman and Cannilus (1984).

3. A Project Steering Committee that will drive the migration exercise should be established. Where support for migration is outsourced, the steering committee should include representatives from the outsourced service provider.

4. As part of operational planning, the Project Steering Committee should develop a migration plan. This migration plan should be guided by the business case and should in turn guide the ongoing refinement of the business case and organisational strategy as various practical issues become more apparent. Components of the migration plan should include plans for managing change, securing user acceptance for highlighting the impact of

FOSS to all in the organisation. This plan should also address the timing of the migration based on when proprietary software licences expire and when hardware reaches the end of its useful life. The reciprocal influence between strategic and operational behaviour is in line with a model for strategic management that was developed by Ansoff (1987).

5. The management of the change should be done in a formal manner and should be managed either by a Project Steering Committee or by a change management committee consisting of representatives from users and senior management. Change management should target both senior management and users across the organisation.

6. The implementation of the migration should be managed by a project team and be preceded by an implementation modelling exercise. This exercise should include an assessment of all the applications that the organisation is running and the identification of FOSS alternatives for proprietary applications. This should be done through the establishment of a test laboratory. This view on implementation modelling is in line with the findings of Mtsweni and Biermann (2008).

7. The laboratory should also represent a place where users will be allowed to familiarise themselves with various FOSS application at their own leisure. This will contribute to user acceptance as users realise that FOSS is easy to use and has the same or better functionality as the proprietary software they are accustomed to. User acceptance should also introduce users to the philosophy behind FOSS and the fact that it is based on the concept of freedom of speech. This is in line with the socio-cognitive perspective of Elliot and Fu (2008) that suggests that a better understanding of a technology by users supports adoption.

8. The different functional units of an organisation should be encouraged to appoint representatives who will test FOSS applications that are relevant to their unit’s needs and sign off on each application that passes the test.

9. Migration can either be done in phases from the back-end to the front-end or simultaneously depending on the size of the organisation and the complexity of applications that are used in the organisation. Smaller organisations with less complex applications can migrate both the back-end and front-end simultaneously. Mtsweni and Biermann (2008) report on gentle migration routes recommended by German Federal Government migration guidelines.

10. A mechanism for noting the lesson arising from actual migration and ensuring that these

feed into the ongoing implementation modelling exercise should be put in place in order to ensure that insights from migrating inform the modelling process. This is line with the Social Learning Theory of Strategic Management (Ginter and White, 1982)

11. Monitoring and evaluation of the migration process should be an ongoing activity that focuses upon tracking the extent to which the benefits of migrating are being produced. Insights derived from monitoring and evaluation should feed into the migration process as well as to the overall strategy of the organisation through adaptations to the business case (Ginter and White, 1982)

It is clear that such a practical management guideline requires considerable time and resources. Also top managers need to be committed to ensuring that all concerned promptly comply with these guidelines, and that certain people do not become side-tracked by departmental issues. In applying the guidelines suggested, many organisations would have to face change management that includes needs to change the organisational culture.

7.6 Results of the Presentation to the Managers

Senior managers from two of the four original case study organisations were approached to discuss the theory, models and the practical management guidelines. The correspondence analysis figures were also shown to these senior managers in order to validate the results of the content analysis for FOSS migration drivers and the FOSS benefits identified.

7.6.1 Organisation no 1

The presentation was made to one of the ICT sector organisations that participated in the case study research. The senior manager indicated their agreement with the framework and that they found it to be a useful tool to support management decisions in relation to IT migration to FOSS. They considered all the elements of the framework as it applied to their organisation and felt that nothing in it or in the management guidelines should be changed. They indicated a need to present the framework to a wider audience of public sector managers, especially ICT managers in order top support broader and quicker adoption of FOSS within the public sector. They also indicated that they appreciated the level of rigour with the study had been approached as demonstrated by the results of the correspondence analysis. The senior manager also indicated that he served on the Government Information Technology Officers' Council (GTOC) sub-committee on FOSS and that he would actively lobby this Council to

consider making use of this framework to advance the objectives of the FOSS policy in South Africa.

7.6.2 Organisation no 2

The second respondent was an informant and senior manager from a case study participant organisation in the Arts and Culture sector. He expressed satisfaction and excitement with the framework and management guidelines. He stated that the framework would assist in dealing with resistance to FOSS adoption in the public sector. The respondent stated that most resistance emanates from ICT managers in the public sector who are averse to trying new technologies. The respondent reported that he had been invited by the GITOC to make a presentation on how his organisation had managed migration and their experiences with utilising FOSS. He indicated that he would request permission from the GITOC for the author to present the framework for IT migration to FOSS at the same meeting. He indicated that he would forward more comments on the framework and guidelines should this be necessary.

7.7 Summary

There are numerous opportunities for IT migration to FOSS by South African public sector organisations. Migration is also supported by government policy but has been slow to be implemented. A strategic management framework for IT migration to FOSS will assist public sector organisations in South Africa to manage migration effectively. The theoretical framework suggested by the case study research is perceived to be useful and the framework suggests a list of principles which will assist organisations in migrating their IT to FOSS.

CHAPTER 8

CONCLUSIONS
LIMITATIONS OF THE RESEARCH AND SOME ISSUES FOR FURTHER RESEARCH

8.1 Introduction

The aim of the research was to investigate IT migration to FOSS in South Africa, develop a theoretical framework and to ground the theoretical framework through answering the research questions set out below.

Main Question

How can a framework be developed to help manage the migration to FOSS to ensure less impact on the strategic plan?

Sub-Questions

- Which factors are important in ensuring that government departments in South Africa succeed in IT migration to FOSS?
- How do the factors that are important in ensuring that South African Government departments succeed in IT migration to FOSS interact with one another?
- How do the factors that are important in ensuring successful IT migration by South African Government departments contribute to such success?
- How will the framework be compiled to ensure that the migration can be successful?

8.2 Conclusions

The conclusions of the research are considered under the headings of the research questions listed above.

8.2.1 Which factors are important in ensuring that government departments in South Africa succeed in IT migration to FOSS?

Factors that are important in ensuring that government departments in South Africa succeed in IT migration to FOSS include both drivers for migration and the benefits of migration. The drivers for migration include change management, migration plans, software and hardware considerations, user acceptance, Information Technology considerations, the challenges of migrating, highlighting the impact of FOSS and the business case. The benefits of migrating to FOSS include training, benefits to the organisation's strategy, skills, support, resources benefits, marketing, tangible benefits (e.g. communications), cooperation and information access.

The drivers for migration represent conditions that precede migrating and that support public organisations in migrating effectively. Migration benefits are factors that occur as a result of migration. These benefits are used as measures of effective migration through their translation into performance matrices.

8.2.2 How do the factors that are important in ensuring that South African government departments succeed in IT migration to FOSS interact with one another?

The interaction between the drivers for migration and the benefits is managed by following a strategic management process. This process entails four distinct yet interrelated phases, viz. strategic planning, operational planning, implementation and monitoring and evaluation. The nature of the interactions between the factors that are important in migrating IT to FOSS is complex, non-linear and reciprocal and these interactions are best explained using both mechanistic and organic perspectives of strategic management. These factors are also managed at different levels of the organisation.

8.2.3 How do the factors that are important in ensuring successful IT migration by South African Government departments contribute to such success?

The mechanism through which the factors that are important in migrating IT to FOSS in the South African public sector contribute to successful migration is through focusing the organisation on the key critical success factors. The significance of organisational learning and adaptation as important aspects of successful migration is highlighted by the interactions amongst these factors. Success is also facilitated by an understanding that the nature of

interactions amongst these factors and the outcomes thereof are often unpredictable. The management of such interactions therefore requires organisational flexibility as suggested by the conditional/consequential matrix.

8.2.4 How will the framework be compiled to ensure that the migration will be successful?

The theoretical framework for IT migration to FOSS is guided by an eclectic use of strategic management perspectives. The development of the framework borrows from both mechanistic and organic views of strategy. These perspectives are used in a manner that highlights their complementary nature. Such an eclectic approach enhances the explanatory power of the framework and contributes to enriching the field of strategic management.

The framework can be used to guide South African public sector organisations that want to manage the process of migrating their IT to FOSS. The framework also allows for some flexibility in terms of its application. The framework takes cognisance of the role that organisational context plays in IT migration to FOSS.

The above research questions were also answered by the framework shown in Figure 7 and adapted in Figure 14.

8.3 Limitations of the Research

As was mentioned before, the aim of the research was to investigate and develop a theoretical framework that is grounded in data on how public sector organisations in South Africa manage the migration of their IT to FOSS. Why and how questions require a primarily qualitative approach to the research. Qualitative research is especially subject to bias, and the author tried to minimise the bias through the use of different data sources, including interviews, documents reviews and observations. In addition, a multiple case approach was adopted. However, bias cannot be totally discounted.

The technique of content analysis, which is an important element of the research, relies on the principle of manifest content categories. These are concept groups which the researcher selects from the data. The author selected these groupings and therefore, the choice is subjective. It is possible for another researcher to choose different manifest content categories and thus derive a different thesis or theoretical framework. The author was aware of this level

of subjectivity and bias, and looked at the evidence from different perspectives in an attempt to reduce it.

The sample used for the case study research could be challenged on the grounds of its representativeness of the universe of organisations that have migrated their IT to FOSS in the South African public sector. To counter this criticism, the author wishes to emphasise that the purpose of this study was not to generalise to a population, but rather to a theoretical framework. This focus makes the choice of working in four public sector organisations acceptable. The framework has been developed in such a way that it would be possible to test its generalisability to a population of public sector organisations in South Africa at a later stage. Later studies could also be conducted to test whether this framework could be applied to public sector organisations in different parts of the world.

The research also limits its focus to internal organisational factors that impact on migration and does not consider factors that are external to the migrating organisation. Amongst such external factors are social, economic, political and legislative factors that may constrain and/or support IT migration to FOSS. It is acknowledged that these external factors play an important role in determining the effectiveness of migration. They have been excluded from this analysis due to the time limitations associated with PhD research. Future research could extend the framework by integrating these factors.

As previously explained, the author decided to focus on organisations of whom it was reasonable to expect to learn how migration to FOSS can be managed effectively. This meant that no attempt was made to try to learn from situations in which IT migration to FOSS had failed. The main reason for it is that, although the author believes there is often much to be learnt from situations of failure, he does not believe that there is often as much to learn from such situations as there is from observing success. In any event it would have been more difficult for the researcher to be taken into the confidence of individuals in an organisation when they are describing a situation in which they think they have failed.

The final validation procedure through a focus group discussion is regarded as useful in that it confirmed the usefulness of the theoretical framework to practitioners.

Finally the research programme concludes with a set of principles which may be applied as practical management guidelines, and which actual practitioners have identified as being useful. This provides a justification for the research in that the results of the study have produced a theoretical framework and a set of principles which may be included in an

organisational level management process of migrating IT to FOSS within the South African public sector.

8.4 A General issue

Generally a great deal of interest has been shown in the subject of IT migration to FOSS within the South African public sector. All those who have participated in the research, including participants in the focus group discussion, were enthusiastic about the subject. Many of them were pleased to be involved and expressed their acceptance of the framework and the empirical generalisations derived from it.

The results of the focus group discussions and the presentations to the practitioners also revealed that there is still some skepticism about the value of FOSS in the public sector. This skepticism is counter-balanced by a growing number of practitioners who support FOSS migration and who are prepared to work actively towards its adoption by the South African Government.

This research represents an original approach in South Africa and internationally to the strategic management of IT migration to FOSS in the public sector. No other similar research, using the approach adopted in this study exists. It appears from the research that the strategic management constructs of strategic planning, operational planning, implementation and monitoring and evaluation are best dealt with in an integrated and holistic manner as part of one open system.

8.5 Issues for Further Research

There are many opportunities for further research in the field of IT migration to FOSS. As previously suggested, future research could focus on testing the applicability of the theoretical framework to the public sector in South Africa and elsewhere in the world. Its applicability to private sector organisations can also be tested. In this way, the framework could be extended from the substantive area of South African public sector to a formal theoretical framework for IT migration to FOSS that is generally applicable.

The focus of this research is on understanding the factors internal to organisations in IT migration to FOSS. There is therefore scope to extend the framework through the integration

of IT migration factors that are external to organisations, including the political, economic, social, technological and legislative/ regulatory factors.

As more and more public sector organisations migrate their IT to FOSS, it would be interesting to assess the extent to which the benefits of migration are realized, and how these impact on the internal conditions of organisations as predicated by the conditional/consequential matrix of Corbin and Strauss (2008).

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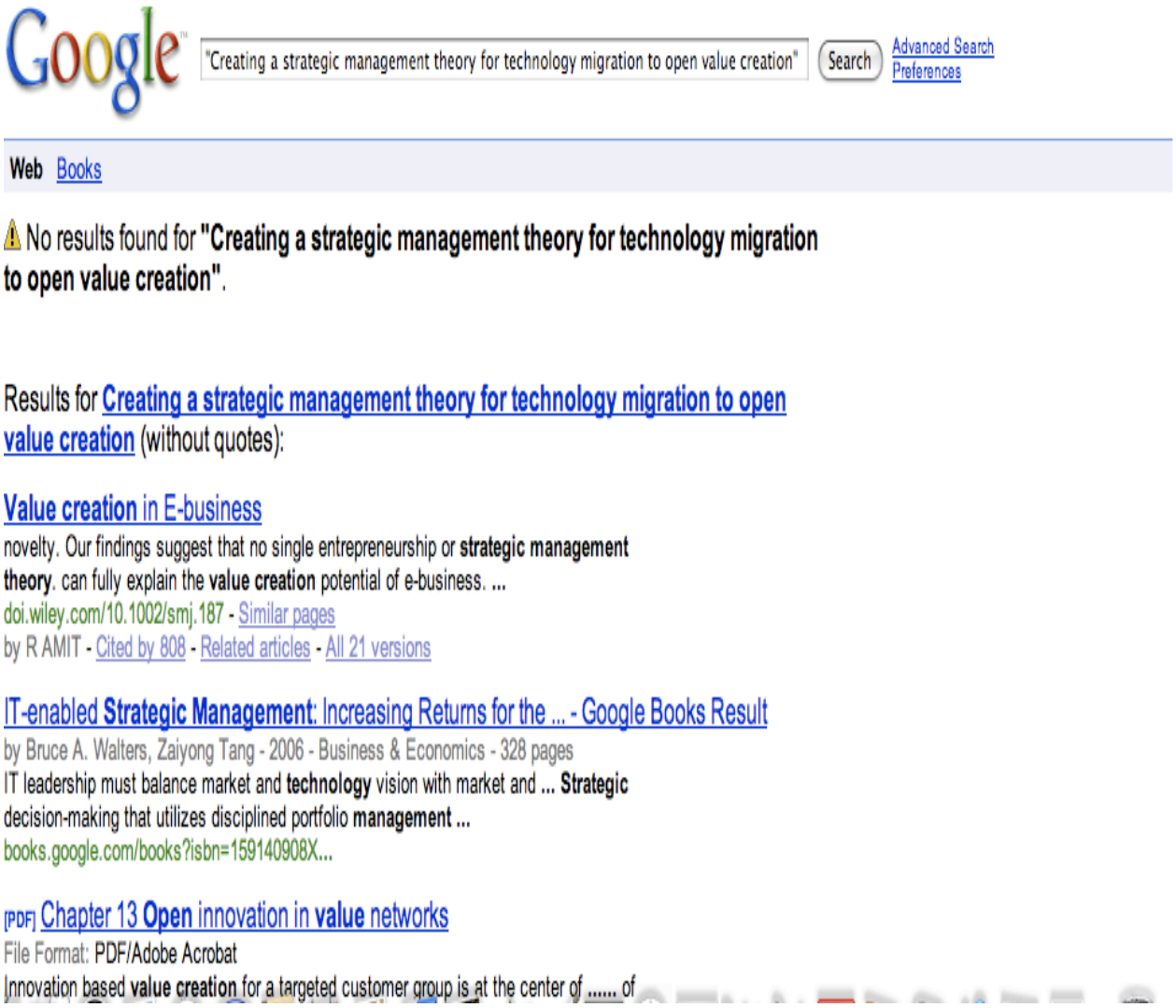
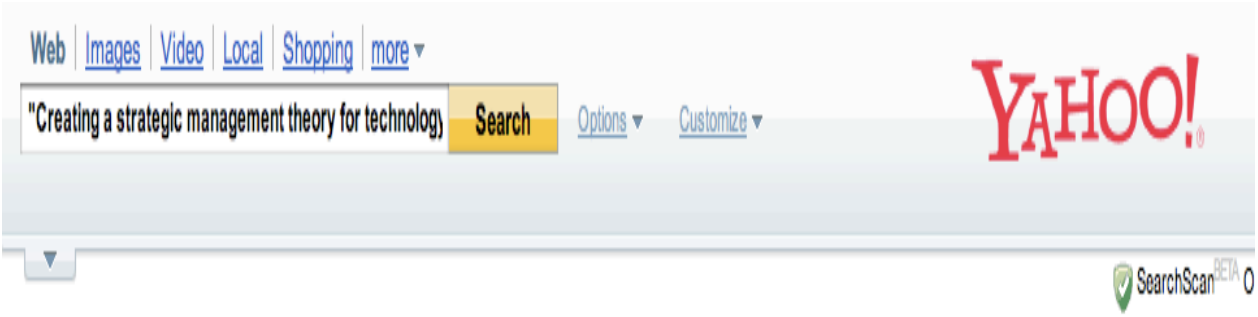
APPENDIX 1

SNAPSHOTS

The search engines used are GOOGLE, YAHOO, PROQUEST, ACADEMIC ONE FILE, and EBSCO HOST.





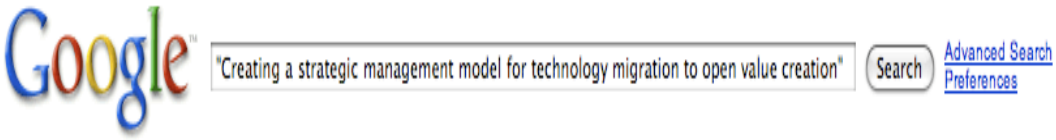
We did not find results for: **"Creating a strategic management theory for technology migration to open value creation"**. Try the suggestions below or type a new query above.

Also Try: Creating a strategic management theory for technology migration to open value creation (quotes removed)

Suggestions:

- Check your spelling.
- Try more general words.
- Try different words that mean the same thing.
- Broaden your search by using fewer words.
- Try asking a question on Yahoo! Answers

For more helpful tips on searching, visit the Yahoo! Search Help Center.



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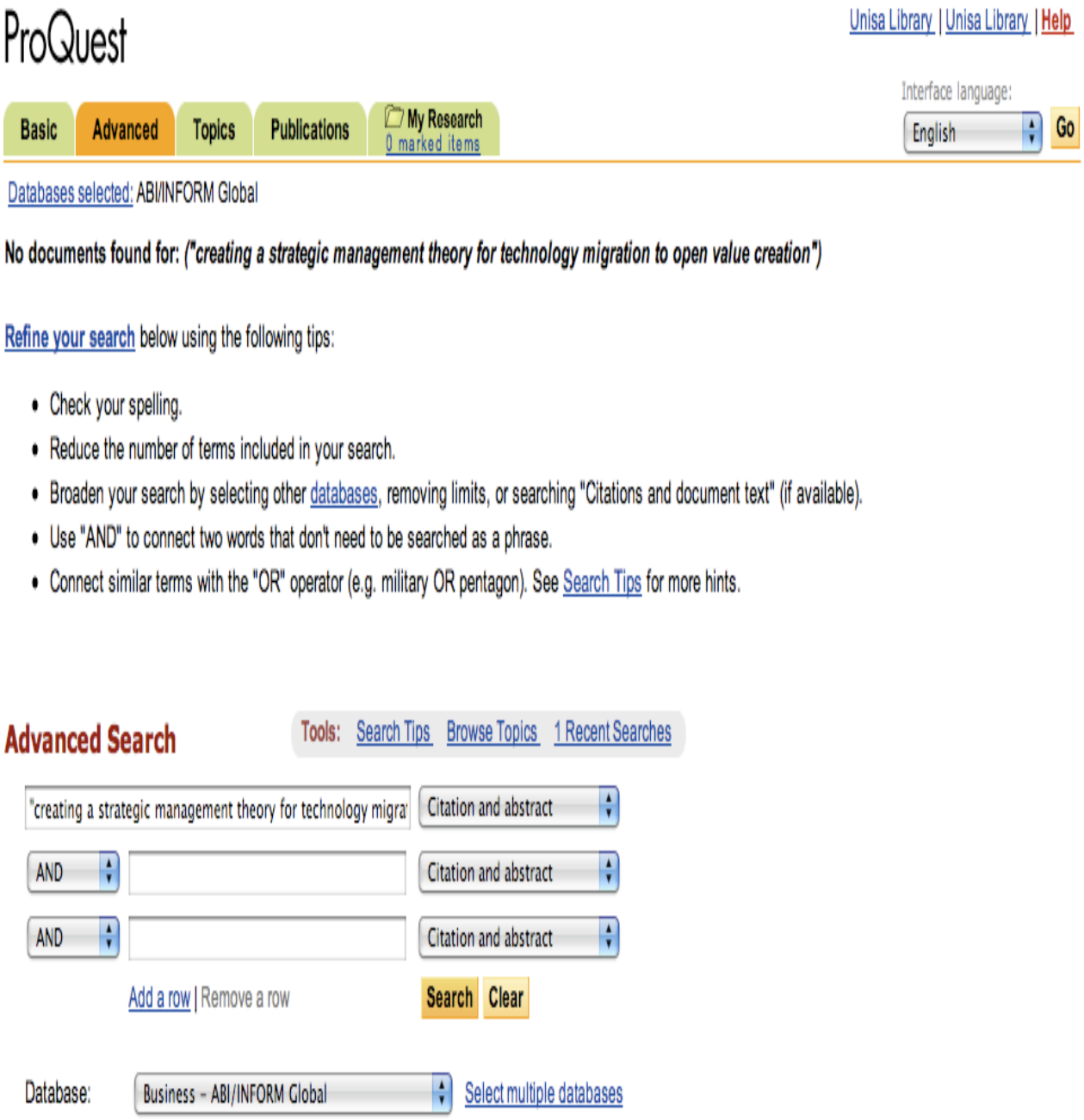
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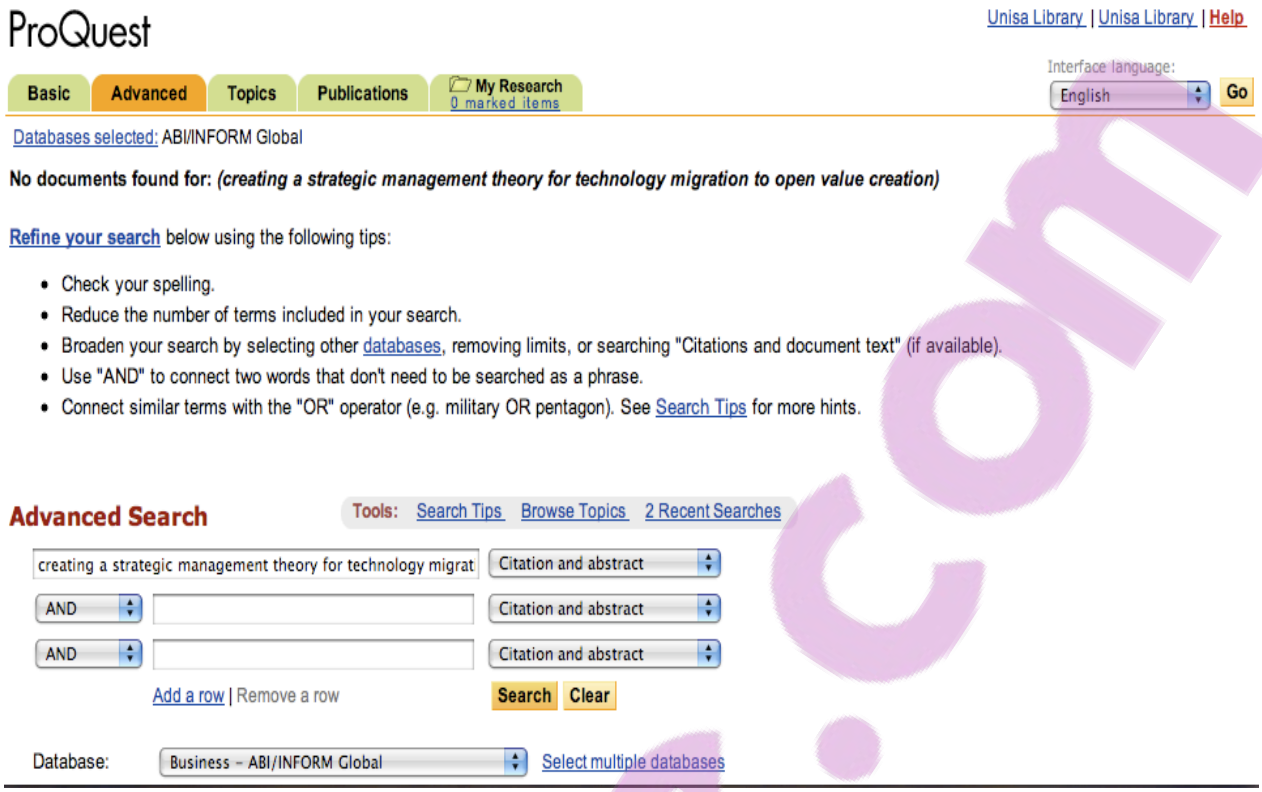
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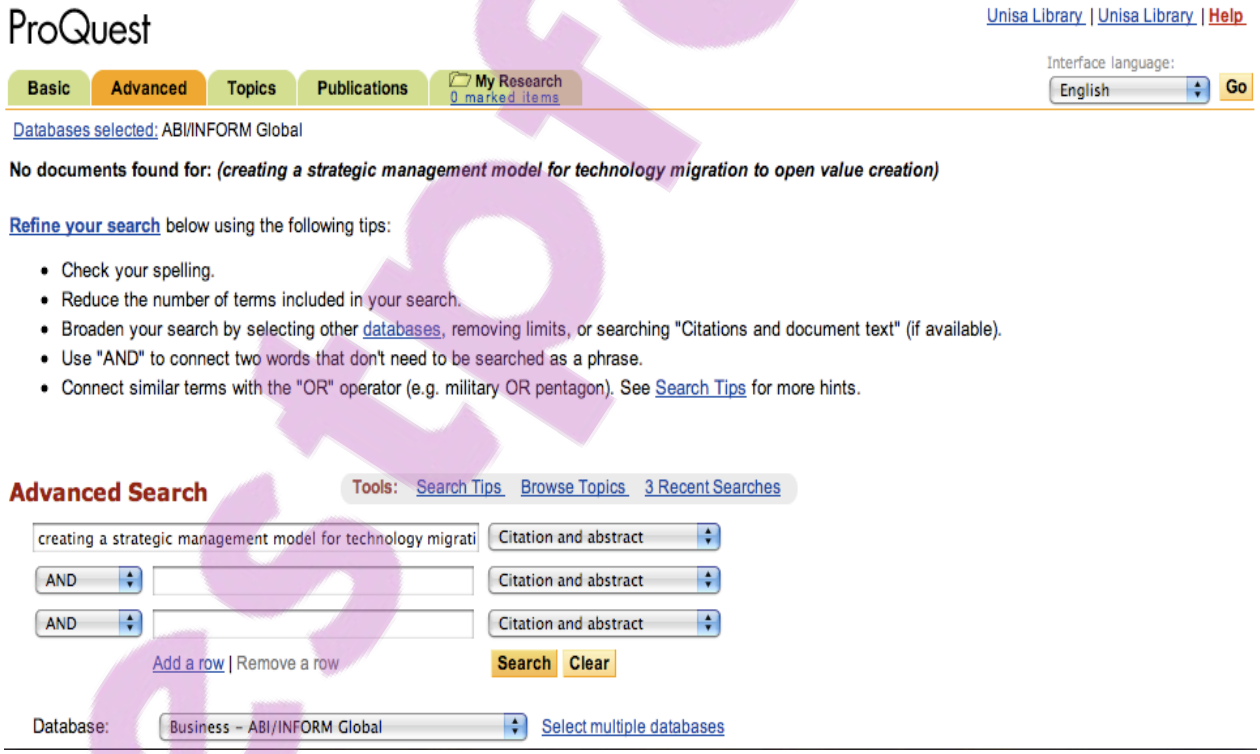
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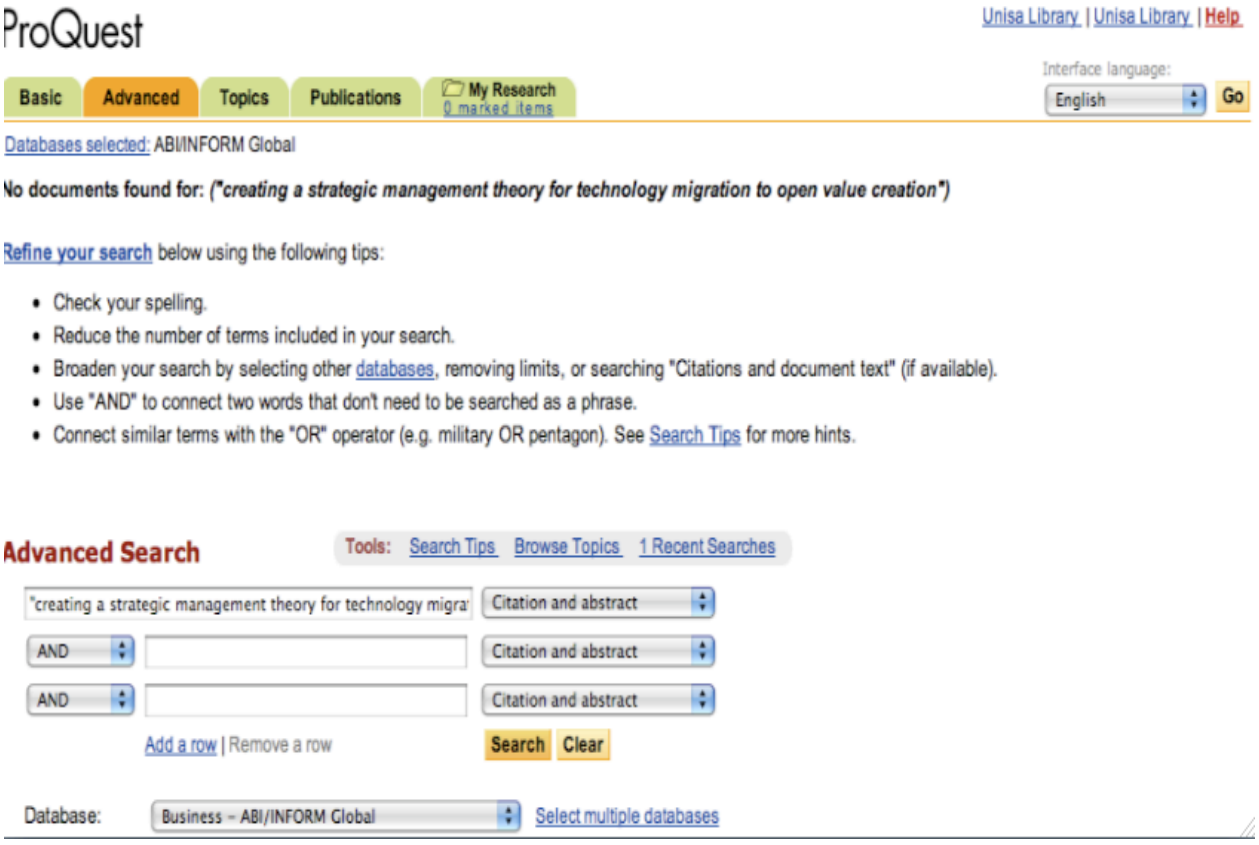

APPENDIX 2

INTERVIEW TRANSCRIPTS

In the following transcripts, the text in bold italics is questions and comments from the interviewer. The rest of the text is responses from the interviewees.

TRANSCRIPT 1:
INTERVIEW WITH KHUTSO NGWASENG (03 JUNE 2010) 12:00
BCX ICT EXPERT (SUPPORTED THE PNC on ISAD WITH MIGRATION)

Managerially and technically shocked at implementing any major systems in government, but it's not my choice to work with SITA.

Its unfortunate if the organization in government that is supposed to be behind this thing is a stumbling block,

At one point my former boss was talking to some gentlemen at Treasury because Treasury was trying to aggregate some costing and pricing so that they can own it as an asset and take it out into government especially to cab IT spend, you'll realise throughout your project that these stats vary as to how much is spent on IT in SA.

Give a little bit of a background of your involvement with the PNC, when did it start, what did you support them with, which element of migration did you help them with?

Uhhm I'll answer that question from a company view and from my personal view. Starting with the company, PNC was engaged in 2006 under Impi Linux, and as the PNC by definition they were supposed to take the lead in terms of open source migration, given that this is what the PNC advised the Presidency to do, so it made sense to get into that. They were migrated around September 2007, back then they were migrated under Impi Linux. It comes from enthusiasts who built a local distribution. And then around 2003, and then they were engaged by Mark Shuttleworth about the same time. Mark wanted to put money into Impi Linux and take it over as a distribution. He had a problem with some of the guys on the team. At the time he was evaluating Impi Linux, and another solution, Debian. He spoke to the leader of the Debian project at the same time while engaging Impi. Impi was using another version of Linux. So when he engaged with them he wanted them to move from their current architecture into the Debian architecture and they refused to do that and that's when

he started ubuntu. And then at the same time impi Linux started formalising as a company. He later came back to take over impi Linux as a company that was to be responsible for the distribution of uBuntu in SA and the distribution model was drive by, we will take a Linux solution in this case ubuntu, we will customise it and put it in the environment. And there were several private sector companies that did that, things like identity management, configuration of mail and that, all this would be built into a single distribution system and pushed forward such that what you have is, Impi Linux – uBuntu – and the customer. And essentially when updates or software comes out of ubuntu or any other supplier like colab, Open Office, sun Microsystems would be aggregated into impi Linux into the customer. That required that you customise the customer base. That made our solution partly open source. So that is what was initially implemented at PNC. So that's when we engaged into the PNC. I joined after this government's seemed very serious about open source at the time they had deadlines about migrating to open office, getting rid of internet explorer etc. So as Impi Linux was beginning to grow at the same time Mark Shuttleworth was losing patience with the company in terms of revenue returns. This did not bode well for impi Linux. That's when BCX came into the picture and took over impi Linux as a going concern from Mark Shuttleworth. So they took it over as a going concern, settling Mark Shuttleworth's stake in the company and that's when we started looking at a new service model. And the service model was based around offering national support, which was the biggest problem around open source. Now we could offer national service support, we could put a trusted established brand behind the whole thing. It was good, ehh, that's when I joined Impi Linux in May 2008, just after they were taken over by BCX. I was recruited by the Impi guys but it was at a transition, so when I joined I joined Impi. When I took over the PNC account it was at a time they started realising the level of stability, they did not grasp the levels of their SLA, we also just too busy getting the hang of being in BCX and getting the hang of Open Source. Long story short, within BCX, Impi Linux was not so successful, it was closed down, we did not get the support we expected.

From BCX, for Linux? Yes, ***Why is that?***

Well first of all I think that BCX did not understand the product they had procured. Secondly the entrepreneurial leadership was lacking from the management of Impi Linux as a business unit, from BCX side. So the guys that were put in charge for that division were not entrepreneurial around Impi Linux. We also struggled to integrate into BCX's operations. So BCX works on the basis of get a business and prepare the skills. We can't do that if you are a start up, especially if you have a new technology. You build the technology, you sell the

technology and you grow. Which is very different, the model was in conflict. The thing is we did not get access to the sales team, the Ferrie Glen team. Isaac, huh, Isaac.

It did not work?

No you see, because of organisational design, if you bring in change you need the executive to lead the change, you need them to act what they preach, so they did not have that. That was missing. That did not stop us from progressing as a company. By December 2008, we had a company of DOC of R4 million from SITA and another R3 million training in the pipeline, with SITA. But at the same time BCX went through its own restructuring. When that was happening, we lost out as Impi Linux, we lost in that tumble, we were essentially liquidated. We dissipated as an organisation and I was moved into the support space. So that led into a situation where we were just stripped of all the resources we needed for competing. We have since reshaped the context of my role at BCX with mixed outcomes because coincidentally at that restructuring was happening in government who were the primary customers for Impi Linux. I remember I was auditing DPSA and GCIS and I was doing, uhh a trial at SITA while I was also bidding for another business at SITA around mail collaboration. And then the one day that those 8 ministers resigned, I lost all those contracts literally within an hour. Well people were just calling and saying there's change, can you take your auditors out, we don't know what they are doing here.

You had contracts? Yeah***. Well how do they just get out of contracts?***

Well, that's an organisational thing that if you're BCX it's not easy to sue government.

Because you depend on government for contracts?

Logically it should happen but it never happened.

You check which side your bread is buttered?

Yes, that's the price you pay. It was serious, so that was the kind of challenge that we ran into in terms of that. So when that happened and the same time, immediately after that, well within months there was Polokwane, after Polokwane, the dismissal of the President, and everybody, outside the world cup, everybody has used the change in government as an excuse not to do what they ought to do, and that's my opinion. Or to avoid all the difficult things they needed to do, that is my opinion in essence.

They used all of that as a scapegoat not to do anything

Yah, of course there are other projects that were issued, home affairs grew from R2 billion to R4 billion, and now we know, now we know how, we know why, you see, all those things. Again from a strategic view, when you look at the Linux ecosystem, is that to an extent the initiative to move into Open Source was a strategic messaging and stakeholder communication from government, they thought to have about 1.5-1.7 million end users in government. We estimate that the cost is around R2000 a year on software per user, we also know that, ehh, government has a mandate to change its hardware every 3 years, under the argument to stimulate the hardware and IT industry in SA. We know that's rubbish. Even if they do it we still know it's rubbish, because the SA IT industry is that they buy overseas and resell in SA at rates of about 7% commission, okay, so we know that's crap, but we know it has an implication, the implications of using OSS within those environments. Contrary to what government says, government is not interested in saving money. We estimate that they spend about R20 billion on Micro Soft only per year. Roughly that's money that goes out, cheques signed and gone.

There must be lots of vested interests also

There is lots of vested interests, we know that there are classified documents out there where. The Minister signed 3-year deals between Micro Soft and DPSA to supply government with software just before she resigned. We also know that she purported herself to be a proponent of Open Source. I still have a recording of her at the 2008 Govtech conference. So you get a whole lot of lack of strengths. If you go to procurement, the policy passed by parliament states that you shall evaluate a solution provided by Open Source before you procure, this does not happen. Very few departments have laboratories. Even SITA does not have laboratories to evaluate the software. We know that for you to even get a trial with them. They tried to get vendors to do it for free, but they were not willing to protect the vendors' intellectual property, to the extent that they said they could go to market with this solution, now SITA going to market itself, has its own dynamics.

That thing was R900 a piece, it is my opinion that it is not in the interest of hardware vendors to reduce can't - hear - specification in their cost because you are talking about people procuring laptops at R8 000-R9 000 a piece to people procuring able to buy R1000 laptops. So I thing that the challenge for the adoption of OSS goes beyond the government's will, industry's ability to support it, industry's willingness to develop the skills to support it, I think this goes through the entire ecosystem, and indeed in evidence you see it in the hand held devises, where people are using Open Source in order to fight a very serious battle in

the Open Source environment where in the mobile operating system environment, where you Google coming up with the android, Nokia going Open Source with the Simbian, uhhm in order to confront RIMS blackberry, iPhone and, Windows. You can see it has cost windows its market. In a short space it has cost Windows its market. So I think that the dimensions that contribute to Open Source adoption are multi-dimensional, which is a good thing that you are approaching it from a strategic view because your mind is much more open to analysing it from a business perspective than just the technical perspective.

This is very fascinating. Now let's come to the PNC if I may, you supported them and they successfully migrated their desktop and their server environment. What factors would you say were responsible for the success of that organisation?

First factor that was successful was the definition of PNC itself. It was the technical leaders of the time as the council responsible for advising the country. The compulsion for them to define themselves through this particular migration. One of the directors there, Khulu, while we were still doing assessments, she eventually told Mike, listen, move to Open Source. That was that, so again that talks to the role of management. That was the first thing. The technical implementation itself was expected to work because Open Source works. That is not the question, so could it technically be done? Of course. Could it be done sooner? Of course. Could it be done 10 year earlier? Yes. The technical solution always works. The technical solution is simple. If you do the worse implementation of Open Source and Linux, which is taking CDs and putting them in a machine and installing, you'll still have a working environment. So that is the one aspect of the PNC. Those are the two major things that made it succeed. Other than that, user training, …user training was rudimental at PNC

Did you also help them with training?

Yes, but it was minimal, and entailed just showing how these things work.

So what were the aspects of this course, what did they do?

It was showing them what is different, the whole idea was to make people feel better about using it. Like I said, Open Source works and when I say works I don't mean the technical aspects only. Using it is also very intuitive, contrary to what people believe. So that is I think what fundamentally drove PNC into being a success. Its size as well also helped us a great deal because linked to the political will was the fact that the political latency was lowered due to the size of the PNC.

It's relatively small, is that what you are saying?

Yes,

So it was not really on the radar screens?

I believe that the implementation of any system, the success is inversely proportional to the number of political stakeholders. So in case of the PNC there was minimal such.

So it allowed them to do their thing out of attention and so on?

And there were no conflicts, you satisfied the Chief Director of the Department of Communication who is responsible for the PNC and that sufficed. You did not have a CEO who had his own interest and had to protect his development team who had to protect their infrastructure team who then had to talk to Treasury who then has to look at budget cuts and changes in those and motivations etc. That made things a lot easier.

But sure you must have experienced some difficulties, however minor, in the process of migrating them, what were those?

I just did the migration now of moving them into a later version of their operating system environment. I can only speak from that experience in terms of difficulties, and I don't care if it goes back top Mike because I've told them so many years ago. My number one challenge with PNC is the ability of its IT department. Sigh…it's a mine job working with those guys. I started using Linux in 2007 full time, and even when I went for impi Linux my role was more business and project management and business analysis So I was involved but it was technical, but I can tell you now that in that time I have acquired more ability than that team put together. So that is a problem. That is a massive, massive, massive problem. In that I cannot pick up the phone and say can you back up the server. Can you move that server from one hardware onto another? Something is wrong with the system, can you find out what it is? Can you tell me what the log files say? These are simple, simple things. I'm talking about one-liners here.

These are people with an IT background?

These are people with an IT background, their job is to get good at this. They've received training. That is in my opinion the top. Then when you remove it from the technical aspect and taking to something like change management, when we were moving all the other things it was easy, it was in the bag. The upgrades etc we had to work at night and the reason I did that is that I did not want them to do it and cost me a month. So there was a bit of duality, when I went into the project I thought I will do a skills transfer. Within two days of engaging

these guys, I asked one of them to change biosettings and they could not, then I had to drive all the way from Johannesburg to change a biosetting. I decided okay, I need to finish this project, just do it. When we did the mail which was the most visible, I came across and said communicate with the client about the change, and they did not, and now, when you do something like, …in Open Source what we discovered is that change management, that is, user training, marketing and mindset modification, just basically getting people to start thinking, like moving the subconscious into Open Source and getting them engaged and excited about the changes that are happening in the organisation. We reckon it is responsible for 70% of the success of the project.

So if you can get these things right?

If you can get that right, Open Source works, that is not the question, it works, we know it works because Google works. We know it works because Amazon works. We know it works because the New York Stock Exchange works everyday. We know it works because Google Android works. We know Open Source works, that is not the question. The question is that is what fails. I will put my entire career on it. That is, if in my opinion, if you are going to come out with a methodology here, that will be the gist of the methodology.

So that is where the focus should be? Taking people along?

Communication, feedback, getting them along, changing them, creating stories around Open Source, molding them, putting them in their hands ***Let them use it****?* Yes, yes, that is the bulk of the change. Indeed if you look at other changes, client server changes, ERP changes and all sorts, the emphasis is not whether those things work. We know they work because the spreadsheet works, and if they don't work you just stop and say use this spreadsheet. But the whole idea is getting people to use it, getting policies around them, discontinue previous systems and so forth. In the case of PNC they did not do that and it cost me because I had to reverse the implementation of mail at least 4 times. Now, what does that mean? It means I spend the week literally from Monday to Sunday moving new mail from the old system into the new system. Then the system goes live on Monday, and then the customer sees it, they log into the email, they see some new interface or some mails are missing, …yah thing does not work, stop there. You see

So you have to move stuff back again?

Yah, because they are not ready. We know the system works because it's receiving email, it's sending email. We know it works because its been growing universally. The problem is here, you see.

So it's more around change management processes and dealing with people?

Yes, ***Or helping them to move across in a smooth way?*** Yes

It goes beyond that because the problem with things like changing people's desktop, and I warned them against this. When people start using mail these things become automatic processes in their heads. Just like when you sms, people used to sit down and sms, using 2 thumbs they will complain about the key pad being too small for their thumbs. Now people sms while they are driving. They are not even looking at the keypad, okay. The problem with changing things like email and the desktop is that people suddenly get aware of the ecosystem again. They are aware of IT service, they become aware of their desktop again.

And people don't want that?

No, it's not whether they want it or not. When that happens, humans are intelligence beings. They survive on intelligence. They start questioning and when you don't have answers that are plausible or when you are not prepared to emotionally support those who are afraid and so forth, and you become overwhelmed yourself. I mean the guy would be overwhelmed and say hey muna people can't see their emails. Then you ask, did they look in their inbox? ..Oh yah eish, …he muna this one called yesterday and said his mail is missing. Yes his mail is missing because the synchronisation started on Monday, so the last person who was done on Friday his email won't miss but the one who was done on Monday will miss email from Monday to Thursday. Okay…oh yah but they need it now! But the old one works, but here is a problem, that's 2 calls, when its 20 calls you are not prepared for it, when you did not go out to advertise, this is the change, these are the frequently asked questions. When you are unable to support that, so the problems I had there were from that IT team. It was not only technical but it was also the lack of development. I should have anticipated it I think. If I was more experienced working in that environment, I should have anticipated it. But that does not excuse the lack of it, because in my project I was not even paid to do that.

So you could not claim extra for that?

My payment was literally an upgrade of this environment, so the modification was something else. So based on the changes made, based on the goodwill that we were seeking. Saying we were paid or not paid is a bit fuzzy***,…so you subsidise the project …*** heavily so, this was supposed to be a 2 months project that took 6 months. That is beside the point because the whole idea is to realise the success of Open Source. We had a bigger objective. That said though I still feel that when people are patching and fixing it's best when everybody comes to the party and contributes to the effort and when they were short in that

thing I did not expect it. I also thing they should have been more capable of realising this. That is my opinion.

But I see some dependencies there, I say this because I see that the core problem was the skills of that team, now because they were not well capacitate in these kinds of things, all of these other things they could not do. They could not anticipate all of these problems. They could not manage effectively. The issue of communication also did not come to the fore, and it all starts with their levels of skills.

If you had a skilled team that would never have been an issue. That is the core, however the reason this was not anticipated is because these are IT managers, support administrators. In 2007/08 we did take them to training. They did the whole LPI thing, they did the uBuntu one, they were trained, and we've always had an open door policy with them. They have a direct line to me, they have a direct line to another guy, they've always had this. And 2007 to 2010, as I said in a lesser time I've acquired more skill. And they've had more training privilege than I did. Cause for me it was literally, ei man we need this done, can you get it done, I was like yeah, I can get it done.

But what do you think was behind this sort of inertia on their part to actually develop themselves?

The fact that they did not have to, there is no pressure, there's no need they can always call. They don't have a balanced score card or if they have it's mis-implemented so individual personal development is not a priority in terms of the score card, and even if it is a priority, the impact of that balanced score card on their bottom line is too low. So I reckon that is definitely one of the reasons why they don't do it. They can always call someone to get it done. And that's why earlier I said government is not interested in saving money because they are not necessarily looking for the best value for money. A director in government earns more than I do, a deputy director earns more than I do actually. But the outcome is too low, way too low.

It's a big problem. Its very fascinating what you are telling me because you can see these inter-dependencies, one thing leading to another you know. So ehh, now you mentioned when you were telling me about what led to their success. You mentioned that they had to define themselves as a leader, hence they migrated. You mentioned the role of management as very important in this, you mentioned training as important and then the fact that they are a small organisation, they were off the political radar screen, which is quite useful, can you spend some time with me on each of these factors and just elaborate

a little bit. Why did the fact that they needed to be seen as a technical leader contribute to success?

The need to be a technical leader works in that each government department provides a service to a customer. I would like to exclude the public as customer. The public is the ultimate beneficiary. Lets take DPSA, let's say they decide that software licences are expensive and they want to reduce them. Let's say they decide that Open Source Software licences are the way to do this, hypothetically speaking. Let's say they go to other departments they say from now on SITA is going to get a 30% budget cut on licences because we believe that's what Open Source costs, go ahead. The easiest way to counter that argument is to say but this thing does not work. And the only way for the DPSA to motivate for that is to prove that this thing works and the way to do that is by using SITA, or for them to migrate. And that is one of the biggest imperatives of technical leadership. Organisations that fall in that space on Open Source are DPSA, SITA, the PNC, the DoC, the DST and the GCIS. Those are the organisations to whom that is the most important thing. The fact that they have not migrated is a first indication of failure in my view, or of this policy in my opinion. So that is the imperative for technical leadership. Never mind that the adoption of the policy on Open Source by government has been motivated by the fact that government needs to lead so that the private sector takes the initiative and they stimulate the skill base nationally. We know that was motivated by the fact that, as I said the local industry works on the basis of going overseas to buy and get commission based on that. The whole idea was to stimulate the local a cycle of money locally and how much you retain local currency. And obviously as a strategist you know the value of retaining local currency in the value of the economy, GDP and productivity and so forth. So that is the bigger picture. And that is the greatest motivation behind technological leadership especially in this context.

***Coming to the role of management in migration, you mentioned that one of the reasons they succeeded is because they had management that wanted to migrate, that bought into this thing, why is that important*?**

It's because nothing in any organisation, … well there is such a thing as ground-up change. That cannot happen in government because government is sincerely, it is duly accountable to the public who mandated Parliament that instructs directorship in the form of Ministers and the Director General and that seeps down like that. So the concept of change in government is like, the bottom is Parliament. It's more like a triangle in that change comes from Parliament who pushes it up to management and management pushes it down within the

department. So the involvement of management is essentially by nature of government what will drive change within departments.

So you could have a department where the staff in general are fully enthusiastic and the IT section of that dept want to go Open Source and so on, but if the manager has not bought into this …

We did a statistic at the DPSA and the GCIS readiness assessment. Most of the respondents did not know what Open Source was.

Was it the managers?

No, this was across the board

When was this?

2008, they did not know what it was but they were willing to try it if it would make their work easier, … well not necessarily easier, but if it would be seamless and they would be able to do their jobs, they would do it. They were looking to the learning opportunities and everything so we know that the people on the ground, the mindset is malleable to the change. We led a change management exercise at SITA in the same year. We called it Sekusile, and that whole thing was designed to drive the change or to get people excited around Open Source. And the people responsive and people were excited about Open Source. Open Source champions were identified and all sought of workshops conducted, people raised their concerns about the change that was coming. Sekusile means the sun is rising.

So there was a lot of anticipation of the change

Yah, and as I told you, management was the stricter incumbent and therefore the destruction. I cannot speak neutrally around management reasons why they would be resistant. They say they are protecting their stakeholders and their organisations from private sector exploitation and I say rubbish. Because they would do inconsistent comparisons for example they would say we spend about R5 million a year on Micro Soft licences and support, ehh, if your software does not come in below that statistic then we cannot adopt it, we cannot justify it, but the true price of Open Source was never based on annual licences and support. Never mind that being a wrong statistic, okay, the whole idea was much much grander than that. And for government executive or management to not understand that, and by management I mean deputy director upwards. Hell forget the deputy director, moist deputy directors are CEO by title. Even director, take chief director upward. For those people not to understand this big picture… and for that not to happen there are many reasons. Does Parliament tell them to account, departments are still working in silos and competing for resources. We have

the minister of coordination now, jeez it's taking forever for those things to be felt. We have compared to the last one a weaker president in terms of impact. I mean I started consulting in government a while back, and during the era of Thabo Mbeki, they would have his annual state of the nation as a mandate, bang, … this is what we are doing. It was simple. This is what we are doing, this is what the Minister of finance said. This is what the province said. Now its ohh, is this what he meant? Or is this what he meant? It's ambiguous. It is the most ambiguous service delivery there's ever been. It's very ambiguous.

So that's a major problem

Yah, its an important thing. One other thing is that a government decision is no longer absolute. Even in that fuzzy decision, if a decision is taken by a minister or a director and an implementation start, people who are not in government can change that, it's amazing. It's a very versatile time, I call it.

It's like everything goes you know, it just depends which side you want to look at things

You know, that's …the grander picture has led to management or in government doing what they can control, okay. Doing what they can control is continuous, is looking for the political powerhouse and bidding to their call. They look for control, the risk factor is very low. That is the problem with government and management. You don't get an entrepreneurial disposition. People have a very low appetite for risk. Very low appetite. They want things done. They want to knock off at 4:30. So management is one of the holy grails of change. If you can get them in, and they start driving it. If you can consolidate it for them and enable them in that perspective then you'll have a high factor of success. That's why they are important to do that.

Okay, and then you mentions also training as an important factor, why is it an important factor?

You see, training is marketing, how you look at that from a philosophy of education view. It's essentially up to you but I know we don't have Open Source developers in this country because Micro Soft sponsors trainers, that is, tertiary institutes and that's why we have so many Micro Soft users. It's what it is, training is marketing. People or academic theories compete all the time and the one with the greatest funding tends to be carried forward no matter how relatively.

Right it is. I mean Sigmund Fraud has been taken as a psychologist …. And there are many competing theories around it, so it is marketing.

It's about pushing your own ideas?

Yes, people can use this and… I mean we know that for the 1st 30 years of electricity people have been trained on direct current, and to this day we think that Edison was a hero. Whereas the truth is that alternate current was the current. So that's what training is, training is marketing. The beautiful things about training is that you can formalise it, you can measure it and you can reemphasise it freely. That is the benefit training has over and above other forms of marketing. It gets people to do, to use and trust and rely. So if you have a training driven change management, and training that is quickly followed by doing. So you need your just in time in there. If you can get that timing right, that's it, you are in it.

So how did you achieve that balance at PNC? To have this training quickly followed by doing, what did you do?

Ehm, we were lucky in that people had started email, so we were not introducing a foreign concept. People were already computer literate, so in as mush they were Micro Soft literate, it was the time when Micro Soft was introducing Windows XP and Windows Vista. And people who have never used alternative software do not know that Micro Soft is very difficult to use. It's not intuitive at all. So when we introduced Open Source people responded to the ease of it and the same time we were running training sessions, and we had support, we had people sitting on-site, re-enforcing this, ehh. Reinforcing is very important in training or marketing. So we had a person sitting on-site for 6 months while the technical staff was being through training, they were being supported and there was enough training material to constantly re-enforce this. At the same time the marketing effort around Open Source was at its pick at that time, and they were essentially the coolest department. If you look at it the training succeeded as a result of the success of the marketing effort around that and the ability of someone to put the product in people's hands. The other thing that enabled success, uhh the complexity of applications within the PNC, they don't have an overhead of business applications that are difficult to run on top of Open Source. So the rate of error was low. That is an important thing because moving business applications platform to platform, if it increases the rate of error then people become less comfortable.

They become very frustrated?

Yes. The other is that adoption is easier in departments that have higher levels of educated staff, which the case in the PNC. Ehh, going to a municipality for example and trying to

implement a change that is backed by training is much more difficult than where it is intellectual like the PNC and GCIS.

So when you say higher level of education you mean?

Tertiary education, the reason is because ehh, one of the things that the statistics we did revealed is that people are afraid of not being unable to fulfill their jobs. And that goes with education. If people trust the education and training they've had, they are less likely to fear failing at what they do. So in terms of user resistance that's one of the things we constantly have to put and overcome. It was actually the number one question. What am I talking about, will I be able to do my job? Will this thing enable me to do my job? That is definitely one thing that you need to overcome. When people have been put, … where they don't necessarily qualify. It makes people look around and when that happens people need to be reassured that they can do their job, they are safe and they are not being measured because of this change. We did the survey for example with us people you know what this is, you know pieces of software for example, you know what FireFox is, you know what, … have you ever used it. People were reluctant… are we supposed to know this? So that's why I said earlier what was the skills the PNC had that was one of them. They did not have the ability to reassure people that were questioning what's going on.

That sounds very important to me

It's absolutely important. I mean we had to essentially go from desk to desk, getting people to do surveys, and it was like it's all right, I will not look at your answers. We have an example of an answer sheet, we don't know who you are. We, you know we just aggregate the results like this. We just know that 17 people said this. We don't measure this, it does not go, the Director General had to write a letter saying we will not know.

It sounds like a small thing but it is a big insight what you've just said,* its massive, *sometime it's small things that people ignore, you look at the technical issues but sometimes its the small issues, reassuring people, it's fascinating.

Like I said, we know, its not because I'm punting the product. This product does work, so what is the problem?

Then the last thing you mentioned around success is that PNC is relatively a small place. You want to say a bit more on that?

Yah it's a simple thing I mean we intentionally are avoiding large and politically central departments. We are not interested in the Department of Transport, we are not interested in the Department of Health, we are not interested ion the Department of Home Affairs,

Correctional Services, Police, hhmm Education, the departtment side its alright, but we will never ever get into the one teacher one laptop exercise.

That has just disappeared off the radar screen.

Yes it has, and I'll tell you why, it is the size of those organisations, but not just in terms of the number of people working in those department, but the following, political weight of the department. Each one of these departments, Sport, Education, Health, Home Affairs are political minefields. People will kill you for those things, they are worth a man's life, it's that simple. Okay, so that is the first size. We all know the name of the minister of education and there's a reason for that. Their size, like I said, even if the numbers are low, their size is big, the PNC is not there. The probability of the project succeeding in those departments is nightmarish. Look at eNatis, and look at how many. ….

What about the private sector, what role should they play?

Ahh jee, you see again Treasury and SITA, one of the things that they need to have clarity on is Public Private Partnerships, ehhm private sector competes, it is what we do. When we were at the pick of this Open Source thing, the guy at SITA wanted to suggest that we come together as private sector and decode what we're gonna offer government, and I was like are you mad?

That person has never worked in the private sector.

No he has worked, and it has worked in the private sector and it's called anticompetitive behaviour…..(laughs). I believe that if SITA is the FOSS project office, I didn't say much about SITA because there is just so much to say about SITA. We can spend the whole day just discussing SITA. Ehhm, Arno's office, that FOSS Project Office, needs to actually sit and aggregate intellectual property around Open Source. Can the private sector participate in this? Yes we can. Are we willing? Yes we are, if government provides the leadership. If that FOSS office provides the leadership, we cannot do it on our own. We have leaders, we have all these things, we can put them in place but we cannot do it on our own, it's illegal. (Laughs), it's illegal.

Even if you wanted to do it, it's just against the law?

You know what I mean! So yah do they have a role in incubating this? Yes they do. Are they doing it? No, there's easier money elsewhere. Tertiary institutions, their role in output, yah there is a role but they also have a customer base that requires them to ….(cannot hear) Proprietary software, so there are some structures of the industry, when you do a structural

analysis of the IT industry, there's a fundamental flaw that it's a retailer industry and there's very little by way of research. I mean IT is one of the lowest claimants from the Department of Science and Technology R&D incentives, because there's no need and you need to, by IT I mean everything starting from Vodacom, going all the way to the man in the garage. We need to restimulate this, I mean the other day I actually applied for funding from the IDC and they were like, we will give you R35 000 for the hardware and R25 000 for the software and I was like, okay, can I take the R25 000 for the software and put it in the hardware? No. Okay can I get more money for the hardware? No. Okay, I need a R100 000 server to start my research. My next competitor, IS is spending 32 million dollars, do you understand? So …

They don't have the perspective. Yes**.** ***And to think they are supposed to be behind driving this, it's a problem.***

So that is my view on the stakeholders.

And then, we are coming towards the end of this thing. When it comes to migrating within an organisation, how should it be handled? I mean you know, which organisation, a government organisation. What approach would you advice, I mean you could have a phased approach, you could have blanket migration. Any approach you think will work best in government*?*

The first thing that you need to do is distill the change from the technical aspect of that change. You need to start selling the purpose and function, you need to constantly answer, what's in it for me? So what? That is the first thing you need to do. And you need to, and I always say this, start with the lowest risk sites, and grow but grow rapidly. Continue to reassure people, so if you hit a snag and people lick wounds, give them time to lick wounds, don't push, otherwise you get resistance. Training, training, change management. I cannot emphasise that enough, and let the human element be the leader of the change, not the technology. That's what I would say. You see it when you say organisation, I mean Facebook, they just change the technology and then they have this, and each time they've done that, fall out from the customer base has been louder and louder and louder. The technology works, you know this, so I'm an absolute fan of change management from a human perspective.

So you say a more gradual approach*?* Yes, and where you go from low risk to higher risk. Uhhm, in my young days I used to believe in fast change (laughs …)

Just do it now and let them swim or sink? But there's governance, governance is important. (Long pause)

Eish, yah no, I've exhausted my questions, this has been absolutely informative, can I come back to you if I need to*?*

Yah, you have my number. (End of interview) 1h24m03s

TRANSCRIPT 2

INTERVIEW WITH MIKE SERERO: IT MANAGER

PRESIDENTIAL NATIONAL COMMISSION ON ICT AND DEVELOPMENT

02 JUNE 2010 (10:00 – 11:30)

PNC ON ISAD

Give a brief background to the project. When does it start? Which parts did you migrate?

I don't know, I'll just become general, it was in 2005. Management took a decision to migrate to Open Source. We tried in 2006, we did try, we had another organisation within the department of Communication that assisted us to implement. Our focus at that time, we were going to implement in phases. So we started first with the servers, it was in 2005, but the migration was unsuccessful due to lack of skills at the PNC and the people that were assisting us. Then what happened because we were using a product, I don't know if I should state it, we were using a Redhat, a product called Redhat Linux. Support was expensive, they were charging us almost about R20 000 a day, to assist us because we did the installation but we got errors. There were dependencies so we asked them to assist us. They did come to assist us but the following day the server went down again and when we inquired they said there is a cost. That's why we decided that we no will no longer go with Redhat. Another challenge with Redhat is that they were only offering web support and there were times difference. Whenever you report something they will tell you they only support Redhat modules, if you install anything, Eldap, they've got their own Eldap. Where you use the open one, they will tell you no, we don't support this, so those are the challenges that we experienced during that time. They were trying to lock us in terms of Redhat. Then we did look at what we had within the country, we find that were 2 companies that were offering Open Source, we had Impi Linux and we had SUSE. Which was then bought by Novell.

We decide because Impi was a SA version, we decided to use Impi Linux. This time we did not do a phase approach, it was a full-blown migration. So during the migration we looked at other elements like communication, change management, training of staff so that they have skills uhmmm, I don't know should I break it down? Then we started with migration, I think we started in 2007 because we had to follow procurement processes to be approved. In 2007 we started with the project, I think it was on 2008 January that we concluded. It was successful, we migrated all the desktops and the servers.

But your migration is not finished yet because you were just migrating your emails?

It was finished at that time because the issue is that the, ay it works they release new versions of the operating system. You know for operating systems they support,…. for uBuntu you've got LTS and short-term versions. Short-term versions are supported for one year six months then you have to upgrade. Then you have long term ones (LTS) its 3 years for desktop and 5 years for servers. So you might find, because now they've released 10.4, so probably by next year we might be migrating again. Because we came late, because for us to change the mail server, it was due to support because we want to build capacity within PNC, so the application we were running it was more, supporting documents were in German languages, so it was difficult when we had problems because we don't want to be always depending on the service providers to assist us, we end up paying too much. There are certain things you can do. So that's why we decided to go the Zimbra route, because it is one of the solutions that SITA was offering, and most government departments recommend that one. We are finished upgrading now and it's up and running.

So tell me in your view, which factors would you say were responsible for your successful migration?

Let me just finish something on the background. This one I just discovered recently, that PNC became a part of the process when the policy was not yet approved, it was draft. PNC was tasked to develop a draft OSS policy because PNC wanted to add an element of Open Content. That was in 2005, that thing was approved in 2005, I think there was a document on that. It was before I came, when I came management said we need to move, we must practice what we preach, it's what we did, but this thing started somewhere, but as I go through the documents I see that this started somewhere. PNC has been long in this game, and is somewhat of a champion in this area having worked on the policy as well.

So let's come to this question, so you migrated successfully, what would you say was responsible for your success in migrating? What are the factors?

For us we made sure that we implement change management, to make sure that we're taking users along because you know, you can implement whatever system you like, but if users reject it you'll never you know, be able to use the system. So we had to make sure that there's proper communication as well, we had communication, the communication strategy in terms of how we were going to do that. In terms of communication, we did a competition for the name of the project, it was named by one of the staff members. The project was called Tokologo, which means freedom and the logo as well, we requested for it and there was a price for it. There were competitions along the way as users were asked questions. As I've already alluded, we made sure that users are ready. What we did, we put labs just to allow users to play and compare, we had a section here down stairs for the lab. We put computers there for users to play around with Open Source.

Over what period did you run this test?

Ehh, this lab was running, I think it was for a month because then for training as well we did a schedule. Users were registering themselves,

On line? No it was not online, on paper.

So it was voluntary for them to do the training?

Because they were running other projects so we came with different days because we needed to have about ten people per module so that we can arrange our training. I think those elements are the key ones. Communication, change management, training of users in Open Source, and then we did train the technical staff in terms of administration of the servers.

So training, communication, change management, basic exposure, where people can just play around with this thing. Yes

And then on the other hand, I'm sure there were some difficulties that you encountered during the migration process, what difficulties did you experience?

The difficulty that we had that time was attendance at training, because the schedule you might find that we take, instead of 6 we had 4, but we had to go on because it's planned already

So did you have to postpone training sessions because of low attendance?

Hmmm, we did not postpone it, the way we did we had to continue with it because that was a training institution and they had to run other programmes as well because we did not do it ourselves, we did it with Interweb.

So training was a problems?

Yes training was a problem but not that much. The other one, what was it? (Hesitation and thinking….)

You mentioned earlier the problem of Redhat and the price they were charging

We had a problem with that and the support was a problem in terms of that. ….(long silence long) Another challenge, and this one came late when Impi Linux was bought by BCX, because we had customised operating systems and that company was no longer existing. What happened is that most of the guys that were actually part of the project left BCX. They had to get new people. That's why we had to upgrade and remove any customisation that was there. Then we leave it as plain uBuntu. This is one of the challenges that people must… especially when it comes to customised applications, they have to look at the issue of sustainability of those companies because if they go under then ….

Does it mean that there were applications that BCX could not support that came from Impi?

Yah they could not support because they had problems … in terms of supporting it, and the new people were not used to that. Because the people that did the bistro he left, because he was from Cape and BCX forced him to migrate to Jo'burg, and he did not like, you know people from Cape Town, he went back and I think that is one of the factors that caused him to go back, other guys left some went to Siemens, Siemens opened an OSS division.

So Siemens also has an OSS division? It seems like the industry is growing?

Yah they are trying because of the policy, but the issue is that people are reluctant to implement.

Now with the reluctance to training, what would you attribute that to, why were people not attending training?

Ahhmmm, it was work related in terms of they had to attend conferences, it was those circumstances, others the issue was that people were not feeling well.

But there was no open resistance

No, there was no open resistance, because immediately when you come from training we issue you with a new computer. When you leave here you leave your computer with Microsoft, when you came back, its Linux. That's why it was easy to accept it because if you come there and it's still Microsoft you will lose what you have learned.

Did that serve as an incentive in your view as well?

Yes, it did, it contributed a lot because that's why they say when you migrate you need to look at hardware lifespan or licences that are getting expired to address migration.

So did you do it at that time?

Yes I did it at that time because the equipment I had at that time, the lifespan was over, so we bought new staff, so timing is important you need to consider such things. Even the servers, you need to look whether they are compatible in terms of migration because you might need to run visualisation. By that time the servers that we had, visualisation was not that popular, even now, we bought, I think during the implementation we bought 2 new servers which are capable to do visualisation because they have more processors, more memory. They give you the allowance to increase the memory. Even them, I think they are almost going for two or three years, so their lifespan is coming to an end so our next upgrade will be looking at that. Procuring 2 new servers with storage devise and then we visualise and remove all these because before we used to buy individual servers, but now we'll buy full screen devises and just run with that.

Ehhh, now you mentioned when you were talking about the factors that were responsible le for your success, you mentioned change management, communication, training and then you mentioned basic exposure, and then the issue of incentive, you know people getting computers when they come back. In your view, was there anyway in which these factors were influencing one another, either positively or negatively? For instance, did training have any impact on your communication strategy and if so, in what way?

I think the ones that were influencing one another was change management and communication. Change and communication were influencing one another. I can say training was running separately, but change and communication are like twins. ***So you were communicating the change?*** Yes, in that you communicate with them frequently, you update them about the project, how many people have been trained, each and every bit we were informing users to say they must understand where are we, where we need to go.

So are you saying had you not had a good communication strategy, your change management strategy would not have succeeded or impacted negatively? Yes, that's true.

Basically the communication strategy was at the core of everything that you did?

That's true, communication was also important in training. Because we had to engage them to say, we gave them options to schedule themselves. We put forms next to that same lab, because we used the same area, we called it Tokologo project office. Everything was happening there.

So you had a project team?

Yes, we had a project team that was made up of the service provider and the internal people. Internally we were about … it was me and Kholofelo, my boss. Two guys were interns but we did manage to, because we had invested in them because we took them through training, but that time it was four of us. The service provider were about 5 guys, all in all we were about 9.

Amongst the factors that you mentioned, that were difficulties, you know including issues of training attendance, the charges from Redhat, the fact that this thing was customized and when BCX took it over there were some applications that they could not support. Were any of these factors influencing one another in any way, you know ehh, for instance on the customisation issue, did it influence the quality of training that you gave when BCX could not support certain applications?

No, because what they do they do a general LPI course, they don't teach about customisation, they just teach you about Linux. If you do LPI you can administer SUSE, you can administer other operation systems. Customisation was for us to know where are the files are sitting.

So there was no relationship really between the factors, unlike on the other side?

Yes, there was no relationship.Ehhh, (silence….)

Now let's come back to the factors that you mentioned as having caused success, if you take each of the factors, can you speak more about them, how did they contribute to success? Take training for instance, then we'll talk about communication, then we'll talk about change management.

All right, check the file, I have to prepare myself better but did not. Training what it does because we were more on Microsoft, we knew more Microsoft applications at that time, we knew nothing about Linux, so we had to go for training, and it did assist us during implementation even though we were not yet clear about what is happening, because when you see something new even though you're an administrator, but it did assist us in terms of the basics. How to log in, how to, because most of the things were text based and we were used to graphic interface. Even the servers were text based, there were no graphics, so it assisted us to up skill ourselves to learn more. That's the technical training.

Doesn't the fact that the interface was text based make it difficult?

Yes it was difficult, but from my point of view, I was used to Windows text base in dos and I did use it before, but the component was different, and it's one of the things that people are fearing. The text base because text base gives you a feel and a look, how systems starts and where things

sit in the system, unlike things that are closed. You can see in the system where things sit, the configuration files are not clear.

But I guess the text base would be more amenable to somebody who is more technically comfortable with systems, if it was just a user who is not into those things, it could be fairly intimidating?

Yes, if it was just a user it would be difficult, because when people are normal users, you need to get used to it and become emotional about it.

What else did training do?

It did assist for desktop users, but there was a challenge at that time, because Open Office, there was Microsoft and Open Office. If you open a document with tables in Microsoft, with Open Office there would be a distortion. You had to convert a document in Microsoft into ODF, so the challenge we were getting was that the tables were getting distorted. But that thing, there's nothing that a technical person can do ehh, it was the issue between Microsoft and Open Office or ODF standards because Microsoft as you know they want to dominate. There was a time when Open Office version 2 had a problem with tables, they recognised it and released a new version. But once it was on par, Microsoft came out with another. There is OASIS, it is the one that control the standards, because here we got SABS and we have European one. MS approaches OASIS when they did MS 7, because MS extended their extension, it used to be .doc, and now it's .docx. They came up with their own schema, they call it schema, extendable markup language which was approved because that schema was based on open standards like HCTP you can use FireFox etc. It's an example of that. They came out with this thing called OOXML Open Office XML, that's a MS product in order to discredit this XML standard. So these guys, what they did, they did, because if you were running that time 2.6 you could not open docx, so they had to release Office 3, because what we want in the country we want an ODF standard. Whatever document must be the same, but those guys do not want that, they are still doing that because when they went to OASIS, they rejected their application. They went to the European one, and they approved it, then they use it. So now it wants to discredit other Open Source applications.

I guess they perceive it as something that is likely to take away their dominance?

Yes It's what they want to do. They want to dominate the market, so it does give uncertainties because users will say this document was like this. Even now we do have some challenges because now we need to communicate 3.2, the new one, at least they merged a lot of things from Microsoft. If you've got MS office you can't open an ODT, but if you have Open Office you can

open everything. The problem is the other way round they don't want to come on board. Because even that 2.2 could not match, so we had to start afresh. It was frustrating.

On the user side, how did you think training helped the users?

Yah training helped them because it was just about comparison in terms of the layout. Because the layout was no longer the same but those functions were still there. So to remove the fear, this thing is still the same as MS, just that these things are not the same. In MS there were certain fonts, it was under licence, they were proprietary and Open office did not have them.

And that's still the case?

That's still the case even now. Any way this helped users to get familiar with the interface, so they can adopt it. I think resistance was not that much. There were teething problems here and there but it was not that serious. And we still give follow up support.

The project team is still intact?

Yes the project team is still intact because we are trying to build skills. What we did is, we signed an SLA with the service provider on adhoc basis because they wanted to reap us as well for support. They wanted to come every twice every month but we said no, you should come only when we experience problems. Even though it does help if you get support because sometimes you experience a problem now, it means you have to go through procurement which might take three weeks, to get an order number and users want to use the thing. So there's advantages and disadvantages. The arrangement is that we call them when we need them.

Do you have to go through procurement all the time?

We have to go through procurement all the time, we have to print the contract every time we need them and say we have a contract, we need this service.

But what's the arrangement with them, do you have a framework contract, a general open contract that you use to procure from them, or is it a new contract all the time?

No, it's the same contract, we signed a three-year contract, that's what helped us.

So we've spoken about training, what about change management, how did change management help you to succeed?

Change management helped us in terms of adoption and to remove the rejection in terms of implementation, because as you know this is a new system. For me to make sure that this application is not a white elephant, it's something that people accept, you need to put in place

change management in terms of addressing them through communication, to say you must be ready for change. As we said, in terms of that, we did take users along, there was an award, we did that thing, a testing lab for users to just play around to make sure that everything that we did we take users along and they know what is happening. That's why I'm saying change management and communication are like twins, they go together. Then we printed cards as well, (…phone rings and he responds to it, …).

So you were telling me that you printed cards

Yah we printed cards, those cards were showing comparisons between Open Source suite and Open Office, Excel and MS word, spreadsheet.

So you gave them information? Yes we did

What other kind of information did you give them, in addition to this one?

(Thinking …..) I think that is those things that we did.

Ehh, I thing you've spoken about how the challenges that you had made things difficult for you. You mentioned that the takeover of Impi by BCX meant that you did not have access to support for certain applications. Was there any other negative impact that came with the fact that BCX was taking charge of this company?

Yah, because now the application was no longer existing, they had to cancel Impi Linux. It was discontinued and there was no new development.

So you replaced it with something else?

Yes, we replaced it with Ubuntu, and how it worked, because we're supposed to get updates from uBuntu, make that they customise it. They align it with our customisation and they send it to us. So that server was no longer there, because if you take direct update you might change the configurations. So that was the problem that we had, so the system becomes outdated while they are busy trying to sort out their problems. So we decided to move. Because while they were trying to sort themselves out we tried to get another company, but they wanted to charge us R300 000 just to remove that. They just put different stories, one thing but they break it down. If you don' know they might take you for a ride.

I guess that's why some departments are reluctant to migrate sometimes, particularly if you're not strong and you don't have information?

That was another thing that made things difficult, because when we started there was nothing. I had to google and google because I knew nothing about Linux. I was one of those that refused to move. I understand why it can be difficult, because they will say this thing is not mature even though they have not tested even one application. Because from hearsay somebody can say something.

That was a big step that you took

Yes, what I like about it is that we failed and carried on. We took it positively.

But it says something about this organization. That you're prepared to take risks and actually learn from them and move on.

Yes because we are a new organisation and we said it's a project base. So you can put it that way and say it's a learning organisation. So I understand that departments don't move, they need proof and some case studies. That is what we are doing at the moment, to build case studies. Then people will not be reluctant to move because we'll be showing something that is running.

This one for training it says it was 25%, could not be away from the office at any one time, that's why we took longer because we had to reschedule for those who did not make it.

So if you just summarise, in your view, what is important to consider when migrating IT to Open Source? You've mentioned training, you've mentioned communication, you've mentioned other things, anything else in addition that is important to consider?

Yes I thing hardware lifespan and when licence agreements expire, when they expire I think that's the best time to do that

Otherwise you open yourself to penalties?

Yes, because that becomes irregular expenditure.

How regularly do licences get renewed?

I think it's 3 years, other are 2 years. We spend something like R6 billion in total per annum. All in all including hardware and consulting fees its about R12 billion.

Any other factors to consider?

No, I think those are the only ones.

And then from a management point of view, (Interrupt)
I don't know in terms of, no I think that one is more technical.

What is that one?
I think when you want to migrate you need to do a feasibility study first, that thing that you need to do. You just take as is, and you want to get to be. It will give you a clear picture because what currently we don't have, there is an office FPO but there is no office for research and development, whereby you have a competency. You take your request, it is tested, and they provide you with solutions where they say this one you can migrate, we have a solution for it, and this one you can't, there is no solution for it currently. Because it will assist us before we even go to business. Because we have a policy already, we need to have guidelines as well. Those guidelines must be generic, to say what kind of software can we use. This research and development office will come in there to say, okay for mail we have 5 applications and you can choose, for operating system you can choose up to 5. They come up with implementation guidelines architecture. But things must be guided by policies from government so that when they go to government they can say, business this is what government wants because business will be responsible for implementation, training, marketing. Because even the training can be customised according to our needs, not business telling government what to do. For instance Redhat, you don't know anything about Redhat, you still have to go and find out. So if there is a group that does research and development they will know better about Redhat, so that they you can say we have uBuntu, it's offering this, we have Redhat, it's offering this, and they can advise in a better before you go to business. So we are missing that leg, that's why you find we got uBuntu, we got SUSE you know. Because the private sector will sell that thing to you even if it does not address your problem. So if that thing goes to research and development community they will be able to see if this thing is possible for us to use or not, so that when you migrate you know what you're doing. Because the issue is not to remove proprietary completely, those who are equivalent you can do. Even legacy systems you need to make sure they can run on Open Source.

Is there an intention to set up this research and development office?
I tried to speak to SITA. I even raise it during the open community, we got a GTOC standing committee. I don't think they are up to it. FPO is there for an advisory role, not as an implementer. For them, they need to bring that element of a research and development community, which will have a Linux group. All the skilled people because we have skilled people in this country. The other day I was attending a convention. These people are building systems for other countries and here we say we don't have skills. We've never done any

groundwork to see what we have, because we have money, they don't know what we're missing. Because the problem is that rural areas don't have, and they cannot afford to pay the price.

You were right when you said maybe there needs for more advocacy. Maybe this is what you need to focus on?

Yes, actually we had a meeting this morning and we did talk about it. And there is no stick as well in terms of monitoring and evaluation. To say how far are you and why are you not doing it? Sure I think the presidency needs to take seriously, that monitoring and evaluation.

But are they taking it seriously?

No, they are not, we are going to try to put recommendations.

Cause if you look at their outcomes, nothing relates to technology adoption

Yes.

So you are planning to engage them?

Yes, we are planning to engage them, even though DPSA will fight with us, the problem with government territories. Even though we are supposed to serve the people, but now it's based on own interest.

Now, if you were to advise someone on the management of the process of migration to FOSS, what would you say to them?

First thing what I'll do is to do an analysis that I spoke about. For me I will say, I've read the Malaysian route because I was asking myself why this resistance to break the ice, but what I found out from the Malaysians model, it did helped me a lot, to say if a person is new in doing that, the person needs to do more research to understand what you want to implement. I might give 3 operating systems. He must do research to understand what they offer. He must look at as is and what he needs to do, because here we are talking about live data. For a new organisation it's easy but for live data it's difficult. You need to decide what you can migrate and what should remain like that. Most departments have got legacy systems, which is a problem that it's not easy to migrate sometimes because it was built by somebody somewhere. After that they must look at issues of hardware lifespan, they need to check their licence enterprise expiry date. They need to consider that because there may be penalties, unless it's from the office of the President. Then another thing, he must make sure that users are taken along. Put in place communication and change management. He must make sure to up skill his staff. He must run Open Source parallel, as a lab for them to get used to. What I've realized is that you can go to a 5 days course on

administration, the way these things are so customised, the 1st two days you might not understand, but you have to continue. But if you have a base you may be able to come with a problem and say, I've experienced something like this how do you fix it? So it's easier that way if you have a background. That thing will help them to engage and get involved during the training, and it will up skill them.

The last one, what about the role of different stakeholders within the organization? For instance, I mean what should be the role of senior management in the process of migration? What should be the role of users and other stakeholders?

The role of management must be the champion. This thing must be, as I'm telling that why we are having a problem in SA, we don't have a political champion. The role of management must be champions in order to influence users. And for you to ensure that users adopt, you put in that communication, to say that thing can work with anything, and you show them, you put practical things. Do meetings, presentations, it's what we did as well. You present the difference, you run parallel system, this is Linux this is Windows. Communicate with them and you need to choose champion amongst the users so that they will assist you in terms of the project. It's part of the project.

So that even if there are doubters these users can support you?

Yes, they can be a line of support.

Are there any other important stakeholders in migrating?

I think others are stakeholders outside the organisation, because you need to look at the workflow, because sometimes they send you a document and it does not open, because we are used to ODT then you send it to someone at DOC and they say hey, what kind of a software are you using. You need to consider this. This is one of the aspects you can use to force people to adopt but it is radical.

It assumes that you have power over them

Yes, and you don't have the right, they implement what they want because they are the ones that answer to the Auditor General when there is an audit. That was a strategy that we wanted to use, to say if you are a member of the OS committee, you must be on OSS. We find that some people on this committee are still using Microsoft. They are not using ODF standards, they are not really committed.

I think at Treasury there was a decision to start using ODF for all treasury documents, of course others are using it, others are not.

The problem is compliance, there's no one that is looking at compliance. And you know somebody came up to say when you talk about Open Government, we need to look at it from that point. Because when you are talking about Open Government, you are talking about Open Content, Open Standards, because they think of Open Source and stop. The President talks about Open Government, in an Open Government you need Open Content, you need Open Standards, then you need Open Source. That will assist to run this Open Content.

Any other stakeholders?

I think it's outside stakeholders because we deal with different stakeholders.

Mike thanks for that.

Whatever we buy we request a test lab to see if it responds, because if you don't, you find that sometimes this thing needs drivers. Before it used to be like that you find that uBuntu, now has improved a lot. The other one when 904 came, when you install it on laptop there was no sound, speakers were not working, but when they did 910 everything was working, they are fixing everything, it's getting better. And they wanted to, the problem was more on graphical interface, because people are used to this windows, nice things. You know Windows 7, Windows 7 will not assist you with production. The only thing with Windows 7 is note pad and solitaire. It's an operating system but the way they are selling it's like it can help you to achieve anything. In order to assist you need to buy something else like Open Office. When you install uBuntu, Open Office is there already. It comes in as a package and you have not paid anything.

The cost differentials are huge, from the initial procurement, the licensing and the support?

If you see many people they are using illegal licence. If you go to the location, no one is complying. If they can inform licence inspectors, people will throw them away, but they know you are running Open Office, they have nothing on you.

End

TRANSCRIPT 3

INTERVIEW WITH LESIBA LEDWABA – NATIONAL LIBRARY OF SOUTH AFRICA – General Manager for ICT (DATE 07 September 2010)

Give me a background on your project, when did it start, which elements did you migrate, you know, just a general overview?

Ehh, we, in 2008 the new library building was just about to be completed, because in the old building we were having about 200 computers, very old computers. And now there was this new building coming in and we needed to beef it up with computer equipment. And what happened we had a donor, the Carnegie Corporation, who actually donated close to R1 million, (900US$) to say put in state of the art ICT equipment, and at the same time government also injected some cash to assist in the equipment. So we weighed the options because we were already in the process of looking at OS, which ones to go for, which ones are tested and all of that. So we weighed the options and we looked MS applications and looked at the various flavours of Linux, we looked at uBuntu, we looked at SLED and the two options, the proprietary and the OSS and we dropped MS. The reasons being, we had to acquire licences. That was the first thing, and Vista was still coming and required more system resources. In other words you had to put more RAM, memory into the PCs, it was more demanding and the costs were too high. And then we looked at the government direction, the FOSS policy as approved by government. They say we should migrate to Open Source environment, we'll only implement proprietary where they demonstrate superiority over Open Source. So we were running NOVELL and NetWare, Group Wise and ZanWorks, all those Novell applications. Then looking at the flavours of Linux, we looked at uBuntu, we looked at SLED and we could not pass the test. So we said we need an OS software application that will be supported, because we don't want to be faced with challenges of maintaining or sustaining the thing afterwards. And then we decided to go the SLED route, the SUSE Linux route then bearing in mind that this is a Novell supported Open Source. That's when we decided that this is the route we're taking.

We then commissioned an audit, a kind of an assessment of our environment, what do we have? Mind you it was before buying new equipment. Mind you it was before we moved into the new building. The assessment was done, we had about 49 applications, from our server side and we had core applications, the library management system which was not running on Open Source, and was not supporting Open Source at the time. That was a major challenge to say but if I want to migrate all these things but the core application is there what are we doing, and if I try to migrate everything am I not going to stop business applications? It was high risk. Then I said, okay, we need to sit down and map a strategy on how we go about doing this. Then we acquired

the computers, we bought about 500 computers. We instructed the manufacturer which was Mastek, to say, supply us with this quantity but no operating system on them. They complied, based on our strategy, we decided to migrate the user side. We started with the desktop environment rather than the servers. So we started from the user side, and the we said what are the users looking for. That's where we came up with four groups. We grouped them into categories, the first category were just those who are accessing the internet and typing, that is, the public terminals. The second group was those that were using these two plus the finance part, that is, the finance staff. Then we looked again at those who are actually using specialised databases, because by then the Calc in Open Source was not that advanced in terms of the macros like Micro Soft, then we had to have another group, and then we had another group of the core applications, that is, that group that actually uses the library system and those other typing and internet access. The last group was a very difficult group because they are using everything thing plus the subscribed or the specialised library applications which are actually running on Linux and they don't have Linux clients at all. It was easy to migrate the first group because it needed an internet web browser, which was FireFox, and open office, which was typing.

So as long as that worked there were no issues?

Yes, that was for the public terminals, and what we did was okay, then we need to look into this. This is the first group that we migrated. It was tested and lab tested and all those kinds of things.

So you set up a lab at the NLSA?

Yes, we had a lab. And then because these users, it's everybody, someone might just decide to go to the library today, it's the public. It was difficult to run one training for them, to run change management for them, because you run change management for this group today, then another group comes later. So in terms of change management, we said no, otherwise we'll just organise sessions for training for them, then we put it aside. Then we looked at the core team for the library staff.

So before you proceed, are you saying you organised training for the users at fixed times and they are still running?

Yes, they are still running. Now these days you find one or two people and you just show them because most of them have been trained. And another thing, if you buy a Blackberry today, and give it to a 6 year old, just leave it there, I'm telling you within 24 hrs, that kid will be a guru. Because the users are school children, they learn quickly.

But the training you did it yourselves? You did not outsource?

Yes we did it ourselves. The training for staff we did it in house. Then we had to move to the other group. Before we could migrate to Open Source, we were engaged in a rigorous change management process. We had to talk to the people, we had to get buy-in from them, we had to select some of them to be the leaders, training others. Remember the National Library has an ageing staff. It's very difficult to tell someone who has been working on Micro Soft for the rest of their lives to say now we are moving close to this one. You'll come across resistance.

So how long did you have to engage in the change management process before making the change?

It took some time because we wanted everybody to be covered. First we had a team selected from the staff members, trained the first and then after training them we put them back into the system to say go and talk to your people, interact with the rest. And then we had some sessions in the process, where we were talking about this. Every Wednesday we had a meeting where we say what's happening. And we had these Linux gadgets we put them there, gave people prices to incentivise them for using them. And you know that gradually.

But the ones that you identified and trained first, what criteria did you use to identify them, was it the people that were more skilled in IT or?

We used just simple logic to say each and every area has a team leader, we identified those team leaders, to say team leaders are the ones who will be interacting with their teams. It started gradually and then picked up, every body was comfortable with that. Though our test labs, because in our test labs you would call one team at a time or two teams at a time and say come and see the screens. You always use Calc, you always use Excel, let's see how it goes, can you see the difference. We'll open Calc.

So they try it out themselves?

Yes, so we say whatever you do here you can do in Calc. and it was such a nice environment because at times people could not notice whether they are on Excel or on Calc. Give them a task and just go, then you monitor them.

By then you had already changed their systems?

Not yet. We were just trying to show them and get buy-in at first. And then from there we moved over. Then we migrated the second and the third team, and the finance and core system were migrated last. The reason for migrating them last is, the Pastel VIP, those other financial systems were running on Windows and were not supported by Linux, the library management system was

then not supported by Linux, but a month later the manufacturer of the system had a Linux supported system.

So you were actually lucky?

But we did not want to implement it because, we implement it from the server level then it's going to affect all the legal deposit libraries. Remember we are a legal deposit library, other libraries rely on us on the system, we are sharing a system so if you implement Linux, you're cutting them out. So we decided not to implement Linux on this one, let's leave it as is. And then we then said because this we cannot migrate, the financial systems we cannot migrate, what do we do? We looked into virtualisation, to have some windows virtualisation and the platform was SLED. We put everything on SLED, and we put those windows applications on virtualized. This means that you're on SLED desktop then you can just go anywhere. Your Windows applications are still available but they are sitting elsewhere. They could still work, they were happy that side, we were happy at the end of the day.

The challenge came now that because we had this, now we had to train these people. Change management was there but we need to train these people to ensure that in as much as they were productive in the Windows environment they can continue being productive,

Cause that's a risk again?

So what we do is we had a service provider who came in, they used an Adapt tool which is self-assessment. In the sense that they load on the system and based on the nature of your work, it assesses you. In other words, if you're in finance, in terms of the office applications, you're going to use Excel much more than somebody who, for example, a reference librarian. So based on that assessment, because it would ask a combination of questions and assess people according to the nature of their work. Not to say we apply the same type of training, to say intermediary, advanced etc. So it was just targeted. Those who are advanced Excel users came out to be the finance people. Those we needed the write up part of it, it was just so interrogative. Not everybody had to go for advanced. Then from there we trained those people according to their levels.

And you saying the training you did yourselves?

No, the training was done by the service provider. And in the process, I did not leave it at that, I understood it very well that at the end of the day I will need my team to sustain this. While the service provider is gone, because I don't want to rely on the service provider. So what I did I organised training with Talk IT and this net CB training wing. So I organised training for them to understand what is happening within Linux. And I built it within the contract of this service

provider to say part of you doing the job you must train these people. Everything that you're doing they must know. And they were so energetic as well, even after the completion of the project, they then made some follow up training with other training companies, so now we can basically sustain ourselves.

So now you're running fully on Open Source?

So we migrated that part, after migrating that part we said now the front end is done and there are no hassles. So we said let's look at our back end now. So we looked at our back end and said we need to migrate the back end. So at the back end, we had to use SLES, SUSE Linux Enterprise Server, the opposite of the desktop one. So what we did, because we were running NetWare as a backbone, we wanted to maintain that momentum because we did not want to lose the Novell flavour, because we were running Novell applications, we want to maintain that. So the base we installed SLES as a base. Everything must run on SLES, then on top of SLES that's when we put Open Enterprise Server. It is an open version of NetWare and then we had on the other side a virtual machine, VMware which was running those applications that are not Linux compatible. So now we have fully migrated the front end and the back end. Now we are covered from all sides, end to end.

Tell me how many people are we talking about at the national library?

We are talking about 167 because we included even those ordinary cleaners. We wanted everybody to be there because they have PCs. From Cape Town to Pretoria.

So what would you say were the factors that really contributed to your success? You've mentioned change management but what else would you was important?

Ehh, the human capital, you know the ability or the willingness of staff to be involved in the project. The strategy that actually embraced all staff to be involved. Because everybody was saying I want to be the first to accept this, I want to be the first in testing this thing.

How did you achieve that, to have people so energised because that can be a problem?

That's the strategy that I was talking about to say we ran some motivational talks, we ran briefing sessions on Wednesdays. From the people themselves we selected those team leaders to be involved in the project so that at the end of the day they are the ones to impart that on the team. You know it was so interactive, they took ownership of the thing.

But tell me in your motivational talks, did you emphasise the value of Open Source?

It was critical, that was critical because before we actually embarked on Open Source, we had a series of discussions. Just before we could migrate or do anything around migration we were

involved in discussions on Open Source. We have this government policy, we have Open Source, and then we would discuss with people you know, do you know of any Open Source application? Some people would say we've seen Linux. Some of them would say no we know something in that line. We were talking about this thing that is called open access journals. Open access journals, these are the journals that they wanted to be available to the user community, public. So they would say open access journal, meaning now we are relating it to Open Source. They will draw that correlation, from there they would say let's put the thing together. Then you take the thing and say if you're writing a document in Writer, just copy it on a memory stick and let's put it in a Linux machine and see if it will open. Funny enough it will open there but when they do it in reverse it does not. We would say why do you think that was the case. Then someone would say no you did not use this extension, you did not use this, you know they would start talking about so many things. And at the end of the day you say this is because this is owned by somebody else, it's locked. If you lock your computer with your password and I don't, it I cannot open it. So we were engaged in those kinds of discussions, even before. So by the time we moved over, they were ready.

And they knew it worked so their anxieties were dealt with? That is absolutely crucial.

What were some of the difficulties that you experienced?

The challenges were that the project goes with challenges. As I indicated to you was that my challenge was that the core application was not compatible with Linux. If it was not because the service provider and our team looked into applications that would assist us in putting this on Linux or on SLED it would be very difficult to do that. That is one of the things, the other thing was actually the skills because skills, the Open Source does have limited skills in terms of human resources in the environment. And we were wondering how can we ensure that we sustain our environment? We cannot create Linux experts in a week. It's actually a process, how are we going to ensure that we sustain our environment? And then some kind of a mitigation against was that we deployed a Novell flavoured, at least we still fall back on Novell while our team is getting experience and Novell was very supportive. Until we gradually built our own capabilities. Unfortunately we just lost one to Department of Trade and Industry.

Did they recruit them because of the skills in Open Source?

No it was just an open advert**.**

So there's still a problem when it comes to OS skills?

Yes the skills are still a problem. With Novell flavoured applications, the skills are still within Novell. Yes they can impart some skills through training, but I'm just worried about those that do not have any association to any of the companies. That is a big challenge.

Because even the tertiary education sector, to what extent are they prioritising Open Source by the way?

I think it's for us to be afraid to take a risk, because if I run a lab of about 500 computers. It's a lab of about 500 computers and I'm paying annual licences on those applications. Why can't I put Writer there and train students on how to use that thing and save on those, and then on some of the offices that's where you can run dual systems until people are comfortable because with us, managers are running dual applications. Their laptops are both Windows and Linux.

Because they are not ready to move over fully?

It's not because they are not ready, you know this is another area of challenge. It's difficult at times to deal with senior managers to say we need you to come to training. And once you switch off their Windows applications, they have a problem. So that is why I'm saying I'm giving this to you, there will be a time when I will close it down.

So you've given them a timeframe?

I've given them a time frame, after that then they'll be switched off. So another thing I said to them is that if you have problems on Windows, you will not be supported. Some will say but I'm communicating with someone overseas and they do not use Writer. And I'll say, on Writer you can save a file as a Word document. You don't have to worry, so if they can send you a Word document, you can open it, so there is no excuse actually.

So technically you have not experienced any difficulties. Issues of interoperability, opening other documents and so on?

No, we trained these people thoroughly to say when you send a document to somebody else, save it as Word. And internally if you're sending a document, just send it on Open Source so if you're running Word you have a problem.

So you have a way of monitoring that people are doing this?

The only way of monitoring is because we're running on SLED, so we know that this is how it is. You go to any office and they are using SLED.

Tell me the role of senior managers, because there is a view that senior management in the organisation is very key to the adoption of technologies such as these.

You know I must say ehh the leadership role played by our CEO in this project was very vital. Because he was the one insisting on a regular bases to say this is government policy. He was always motivating people. He offered to staff to stay if you have problems, come to my office.

So he made himself available?

Yes, he advocated for this.

But how did he get there, did you have to struggle with him?

No, I did not have to struggle that much, but I had to sit with him and say this is government policy as outlined in the cabinet announcement of 2007. This is the direction, because he is also creative and innovative, he does not leave things as they are. He also goes farther to investigate and research. He did his research and then it was easy for him to say this is the direction. And then it was easy for other management staff to say this is the direction. The other convincing part was the savings that we'll be getting when we implement Open Source. Because I made this table whereby in terms of Micro Soft this is what you're paying currently and with Linux this is what we will be paying. Of course this will include training of staff, the cost might be initially higher because we need to build capacity. So it was easy to sell this to the board. Then the board accepted as well.

How much would you say you have saved?

In millions. And when we reworked the figures, you know it would cost us, for the 500 computers to install Windows, because we would have to go for higher specs to accommodate Vista as compared to what we needed to accommodate Linux.

So the board also bought into this? Yes, they realised the implications given the costs***. Any regrets?***

No, not at all. The only thing that I could do is if somebody can come and say assist us, I'll run to assist them. And also to show them that if we knew some of the things before we would have done them differently.

So now you're running Open Source, has it allowed you to make adaptations to some of the systems that you run, make them for yourselves?

Yah, so far everything except those applications that are not compatible to Linux, accept those applications that are still running on VMware, but we put VMware on top of it then, we're just operating on a Linux environment.

You know more people need to hear about these things, even people in the IT environment are negative. There is a lot of skepticism.

You know, maybe it's because they are not so focused, they do not have targeted areas where they could say you roll out Open Source. Open Source is standardised, what more do you need? You'll talk of standards because you're still bound to Micro Soft. It's a challenge because I even called SITA during this project to say come I'm doing this thing. SITA was not there, they were talking about project management. I said it's fine, you're going to manage this thing, it needs to abide by all project management principles. I gave them all the documentation starting from training, change, migrating strategy. I said here are the documents. Our project is known outside, but not here at home. On BBC radio I was interviewed there.

End: 43m37s

TRANSCRIPT 4

Interview with Thibedi Mogoba (CEO) and Dalson Motimele (Business Development Director) Meso Solutions (Date 13 October 2010) - 10:00

The company supported the National Library of South Africa to migrate

Tell me about your support to the National Library of South Africa

Well ehhm we were well aware of those challenges and we always advocate our methodology that it works, and why we say that is because we have actually long thought in terms of what really should be the area of focus before hand or before talking Open Source or before even considering migration. So ehhm we came up with some sort of a number of steps, which are the following. One we are saying it's critical for institutions to develop a business case, but informed by an assessment which will then lead to a readiness plan to say given what you already have currently, where can you start in terms of prioritising to migrate and what would be the advantages of doing that. So the assessment is critical, because also what that does, that actually dictates or say what flavour, what kind of flavour can you start introducing, for any Open Source solutions out there.

That's one, then the 2nd thing which we then know after having done the assessment is that you look at the assessment in two parts, the environment, in terms of the technical environment and the people. So now with the people part we use a tool, which is called Ad-up tool. (Silence ….. searching in computer). What Ad-up does is it looks at the usage, the skills level of the users in

terms of all the systems they use internally and it confirms their level of usage of those systems at that point in time so you can see which ones are used intensely. But at the same time, you want to confirm that those users, in terms of what they are supposed to do in terms of their work, are they using those systems. So you find that for instance the finance department, you would expect them to be at an advance level of using Excel. But you find that after doing the assessment you find that they want to use excel, but they don't have the advance knowledge of Excel. So already when you conduct training as part of the migration you have a targeted training, that is, for this unit I'm going to concentrate on this because they need it as part of the job function, to at this level.

So you know how to pitch the training cause you know where they are? Correct.

It is also ehhm, the reason for the tool, it is also targeted in that it helps to avoid blanket training. What it does, it's individualised. So during the pre-assessment where we ascertain the level of usage and …. so to assess that this particular individual is dealing with this particular so you are able to conduct training. So we conduct introductory training and follow it with focused workshops on those particular issues.

But just to add, you see when you get to the point of doing the actual migration, you already have identified project champions through the assessment. Those you know can impart knowledge because they are already advance users. Then you use them to become your project champions as you start doing your training and after you hand over to say they will be the people that handhold others because they are at an advance level.

But, do you sort of sensitise them about this role that you are giving them? How do you do that?

Yah you're it at a point when you establish the Steering Committee. You say as part of the steering committee you've identified champions whose roles is that of assisting. To then give that first line support or first line assistance as and when required.

So from then on we go to the support part of our methodology, which is change management and training. We have realised that most technology projects, or most projects for that matter fail, the issue is not about migration. The migration part of it is a technical issues which to a large extent can be termed as non-tangible. The reason I'm saying it's non tangible is that what the users want to see, is being able to get to the workstation and be able to work. Now selected few people want to see happening which is your network administrators and managers is that it does not consume their network resources, network flow, it's scalable etc. So all those issues are important but this

is to satisfy only a selected few. But because this is a department wide or an organisation wide project, what we do we run, depending on the size and the people, after the pre-assessment when we are busy preparing our migration strategy, it gives us an idea of the organisational culture and the types of people we are dealing with. So, like for example, it was different at the library here in Pretoria to that in Cape Town. The reason it was different is because the staff in Cape Town was a bit older. Then that leads to higher resistance to change. What we then we had to run, instead of here we ran two months of training and change management but in Cape Town we had to add another month, to make it four months change management and training. So the message that we are preaching first and foremost is that change is coming, expect the change, even before we start migrating. So that part of change gets to be pushed, it gets to be imprinted in people's mind, we even put up posters in common areas, cafeterias. You ensure that after two months everybody knows about it and is ready, and at the same time as we do change management we do training, so that you do your introductory blanket training and we do individually targeted training. Amongst others, because we know there are certain people that are good at learning on their own and there are those that need classroom training, so we also ask for space where we put what we call a sandpit. That is just some sort of a lab test where we put about 6-10 computers that are running what that change is about. So while in terms of the operations nothing has changed, they have a chance to go and see the look and feel before that look and feel becomes reality, you know. We found that, we ourselves have done a rigorous test or research and development because we were worried because if you can see within the public sector, Open Source has failed dismally. But one study was done by CSIR or SITA itself where these guys came to the office, they trained the secretaries on Monday, come Wednesday, the secretaries found that the computers have been changed. It was too drastic, that's why the issue ended up failing and everybody says Open Source does not work, which is not true, so we decided that given those case studies, we needed to do things differently, that is where we came up as part and parcel of migrating, to give change management and training the respect that it deserves.

But tell me how do you ensure that the people actually go to the lab and play around?

We, through those champions for example, we encourage them. At the training we create such hype that the interest and desire gets more. Because it's not only about Open Source, in the training we make sure we also emphasise that it's also about productivity. Amongst other things why we are there, we are there to ensure that the organisation becomes more productive in the areas we are looking at. So we try to make sure that we create that hype.

But how do you make sure that people are passionate about Open Source?

Well I think, if I may, we want to always use that, whatever medium of communication institutions have. Like for instance we picked up at the NLSA that they have meetings every Wednesday of every week, it was a staff meeting. So we turned that into a project meeting to actually start introducing whatever issues because that actually create a level of interest amongst users so that they don't see it only as an IT project. So you use those forums to get them to be interested. We create the hype by creating posters in every area or entrance, which everybody uses, to say by the way this is the project to start with, it's migration to Open Source. What is Open Source, one is legislation by government, we are expected to comply as an institution, but at the same time we would like to use the opportunity to then train those that never had the opportunity to be trained on whatever productivity tools they need. But not only do you use the meetings, because as part of the steering committee you have a communications manager or directorate who is responsible to convey the message either using different mediums that they have or those that we suggest like intranet, weekly meetings.

I think the other thing to mention, if you remember, amongst other things there would be price giving. From time to time what we would do, the idea is not to say a particular person is struggling and that everybody needs to know about it. So once we see improvement, that that person has improved, we give them something. For example we had penguins and we would dish out penguins, or memory sticks sometime these pouches. So we really incentivised people to create hype and to encourage people, besides the fact that it’s your duty.

Just one last think on change management and creating hype, because having learned about the culture, you then come up with mitigation factors or whatever issues that can come out. One of the things that we use to create that hype, is, as part of the steering committee we get ideas on how we can involve these people. So we get ideas from the steering committee on what they are thinking in order to involve people based on the culture. From that then you'll say for us we think for this thing to get attention, let's come up with a name for instance, which went very well at the NLSA. We say guys we have a project, what do we call it, and they wanted to call it project Tswelopele, right, simply because it means there is progress in terms of what the legislation is expecting them to do. They are the ones taking the lead in complying. So when it was said, everybody knew what the project is about. Yes we are moving to Open Source but we are making progress. So that as an organisation you are one of the first to move.

When looking at the NLSA as an organisation. What characteristics would you say assisted your work, but also assisted them in migrating? Are there any specific traits you know that you would say?

Ehhh I think it worked to be very honest mostly is that they were moving to a new building, so it was coincidence and for them it was like moving to a new building, and new systems in order for us as an organisation to improve our output. I remember one of the, we did the assessment. After doing the assessment we put together a road map to say how do we then get to migrate. Which looked at issues of risks and dependencies, and all those things were informed by the fact that they are moving to a new building. So how do you migrate people to new systems at the same time they have to acclimatise to a new building? So the view was that that was going to be a positive because people were saying jeez we are going back to square one in terms of doing things, so we had to create that hype before they moved to ensure that change management and training has taken place because they would have played around at the sandpit. But at the same time as we conduct the change management and training, we then give them what we call computer based programmes which is exactly applications like Word, PowerPoint. They can actually load the applications and start using them at home. Remember this is before actual migration.

So the familiarity issue is very important? Yes

As you say, when people are seated alone it's when that you start realising that some of the things you never had an opportunity to understand or try. So it helps that when people sit on their own, they come with questions to say how do I close here. The only way that people could pick up those difficulties is that people were able to try out the new system.

Besides being there to train them, what other form of support did you provide?

As we are saying that our methodology has been broken down in four, so support is part and parcel of it, but it's the last phase. On the assessment part of it, we also do technical assessment not only on people but on systems, because not all systems are migrateable, because some systems are …. so it helps us to know that we can use any form of virtualisation to run those systems. For instance for book booking at the NLSA we had to create a virtual desktop. But after that, because the most part of our project has been spent on the first two phases. After that we started the actual migration where we roll out, this roll out it takes place more, because mostly the back end does not affect people. Usually by then the back end has been migrated. So once change management is done, we move to the second part, which is the migration. Obviously for us that is

an easy step because it's just taking a bunch of techies to migrate. That was easy because they were getting new computers, so we just loaded the software at the supplier. So by the time they move to the new building the systems have been loaded. The fourth part of it is post assessment. On the issue of actual change management training, we need to bear in mind that there are two issues about the people that you train, that is your users themselves and the technical support. Because the question always arises that you're going to migrate this thing, who is going to support us. We already address that prior the actual migration to have technical people who can possibly have different backgrounds. That's why initially we need to assess the environment to find out what knowledge they have and to assess the environment to find out what kinds of systems will be able to support Open Source, if not what then do you do technically. After having done that then you know what has to be done immediately, because that is a risk area. You need then to mitigate by training the very technical people who do not possess the knowledge of the new system you are introducing. Of concern most of the time you find that most people have invested themselves in Micro Soft. They say that now you're introducing Linux, it is foreign, we don't know it. It's going to be a complex exercise for us to do. But we always say is that the best people we want are those with a knowledge of Micro Soft, because then you have the best of both worlds, that if anything does happen. Because you find that in the business, of all the systems that they have which are core to the business, some of them don't integrate well with Linux or Open Source, so what you do you use VMware. It's a virtualisation so that when you need to use that system you are able to view it through an icon that actually sit on your desktop, without you having to move from one operating system to the other. Then you have them having an ability to support both worlds.

Because in terms of our Micro Soft resource, as we say that is the resource that we want. We discourage people who have only Linux experience. We need guys that have the best of both worlds. Somewhere somehow Micro Soft is still used by about 80-90% of the world, so you cannot operate in isolation, you still need people with that background. I always make the example that when you drive a Toyota Tazz to a luxury car like a Merc, yes there is a difference in terms of certain buttons, however the most basic fundamental thing is that at least you can drive. If you take someone that cannot drive it's more difficult. So migrating that person or getting that person to drive a luxury car but his first experience is to drive a luxury car, if you take that person and say drive a Tazz, if they are used to driving an automatic it will be difficult. So it's the same concept that or analogy that we're saying that investment will come in handy more than you can think.

So again going back to this 3rd part which I think a lot of time we don't want it to seem complex. In terms of the actual migration, you have the technical people going on site from the minute you start doing assessment and change management. They should already be on site doing an assessment of all the system that they run so they have a test lab where they test all the system with what will be the favoured flavour of Linux, so that they already know that all those systems are being tested to integrate so that those systems that only run with Micro Soft you can know what to do. All that happened concurrent to the change management, so that at the point when the actual migration happens you have all the glitches sorted out.

Then the role of leadership at the National Library, like the role of the CEO and senior management. How important was this role?

It was very important. Look, understand one thing, a senior manager or a general manager of an institution, by virtue of that post, it's a very demanding job. So we had to come up with good strategies to get those people involved without taking too much of their time. For example, in those staff meetings we then encourage the CEO to touch on the project. In those meetings he must be seen that this project has got the blessing from the highest office from the organisation. Not just once, not shortly but dedicate about 3 minutes to talking about the importance of this project and why it is important for the organisation to see this succeeding. But in subsequent meetings for the various senior managers to inform on the milestones of the project, the benefits and the continuous support. So you don't necessarily get these guys, you don't only deal with them … because at the senior management you have a lot of your support staff. It's very important for your support staff to know that, … we are more of a relationships building be it in a business or government organisation. It is difficult but it's a delicate act, but we try to get them involved without taking too much of their time.

But I think that lies more in the objectives of the steering committee. So the project manager must make sure that all the things that require the involvement of leadership are well communicated through the communication persons who form part of the steering committee and you then explain the point that it is very clear for what reason … but at the National Library we had a very interesting environment. Mr Tsebe was quite involved. I think at the point where he understood what this thing is about, it excited him. To say as far as this thing is a requirement, we need to consider it because there is legislation. Because there is going to be enough savings from us in terms of finance. Because it's always a point that why do we have to spend so much on IT, can this not be cheaper? So he was quite excited from the business side.

Did you have to do an analysis for them to show the savings?

Yes, as part of the assessment, the approach is this, what you talk to business is different to what you talk to technical. As I said the IT people are concerned about quite different things to your managers. This one is concerned about how is this going to be compatible with my infrastructure? Is it not going to demand too much from my network? Is it scalable? Is it safe? Whereas these ones, you can't speak about those things, so here we pushed amongst others that from a business perspective, the cost is an issue, how do you as an organisation get the best from a reasonable budget? How do you cut the IT budget without compromising quality? So they understood that they can cut the IT budget without compromising quality. So that was the angle at which it was pitched.

Maybe while we are at this point is, because I think the reason there has not been progress, is that people who are charged with Open Source have been only the IT people, not involving the business. If it was well understood at a business level also, people would start saying why are we not first complying? There is legislation, people must follow. But nobody has actually done that. Second is the issue of what are the critical ehhh outcomes of the legislation. One of the things that the legislation touches nicely is you want to save costs. You want to drive costs to make sure that when you sit and say you want to put together an IT strategy, amongst others in your plan, what kinds of implications are there in terms of money and when you do that, have you considered that there are alternatives in the market. If there are alternatives, why are you then not considering them? The very same guy that we are meeting has done a Phd in the finance side of IT. The govt. has done so much on IT without yielding results. He is saying it's not the reasons about going Open Source, if people can say let us reflect what the policy says about Open Source. Another thing is to say let us look at local content. Because we are making the mistake of wanting to be consumers all the time of foreign technology. Actually ignoring your own innovations, technology. So all these things are there in the legislation.

Actually linked to that, is that for us what the benefit is to the client. After the implementation of this Open Source, last month we were called to say guys, you know students go all the way and park at the library. Instead of studying and reading, they are actually hogging the internet, other people are not able to use the internet for what they need it for. So here is a problem, how do you link someone with a computer and give them a maximum number of hours. Because of the Open Source nature of it, we able to develop an application. We were able to do R&D and have been able to develop that solution and the library is happy. But from a company perspective, we have been able to develop a system and have shown that given the right conditions, we can develop the

right skills that can benefit the country. But at the same time we impact costs and second on technology being reliable. Because before we went to the NLSA they went to multinational companies who charged them a lot of money and they felt they can't. Then we went and showed them it was a fraction of what they were charged.

Okay, you've told me about what you did and what contributed to success. What challenges did you experience?

Resistance, to change. That's the first things, but not only that. The fact that we are a black company was a problem for some people. Both black and white. Even at the board level was a problem. The fact that we were young was a problem. Those were amongst our greatest challenges. We had to come up with strategies, because we are a technology company and not strong on change management. We had a relationship with an empowered company with some white people. So we had to mix our team so that we give confidence, but not only that, we also had to engage our older board members. We used to have older board members to come along in those meetings so they do the introductory part and not bother with the nitty gritties. Those were amongst our challenges.

The other thing was obviously, it was not a challenge but was part and parcel of the process of getting to educate senior managers, CEO and the board to understand where lies the value of Open Source and secondly, the issue of why, the critical question of why go to Open Source. That was mainly the workshop and people had different perspectives. It's where it occurred that one of the board members at NLSA was part of the team that compiled this legislation but he was one of the people that was against it. Rightfully or wrongfully so. The right part of it is that he had seen many failed projects then he became skeptical. The wrong thing about it is that he was not approaching it with an open mind. Open mindedness is knowing that he is better placed than anybody else to know that here we are coming with a much better approach. We might have not been involved earlier but we had made our own R&D to know why these projects fail.

So the challenges were more related in gaining confidence in what you can do and what you can deliver, not with the technical aspects of the system?

The assessment actually gives you an indication of where your risks lie, and where your dependencies lie, and where you may need to mitigate even before you do the migration. We never experienced technical glitches even to date. We had a team that was there to make sure that whatever came up is addressed. We do rigorous training and change management and parallel to that we do ongoing technical assessment so that technical lab kind of runs almost as a simulated

environment. So by the time the guys do the actual migration the environment has been broken down and tested for a period of over a month. Unless otherwise maybe we would have experienced those challenges had we hastily migrated. Because of this methodology it helped because we did not want to experience any down time. Another challenge was for us to manage the pressure to succeed because when everybody does not believe in what you do and you really fail, it becomes worse. So the pressure to succeed, but it helped us to be meticulous in our execution.

But I think this very Ad-up tool that we mentioned, it establishes the lack of risk mitigation skill and support the identification of risks. So on the people side it was actually useful and gave what was required in terms of looking at desktop usage, user attitudes, applications usage and user levels and their attitudes and way of working and culture.

I think the last part of it, because the most important part has been the post assessment, that is the last part of the project. What is currently in the post assessment, remember we have the pre assessment reports, where everybody's level of usage is and where training needs to be done. We took those results and did a post assessment. Do a comparative study. That study has been amazing in that productivity actually shot up. But also what helped is again keep doing the monitoring because that is part and parcel of the handholding. So we are able to monitor those that are on the job, we were able to hand hold those people. We were able to dedicate a resource to support those people and that has worked and it has also shot up productivity. Because now for once, when organisations are buying technology like the phone, you know the phone comes with all kinds of functionalities but you only use a small part of this. So all those things.

This is fascinating because you could use this report to demonstrate that this makes a difference because this is a real project?

Because after that, after the post assessment we then compiled a report for the organisation. That report covers from phase 1 covering the challenges, the milestones, where did we want to go to. And the last thing, especially when it comes to the technical guys we find that certification was important. So we did training that was certified to give them a piece of paper. We do this training ourselves. We certify through our sister company linked to a certified ISET SETA SAQA accredited process. There is just some road maps which are very brief which I can share with you so you can get an indication of what goes in each stage..……..

End

TRANSCRIPT 5

INTERVIEW WITH MORARE MAMABOLO NLSA (Former Deputy Manager ICT – National Library of South Africa) – 30 September 2010

Maybe you can tell me where you joined the process of migration at the NLSA

Ehh, in 2008, we were still in the old building, now it's National Archives. It was still at the beginning, so when we moved, because we moved on the 1st of August, I forgot which year, but we moved into the new building on the 1st of August. So when we moved there, all the desktop, we started with the desktop environment. We migrated to SUSE 10, the desktop environment, and later when I left we had started with the back end, we were moving to OES.

So by the time you left all the desktop was done? Yes***. You were now dealing with the backend?*** Yes.

Now in your recollection what was the motivation for migration to Open Source at the National Library?

The issue was licencing, it has reduced the licensing tremendously, because at the library they have the public environment, which is the kiosks, and those machines are 250 machines. So can you imagine the licence fees? Each of the machines had to have a licence, and for Windows operating and for Office. So only now they've installed Open Source.

Do you know what the licence fees are?

Right now I'm no longer sure, I cannot recall. The main reason was that and also to adhere to the policy on Open Source.

Now if I were to ask you, what would you say was responsible for your success in migrating at the National Library, what things did you do to ensure that there was success?

I think the whole project was, we had a good team, the company that had been appointed to do the desktop environment was Meso Technologies. The whole project management thereof was the one that worked.

Was training part of the project management as well?

Yah, change management and training as well.

Can you tell me about training, how did you approach training?

It was done in phases, we started by just familiarising the customers with the wording you know, like in office they will say Word, in Open Office we call it Writer. We started familiarising people with that in phases going section by section, and then when they were comfortable we introduced them to the screen to show them we have this and we have that. But then again I think the library people as old as they are, they arte interested people. They were ready for it.

So there was no resistance as such?

There was not resistance, I don't remember resistance as such. I remember uncomfortability here and there because this was something new. I think the other thing that helped the most that we were moving from Alexandra to Sandton. So to be in a new environment, new computers, I think that motivated people as well. And the other thing, from the IT side we kept informing them how important this thing is, how important it is to adhere to policy. That we are amongst a few that have migrated, and that we are going to be a success story. And after we had finished migrating desktop, the manager was interviewed by Novell. It was very nice, an international company. A person, I remember Margeta, an international person from Ireland came to interview him. It was nice. They interviewed Lesiba.

Yes he mentioned that he was covered on BBC

He was on BBC, so to see your organisation there it's like wow, you feel special.

So you did training, but training was mainly exposing them to the environment?

Yes, the first time around, just when we were starting. Then after that they were scheduled for the operating system part of it, which was not details because it was to say this is the inbox, this is how group-wise would look like, but after that there was training on Open Office, the Writer, the Presentation, and the Calc.

So you took them in groups and you had a lab you had set up?

Yes we took them in groups and we had a very beautiful lab.

So training was an important part of succeeding. But also you mentioned change management, what did you do on change management?

Uhm the whole change, it was not managed like your typical change where you sign a change request and you go through the configuration process, it was just a mind set thing, the way it was approached. It was not even your formal change process. It was just conscientising people, how do you feel.

So it was about making them feel comfortable?

Yes, are you comfortable, is this okay for you?

So it was not very heavy and formalize?

No, I would not say it was.

Now you mentioned project management, in terms of project management it was yourself?

Lesiba was the sponsor, I was the owner and the others were implementers. The Meso group had their own project managers and together we formed a team.

From the National Library you were leading the project, sponsored by Lesiba? Yes.

So MESO, the role they played was to actually do the migration? They did not help you with training?

They did training and change management.

And how long did it take, this process, from when you came, so you left before it stopped?

We were almost finished when I left. Because when I left we left we the visualisation of the windows servers.

Now that is the factors for success, you mentioned training and you mentioned change management. Is there anything else that you think helped?

I think the approach, the approach also helped. The way Lesiba introduced the thing to them. He enticed them, he got their buy-in. By the time the whole process happened they were ready they, were waiting for this amazing process. It was not like, we are going there, the government says we must migrate. People were like, eehm, we had a process to test other programmes to make sure that they are running on Open Source or we have to visualise. Because at some point we had to visualise. Because out of the 300 customers (machines) that we had, we had 50 plus that we had to visualise to run the millennium and other things that could not run on Open Source.

So you had to do a lot of things?

Yes, at the beginning before the whole thing happened. We had a month or two to test the programmes to make sure that they were running and to decide whether, … the first thing we had, we had a list of all the programmes that were running and to check if there is an alternative in Open Source. If it does not have an alternative, how will it run on Linux?

So by the time you migrated you were confident that you had done your homework. And then, were there any difficulties that you experienced?

I would not say they were difficulties, it was challenges. It was not a case of having migrated to Open Source, I think it was a network issue. Because when we moved the new building had everything new. Now what used to happen some acts of God you to happen at night, so when we come in the morning we had to go reset all the IP addresses. Because we were using VOIP, so the phones would not work for some reason. They would pick up the data IP addresses instead.

But you would not attribute that to Linux?

I don't think so. I think it was the problem we had that we did not understand in terms of the valance we had. Because now we had a valance for data and a valance for phone. Now whatever used to happen there, I'm thinking that it was a network issue.

Do you know if that was sorted out?

That had to be sorted out.

So it was only at the beginning?

It was at the beginning.

So the technology did not give you problems?

The technology did not give us problem, really. Okay we had problems of printing but I thing that was because we did not configure our printers properly, but then it was solved.

You did not have problems with opening up documents, interoperability? People got used to it quickly?

Yes, you know I'm beginning to credit the library people because we never had those problems. To think that they are elderly people. We had file converter so any document that came in word could be converted to ODT. We had educated them to say that if you are going to send your document out send it in word, but if it's internal save as odt.

It's very strange because normally elderly people are …

That's why I realise that in fact those guys, we undermine them. It was amazing because those are senior citizens. The young generation is 10%.

But are they generally people with high levels of IT skills?

No, they are librarians. IT people, okay but another thing I learnt when I worked with librarians is that people have a knowledge of IT, because a lot of things we would learn from them.

So on the technology side there was no problem. But other problems? Resistance?

We did not get resistance; we did not even get resistance from management

How did you convince management?

I think Lesiba had done that before I came in, because when I came everyone was ready, mine was just to implement, initiate and... my job was the operational part.

But looking at the CEO for instance, is there any particular role that he played?

I think they way Lesiba had introduced the issue, if you convince somebody with figures, to say this is how much we are spending right now, and if we use this is what will happen, then obviously, they will be convinced.

So already he had bought into it?

He became Mr. Linux himself, he was talking about it. Though he has not changed his machine yet. He has two machines, the other one is Linux the other is Windows.

What about the other managers, are they also running two machines?

When I left, we were taking the other machines away by force. Handover, but we had to negotiate but we were getting there. I remember when I left we managed to take the Marketing Manager's laptop and that of the Finance Manager.

So overall, if somebody were to ask for advice from you regarding migrating, what key things would you advise?

The first thing is the buy in. if you get the buy in you can go anywhere. If people are convinced that you know your story and you will do the right thing, that's the first thing. The second thing is to have the right team to do the job. Because Linux is tricky, every little thing is just work. So I will say that as well.

Do you know how this company was identified, are there many companies that provide support on Open Source?

We had how many companies? I'm trying to figure out if it went to tender process or through RFP. But we had presentations, and for the OES as well. It was one project and two phases, for the desktop and backend. It was a few companies.

You used Meso for the desktop environment?

Yes, and the OES we, … Novell is the environment, but the people who were helping us with that is MacMans intelligence systems. Something like that. The MD there is Rainford Machimana, very young.

So you say buy in, convince people…

The change management process has to be in order. And I think the step in between is gonna be, get the list of all the programmes you are using. Check the compatibility issue. Check if it's going to run on Linux or if it's got an Open Source alternative.

So in fac t it's not such a big headache to succeed in migrating? It's not as difficult as people think it is?

It's not, but then again, the library is small. Maybe migrating Department of Trade and Industry where we have 1500, it could be a big project. But if we take it step by step, it would work. I think people just have fear about Linux and since I'm here, I feel that I've taken a step back and starting to be fearful. Support for Open Source is there, companies are there and they do tremendous work. I think starting with the users was good, by the time you get to the backend, they are comfortable, but to start with the backend, when something does not work, they say don't even think about the user side.

What was your position at the Library?

Deputy Manager for ICT.

Is there anything else you would like to share?

There is this FOSS group of GITOC, we were supposed to have a meeting yesterday but it was cancelled, then they rescheduled it for the 6th.

But what plans do you have as that committee for Open source?

It will be the first time I attend that meeting, when I was at the library my boss used to attend.

The thing is the initial implementation of Open Source can be costly, for us at the library it was costly because we were getting everything new. But we could say the reason we managed to get new computers is because we saved some money from this.

End

TRANSCRIPT 6

Interview with Brodwyn – Skills Development Officer and Acting Head (FOSS Programme Office – SITA)

Date: 11 August 2010

My position has been a dynamic position, I came in, the office started in 2007 and it was set up post the cabinet decision of the Open Source policy. I think it was just Arno by himself, I came in to head skills development. I came in as a skills development manager. We had a SITA internship programme, well that focused on Open Source so to mentor these guys, to work with the curriculums that they go through, that's when I came in.

Your focus was it on skills development for Open Source?

Yah. Because previously I was lecturing at UCT, 1st year computer programming and I was doing my masters as well, on Open Source speaker verification systems. So given the Open Source space and with the working students before, well you know let's work with the government skills. So that's where I came in but it evolved, so I kind of got involved in everything, strategy, everything that the office was set up to do. And then we have two other components, an advocacy lady who came in and then Njabulo who came in primarily under monitoring and evaluation. That's been our office. Up to date we we've ran two internship programmes and somewhat unfruitful as far as the original purpose, but we found value to derive from it. That has been discontinued as far as internship programmes so the rest of my role has been business analysis. Yah, it's a tough one because I can't find anything to put on my business card. Currently I'm coordinating everything, sought of project manager. I don't how we can do this, maybe I can speak of the role of the office and our activities to date. ***Yes.***

The office was set up to be the implementing arm of the Open Source policy. There was a standing committee started, an Open Source standing committee that reports to GITO and chaired by Arno Webb. It was representative of a few departments who are supposed to be role players in the policy implementation as well. The Department of Communication, the Department of Education, … so they were there as far as the overall guidance and leadership of the policy and we were supposed to be the implementing arm from the SITA. Our client being government at large and us kind of facilitating and coordinating the efforts of Open Source in government albeit efforts happened even without us. For instance SARS has got a lot of Open Source servers, SITA has Open Source firewalls and these have been not provoked necessarily by the office but were

business decisions that they made. There were pockets of activity that were going on and us we came and propagated that.

Then what we've done to date is, progress has been slow because we've tried certain routes and find they don't work and tried other routes. So on the advocacy side since Pumeza has been working with newsletters, having events, kind of having brochures. I think the newsletter has been quite successful; it's called FOSS Focus.

How is it distributed, electronically?

There is an electronic distribution and some are posted etc, and stories that have been gathered happening in government are put there. ***Would this newsletter be on the website***? Yah it was on OOS.gov website but it's been down recently so Pumeza is on maternity leave right now so it's been down. It comes out quarterly. And then there was events, we has the Open Source CIO open workshops. Information is communicated there and information is sourced. There was a cloud-computing thing but focused on Open Source, you know different technologies. We had a few events, Govtech we tried to distribute stuff and spoke there as well. So as far as the advocacy that has been our thing, the periodicals, the website etc etc.

So this has been since Pumeza came on board? Yes. ***When did she come on board***? I think it must have been June 2008. So that's been on the advocacy to kind of get information out there and disseminate information. Then on the skills side, the idea was to start these internship programmes. These are graduates who come from tertiary with diplomas and degrees and then they go through the SITA's normal year of internship, 6 months theory and 6 months in the practical environment. The idea was that the uptake of Open Source activity would reach a place that by the time they finish a year, they would be absorbed, and I came in the middle of the internship programme. When I came in I realised that there were no plans to absorb them at the end of the period. You know these are not like equipment, which you can just keep there. There were places in government where they were needed, and in cases where they were needed they needed seasoned people with experience, so we had a gap there. So what we did do was within SITA Open Source activities. Maybe let me digress a bit, Craig and them, their work has been internally focused on SITA, dealing with SITA migration. So they had a need for interns to work with them, so we supplied them. At first there were like 6 interns. At first they ran behind plans, they initially thought they were going to need all 40 interns, some left I think there were 36 left in the programme, so Ekshan said they will need all of them, so we gave them as many as 20 and 30 and we kept 10 here within the R&D space here because we're connected with R&D. So they put them on LAN support to be migration stuff. But their migration, you now bugs etc also caused

delays, their delays went past their internship period, and so we had, so with us they achieved the IPL 1 certification, you know the international certification. So we could see that this thing was not going to start, so we got them applying everywhere else, so some came into R&D and some stayed with Craig, I think there is 2 or 3. R&D we took a good number, extended their contract, not permanent but contract on Open Source. Some went to occupations within SITA but not necessarily Open Source. A few got into departments but not necessarily Open Source, some got into training but not necessarily Open Source. It happened like that.

So we took the 2nd year intake,

Another 40?

No we take them, they get certification but there is no obligation that they will go anywhere. So it's just a training environment on Open Source, if they can work within SITA that's fine. No promises. But it's good that we had an Open Source stream.

It's unfortunate that there is not enough demand for them to go and support departments, or as you say, if there is demand they are looking for professionals.

That's a generic challenge in South Africa in that there is a skills shortage and the skills that we're looking for, the graduates do not have that level of skill.

So how many did you take?

The 2nd one I think it was 20 students. Half the number in 2009, and the early parts of 2010, and from there same thing, because they had the 6 months practical training so we tried to source them to services that use Open Source, so the spaces that use Linux in SITA and our R&D. Those are the 2 spaces. In that 6 months, if the manager finds a need for them, he could extend their contracts and use them, so some of them got contract extensions, I think there was about 6 of them, and the host was the guy who was in charge of those Linux servicers has left so they leave as well. But the work that they do here at R&D has been to their advantage. For example we had 4-5 guys working on a GIS R&D research project, they are working with quite a seasoned guy and within a few months, 4 of them were snatched by GIS companies.

So you are contributing to Skills development in SA? Yah, so there was value in it but not as planned. It's still a win in the end to the country.

So the R&D component, what exactly do they do?

This is where the restructuring come cause is we've realised that our office can't manage these R&D components and the turn around time is not ideal, so we had a component of Open Source

Research within the programme office like a GIS one where they did research, but we also got R&D capacity within SITA which is made up of the technology labs and innovation labs which are also on this floor and they do general R&D research. They are seasoned ICT people who are also good in Open Source, so their mandate is not within the Open Source policy, it just happens that they also focus on Open Source. So when these guys got into those environments, being Open Source, were working on those project which were not necessarily connected with us, but were being done by SITA. Like I think in the R&D lab there was a cloud computing, grid computing and e-learning and all of them were Open Source investigations. So the interns were configuring and installing. In the innovation lab there was a wasp platform, the middleware and all those kinds of platforms, so they got into the real R&D work that happened to be Open Source.

But do departments use this R&D capability for their own needs?

I guess SITA, there's a market oriented approach where the need arises and you research, or there's a product-oriented approach where you research an area and you come up with something and you try to take it out, so the latter is the case. If it was the former we would say the activity is provoked by the environment but it's not so.

But you still are able to take your products out to the market?

Yes, because the e-learning, they settled on a product called SACAY, our interns became the lead administrators in configuring it. That was going to be the SITA's offering on e-learning. There were some pilots that were initiated, but I don't think the pilots are continued because the guy that was responsible is no longer with us. It's often our case where things come up and the people on it go. But it was viable. The wasp one, the bulk mailing it was Open Source. I mean there is a pilot happening currently nationally at GCIS, people are interested in these products. There are people who are using the WASP bulk SMS platform, there are about 4 departments. So these interns are not being sourced to the departments as staff, but the products are being supported or worked on by these interns.

I here you say it's more of a push kind of an approach, but after that, is there a demand for these products, do the departments want them, do they use them?

The two that came from the R&D pure space will come to our office space and we'll use them, but the bulk sms and the e-learning, there is a demand, but it takes longer to implement, pilot and all that. As far as the office thing, you know we work on GIS, there has been a few provinces. Departments approach us all the time, the provinces, I think Limpopo they were working on a GIS system for education, the Northern Cape, Eastern Cape, Western Cape, the Department of

Education wanted to roll out and put in Open Source. So all these requests come and we've been engaging with them accordingly. To date what we've been able to do for departments is what we've called readiness assessments. So that is where we went into departments. Assessments for Open Source. We assess your whole department, we get service providers to do it so they assess what can be moved. So with all that support, with all things, you are sure afterwards how successful something has been done. The document is produced but nothing transpired after all. It's like it got stuck and you start to identify why there has been no migration. To date there has been a whole lot of engagement, there has been readiness assessments, there has been strategies but no implementation of anything has been done to date. This is where towards the end of Arno's time and now where we're restructuring and thinking. I've started to realise that the resources for something to go forward are not set up. Right from, for example a guy came to me recently from the CIDB and basically they are moving over to an ECM and a CRM and he's heard about the government policy and he wanted to know what the options were. I know that there are this and that, the leading products, Alfresco, but after that there, can we put it in, it is not been set up. Firstly we don't know the whole footprint of support, who will deploy, who will support, how will it go in. I'm not saying it's not there, but the information is not there. We've been engaging in the past without these things being in place yet. We engage and we say we'll look into it, the expectation is set up, and then when we research we find that development has to be done, partnerships have to be setup and then it just drags on and interest wanes or it's just not viable. So strategically, let's start to wind up this information. Who locally can do every element on that value chain inside SITA or outside. Secondly does our governance or procurement procedures, … if they are not on our database it can't be leveraged, so how do we work with them? How does government work with them? And then even if they do exist, are they of the capacity that is needed for a government scale? If not, where do we start development? So all these things have been talked at a high level but on the ground they have not been ironed out so when the actual time for implementation comes, they are wanting. And so that's why now at this place there is this whole type of thinking that says where to start. For instance next we are looking to have this database, what I want to do know up to the end of the year, is gather this database, even if they are not on the procurement list. On every product, who is the support, training, support etc and kind of have it as relational database such that you can see a vendor and all his services or if I look at a product I can see all the vendors. So those two should be available for the website, I think it would be a significant step.

Would you make that information available to whole of government?

Yes. It will also keep a lot of skeptics quiet because a lot of people say well there is just now one to do it. It's entirely untrue; it's just an unknown.

So it's a change of strategy, you are looking to unblock the blockages? Yah.

Cause you say there is assessment and nothing can happen because there is no information?

But this takes a bit of management of stakeholders because in the time of building resources there is no activity necessarily happening and stakeholders will say what's happening, I don't see anything happening. The challenge is the office has been there for three years, and it's like you should have done these things earlier. But we learn somethings.

Have you worked with any department that has succeeded in migrating, as a result of this office? Just from your interaction?

From my interaction the provinces have been quite active on their own, Western Cape, …. The SITA account manager Danny Van der Merwe, he's been stimulating Open Source and Open Standards. In the Northern Cape, I think they've been quite active in the Department of Education, I don't think implementation has happened but the interest is there. Limpopo has been very active and I think there are a few departments there, for example, Health who have upgraded their servers, they have done it on their own. The Eastern Cape is showing a lot of interest recently. I'm not very intimate about the progress that has been done. Many of them at their initiative. And then SARS, I know the back end is quite advanced on Open Source. There's been the Department of Science and Technology, and it's often because of champions at these places. Arts and Culture because of Arno's old influence and now Seaparo, also the National Library.

But it's largely due to their own initiatives. But for those departments that have succeeded to migrate, what would you attribute that success to? You've mentioned champions as the one thing that drives them, but what are the other factors you think are important in this?

You know I think I could solely in my understanding put it down to champions in that they play a leadership role in those technologies. When people are doubting or skeptical they fill the gap of the unknown to calm fears to say this is possible etc. Sometimes they are at the CIO level. GCIS as where for instance Terry, there was a project and the first thing that he asks is it Open Sources? So even when new people approach him with those things he will always ask. So sometimes it's from a CIO level sometimes it's from a senior technical manager, but it's always someone who is an advocate of Open Source.

And someone fairly senior in the organisation almost all the time? Yes.

If you don't have that advocate mind set in that senior position, I have not seen Open Source succeeding. I think it's a leadership role they take in the true sense of what leaders do. They lead that space. It's a bit sad that SITA has not been able to build capacity because if we did, connecting with those leaders and advocates, I think speed could have been faster.

And also to document some of these successes in order to deal with skeptics, to say this department and that have succeeded and are working okay with Open Source. So there is no effort at capturing those lessons?

I think Njabulo and Pumeza have been trying to work on those case studies, but again we realise that we need something of a technical writer, something that has been challenges. Whenever there's a gap and we need someone to fill that gap, our processes take time, it's possible but sometimes.

But you know this is where I can come in to write up these cases, think about it. Talk to Pumeza, I've met her before.

Your focus, there are two types of migration, landscape, where there whole landscape changed, and there is product, be it a server etc. I'm focusing on all types of migration. You see on the product side, you will see innovations, SITA has now registered a wasp, bulk sms services, they are creating that portfolio, they are selling it as a product, the whole is based on Open Source. They go as mobile services. That's why knowledge of Open Source would miss the attention because most of these go out to serve a need. For instance at Govtech they ask us what is our offering on Open Source, we say bulk sms, okay, they say that is already going from the lab and business development as mobile services, so they are not classing it as Open Source because, it is not registered as an Open Source project, but that becomes the test because it's powered by Open Source but people don't see. I just don't see why it has to be like that. It think it will be surprising if you go through government, Njabulo started a survey together with Arno to see how much penetration in government, and to look at MSP and what's in people's plans, what implementation. They came out with something, I think, I think I saw something that said something there were 50% of departments with some plans, …

Yah, I think that came from that, but what we deemed was that the sample or the departments of this thing does not warrant, so we are taking a second short at it. You must speak to him as well, because the information he is after is probably the information you are after as well. Because somehow we want to get a benchmark to see if things did increase what did they increase to. I guess that's where your expertise in research come in. What do we measure, do we measure

spend on Open Source, total spend, do we measure number of implementations versus total implementation?

I've seen a number of article of articles that measure adoption and you can come at it from different angles, including spend, number of Open Source based applications as a percentage of total applications or the total number of people using Open Source based applications versus the total number.

Yah but if you take an email solution, even if it's one application, you can look at the number of users.

Because one statistic that's coming out says that Brazil has the highest number of developers in the world, so that says something about that country, so you can look at a number of things to measure adoption.

So I think your input into that will be quite useful to this office.

I've not met Njabulo before, you'll connect me. As I say anything that I can help with. This will help me. As I've said the Treasury is doing a review on ICT success and I've pushed them to include Open Source. From a policy point of view etc?

Well from a policy point of view because the policy is very clear about OS, but nothing is happening.

You spoke about constraints earlier; I prefer to learn from successes. But just to cautiously pull from the failures, what I've realised is that when we approach departments. The strategy of how Open Source was sold, I don't believe it was right. For instance I knock on your door at Treasury, you are doing anything on Open Source. I say you know what there is this policy on Open Source, we need to move, let's see what we can move. Now you're sitting there as CIO, you have problems, but I'm not talking to that, I'm speaking about Open Source as the end. What I think is a better alternative is where I speak to you and find out what is on your mind, what are your challenges? Then after I speak to you we get where you are on my side, you understand and I say would you allow me to help you to look for solutions. And from that perspective of your business needs I look in the Open Source universe to see what can work and I would sell to you a solution to your problems, but I don't even have to mentions Open Source. If it has everything, we can move on. The policy can then come in later to push things along where needs be. That's a very different approach that uses influence and tact, versus saying there is a policy you must migrate, people resist and are apprehensive to that type of domination, and yet the this approach is easier. I think most government people push it that way.

I agree with you, it's got to be about functionality, because people are worried about support, inter-operability etc.

I think you have to speak to the values of this thing to the business, and then it's because of the development model that these values are delivered. Because to many people, FOSS has become a taboo word, they hear it they already put up these walls. They prejudge it, I think it's been caused by this type of approach.

Also people associate the free in Open Source and meaning that no one owns this solution. So if I'm Treasury and I'm running critical applications, I need to know who owns the system.

So it's not like we are starting from a clean slate. Going forward we need to fix those things. It's the approach that I took at national liaison with the bulk sms system. As you know their business is communication. I went there and drew up a business problem case with all the constraints, pay as you go one that you draw up petty cash, they take money to the bank, only one person can use a PC at certain times and when they are not there no one can send messages. And in that engagement meeting, I spoke only about how all these gaps can be addressed, it was an exciting model and I never even mentioned Open Source once. They invited about 3 units with GCIS, all of them want it, I just said hold on, we just need to do proof of concept and this is what I'm busy with. That principle can be applied anywhere. Open Source products will be received readily and not everyone agrees because some stakeholders want you to mentions Open Source because if you don't mention Open Source, what are you doing?

Do you think if you approach it from a financial basis, in this environment where departments are constrained and you know how much money is being spent on licecse fees, would that approach work?

I think in a mature environment it would later as a selling point, but as starters, I think the set-up costs could outweigh proprietary costs. So all the support costs, because if you go for support, you would probably save only 30% on licence costs. Now that 30% saving, you're going with a product that has not had an ecosystem like proprietary that would take money, which could be more than proprietary. It would be creating an expectation, which you cannot manage, in the short term. In fact you may just drive away people when they sees the costs.

You know SARS said, you know we are using this stuff but the licence costs, that is, all the costs including training the people works out to more than we used to pay. So in the beginning you have to speak of freedom, customization, vendor lock in all those things and as the ecosystem

develops you could probably have a selling point on costs. With economies of scale coming through. Yah.

And again it's something you fix because we started with the free part and cheap part, but I think when we start implementation we are going to come across that expectation.

It would be interesting to go to these countries that have implemented like Malaysia and Brazil.
Malaysia has come and seen us and Arno went to Brazil as well, talked to them.

Do you have any write-ups on those?
We don't have write ups but they shared their documentation with us. They've got very like Malaysia for example, very mature models from what they worked from. For example 0-2 years this is the space, so desktop was not part of that, then we'll go to this type of software, so they broke up stuff like that and they followed those phases.

So it was a very controlled process of migrating, control from the centre somewhere?
Yah. I'm trying to think, I must go and look about the differences but I think Brazil's industry of support was a very different thing and I think the procurement think was flexible. So those types of things, whereas there is so much of governance and things in our case.

A number of companies set themselves up to support Open Source after the policy, which shows also the impact of policy on the environment, but the problem is that government is not moving.
I know that BCX set up a unit, which it later closed because there was nothing. Sun Microsystems is supporting the Department of Transport with eNatis. I understand also that Siemens, but if the government is not moving, what is the value of investing in resources to support. And my mind still swells around on the best way forward. For instance do we take one area, one product and say this is our service offering for now. Do we negate, you know the delay in the internal SITA project has come where they said whole migration, back and front end. But the front end proved to be most challenging. Email servers and all those things were done in not time.

But why was the desktop more challenging?
Because they still have to integrate the current things that people use. So they could not on-off switch. So having a Linux desktop but still able to use Micro Soft, for instance all our SITA templates, you open them in Open Source they don't display right. Somebody has to go and change all those templates, so we continue using Micro Soft there until we transition slowly. So

those integration were very challenging. They are still ironing out bugs. They are 2 years behind schedule; I think this was supposed to be done in 2008. I think. We just past the 2-year behind schedule mark. Yet if they set and said we will do email, they would have completed that sign it off and move to the next thing.

So you would favour a gradual approach?

Yah. The big bang gives you a sense that we are doing it; it has a lot of costs. So we've seen departments putting up servers. So do we find out that in mature spaces, web servers, middle ware, databases, quite mature, commercial support, is there successful implementation in SA at large? I mean if you go to Obsidian, they will tell about implementation in SA at large. So where we capacitate ourselves, push that wide either landscape wide or that, you close it off, success and transition to the things maybe your ECMs, CRMs etc and then desktop operating systems. But stakeholders want to see, so if I have the whole back end on Open Source but for them it's like nothing has been done.

Would that also be affected by the size of the organisation, where in the small organization you could move everything, like the PNC with only 60 people? I just wonder if the size of the organisation would be a factor in deciding how to migrate?

I think it is a factor, it does I mean, size of the organisation and general functions of the organisation. For instance we've heard that FNB has put desktop on Open Source but the functions that they do on the desktop, let's say they only put browser functions, you could transition that because maybe it's one application. So it's a number of things to see the number of people and what is the range of applications. If an organisation is using a range of proprietary applications that could be a challenge.

So you can never come up with a one size fits all framework or solution?

Yah. That is the idea behind the readiness assessment.

Are these reports available?

They are available, Njabulo has been working with them, and I think they will be available.

Going forward we are very much geared towards building capacity. Not just government talk but SITA talk. We talk about capacity where it is integrated into how you procure. Tailor-made for capacity building in government because what I find is that people want stuff, they want to try stuff, like the provinces, but I can't tell them who can help them. Because if they use it, will they be able to read what's coming from outside, because if they cannot you cannot say you been successful. Holistically it's not a success.

But would you provide a service where you provide to departments a database of service providers?

That's my intention by the end of the year. I'm planning to issue an RFP inviting providers to say what they are offering. I'm planning to get somebody to capture it in a database and have it on the OSS.gov website so that people can use. Now the clarity I will need will be should I surface vendors, will I be violating any SITA rules? I don't know if SITA will frown on it, are you encouraging people to go to? My idea will then be to stimulate them to go on a SITA contract, say to create a contract for a period of time. Another thing is that to date we've been so inundated with request from different places and different levels and we say yes to everyone. So we have not been able to focus on this thing. I would say that we keep information going, but when it comes to implementation we taper it off so we can focus on one thing. I think that's the other thing that's been missing, focus, we're spread too thin. There are two people now.

What's the level of buy-in on this project from the SITA? I mean if there is no intention in the short-term to replace Arno, it says something about the level of priority that this project is regarded as within the SITA

That's another thing because we are not in positions of authority within the SITA to influence decision and say put this high on the priority list.

But this Steering Committee of Director Generals of the various departments. Is that still around?

That's still around but it has not been that effective. It was how we strategically chose to use them and we did not leverage them or we could speak about the understanding of their role and how they get involved. So it's debatable whether it's the committee itself, it's something we have to evaluate. Do we need the DG Steering Committee, if we do how do we use them?

Who chairs this, is it the DG of DPSA?

I think he has moved to another department, there is someone else now. They don't necessarily, you see they know this is the policy, but the goals and other things they depend on the office we've lacked focus, we've spread ourselves thin out of good intention. R&D, training. I would say take the limited resources, make the appropriate partnerships and hit that path successfully and use that as credibility for moving on to other things. I very much would advocate not starting with the desktop first. It can be a drawn out process, stakeholders can become restless from whatever level you'll be talking. Start with quick wins, the back end, if servers can be overhauled start there, if emails can be overhauled start there, your very web based cloud type of

infrastructure. Yes, users may not see it but it's a plus because change management starts with a few techies. Because even with the back end movement, the industry starts to gear itself. The gearing of the industry also supports the front end later.

End

TRANSCRIPT 7

INTERVIEW WITH GRAIG GALLOWAY: LINUX ENGINEER AT SITA

30 JUNE 2010, 10:00

Can you then just give a brief background about migration at the SITA to FOSS, what aspects were migrated, when did it happen?

Basically we started with the back end, so we looked at mail, we looked at web pages, portals that kind of stuff as well as faxing. One thing we found is that a lot of the webpages were developed for …. (can't' hear), platform so we did a lot of migration from that. We migrated the mail from to Zimbra, we migrated faxing from …, to Halifax. Currently we are busy with the desktop, so that's pretty much where we are at the moment.

When did you start the process?

We started this project in 2005 actually but actually kicked it off in February 2009.

So you've done all your back end and are moving to desktop? Yah

What's the level of advancement have you achieved there, what % of desktop have you migrated?

With desktop the current level of hardware refresher, the new image that we are busy developing will be put onto the new hardware, so it makes our migration easier because the user gets a new machine with the new image. So I'll say we probably have about 6 or 7 machines out there that are on test basis.

So you're still testing at the moment? Yes

Just briefly, why did you arrive at a decision to migrate, was it the issue of the policy?

Basically we got a new CIO in 2007 and one of his mandates was to implement Open Source at SITA. I think that came from the board that nothing has happened since 2005, so it came from a drive from management.

Now looking at the migration itself, that part of it that you achieved, the backend and the little bit of the desktop as you've mentioned, do you feel that you've been successful in migrating to Open Source?

Definitely, I would not say complete yet, I think it's a long road, but I think we've definitely taken a step in the right direction. With regard to the backend we've got 500 people on the mail system already, so we're gradually migrating those people across, we've achieved a lot in the year and a half.

And what factors would you say were responsible for your success or are responsible?

(Not clear about the question, pause), and factors as in uhh?

It could be technological factors, it could be the way you dealt with the people, training, you know those kinds of things.

You see I think that the people side of things we have not got there yet, what we did we did the change management side, we got a competition for a name, we got people got involved with the project. We've got monthly newsletters about FOSS, we call it the FOSS Focus, and that focuses on all Open Source Software, why Open Source, proprietary versus Open Source. We are trying to educate the users to say we are not just doing this because of the free word. It's got nothing to do with monetary issues, but we want to be able to do what we want to do with our software. I think the whole change management involves the education side as well as picking the right products that you want to migrate to.

So there's no element of training in the change management?

There is for the desktop.

How do you do that?

Basically we do in two ways, we've got classroom training and on-line using AP Plex and that kind of stuff. So what we basically do is we're going to run, it's kind of like skills assessment where we'll assess what level of training each user will require. So for example if a users can't answer some question, they will require classroom training, whereas there are some advanced users out there, we won't bore them for 5 days for the same training. So we'll definitely categorise users and take them through these trainings that they require. We're definitely going to have 1-2 day sessions in the classroom or up to 5 days, and where one is advanced we'll have online sessions where a guy can log in and actually go through the system and see how the system works.

So you'll tailor make the training depending on where they are? Exactly.
And then your change management project, that still continues, you have not stopped? No.
You still generate newsletters and stuff, you still do these kinds of things? Yes.

So you reckon from the people side those were the two main areas, the change management and the training that will take place? Yes

On the technology side you mentioned picking the right products? Yah
Another thing to add to that is pick a product that's got a roadmap or a migration path from where you are to where you want to be. That's one of the things that we looked at. We looked at companies that had a migration path to their product from where you are now to their product.

So you are using external service providers to assist you with this process? Yes
Which company are you …. Obsidian
And then on the other hand, probably you experienced some difficulties, and you're still experiencing some difficulties with the migration, can you take me through those?
Uhhm, quickly the very difficulty that we face at the moment are skills within the country, to support an organisation of a 1000 users. We do battle to get the credible skills in the country. So that makes us depend on vendors and there is not a lot of competition in that field. I mean there are a couple of 2 or 3 main teams out there but the biggest will be Obsidian that has got some bit of skills. We've had the resistance to change that was one of the biggest challenges from a user point of view, as well as from certain management point of view. I think people have got their views, and some people are (can't hear). Those are the two main difficulties we've had. Obviously there were some technical difficulties but not so big. So that was pretty much the two main ones.

The technical ones, without getting into details, can you just tell me what they involved or entailed?
Uhhm, cannot think now without getting technical, (silence ….) I don't know how I'm going to explain without being technical, (Laughs).

But did it have to do with compatibility?
No, it's not compatibility, it's something like, just you would do data migration from one platform to another, and when you get to the other side you see that the data is not consistent to what it was, so consistency issues and that kind of stuff. But at the end of the day it has all been resolved, but there were quite a few technical issues. Like I said, as well as skills. We were one of the 1st people in the country to look at Zimbra, so were like guinea pigs. So we had a lot to learn.

But the level of support that you're getting from the service provider?
Yah, the service provider is fine. ***Also from a cost point of view, it makes sense?***
Yah**,** we did a whole Total Cost of Ownership thing that we've looked at now, and so I mean it looks that probably about 33-40% decrease in our licensing fees and costs.

You're migrating the whole of SITA, including your regional offices and so on, Yah.
So those are the main difficulties, so although there were technical difficulties the big ones were on the people side, around skills and around resistance? Yes**.** ***And how did you go about addressing these difficulties?***
You see around the skills we still got that problem, we obviously got SLAs with certain companies like Obsidian, so that helps. The resistance to change we basically take an approach now, we do not want to come across as forcing on the side of the users, so we use the monthly newsletter. We sit around the table and decide why would there be resistance to change because people don't like anything to be changed, when they are used to something they don't want it changed. Why don't we approach it as in an education thing, get them, that's why we ran a competition, that why we got a monthly newsletter, that's why we have dummy accounts, people can log in and have a look at the system, see how it feels. If the people become more comfortable with the product, they are not going to be as resistant, so we basically do continuous change management every month as well as create SLA's where there are gaps with companies like Obsidian.

Can we go back to the factors that are responsible for success a little bit, you mentioned picking the right products, can you tell me a little bit on that, what does that mean really?
Well the thing is what we've looked at is FOSS, great, but you get enterprise version and you get Open Source versions. We could have made the decision that we're not paying for anything, we will just go Open Source, so we had a looked at certain functions so we compared the Open Source version to the enterprise version. For instance Zimbra and it's okay, what are we gonna pay for? If we get this what are we gonna get? If we get that what are we gonna get? So you'll get certain functionalities like built in backups for example, built in cell phone synching, which you won't get in an Open Source version. So we actually had a look at various products and packages and say this is gonna work for us, this is not gonna work for us, so we set in a lab environment and actually downloaded these versions, installed them, looked at the migration path, looked at the functionality and then from there we had to make a decision. So it was quite a lengthy process because out there you can have 10, 20 Open Source clients or servers so to pick the right one for

your organisation you have to go through each one, so that's basically what we've done with mail, with faxing, with the desktop side of things, so yah picking the right product is important,

So starting with what you need and eliminating, so you do that yourselves, you don't leave that to the service provider?

Yah, we did it ourselves. You see we would not have a service provider until we knew what product we wanted. So we had to get what is our deliverables to the users, what kind of functionalities do we want, once we've picked the product we can then go out and say okay, provide us with x, y and z.

That requires that you have internal capacity to do that, because an organisation that does not have that capacity will not be able to do that. Yes.

And then why is change management important to success?

I mean if you don't get buy-in from management and the end-user I think any project will fail. I think that's one of the big huddles you are going to have with any project, is to get buy-in. So instead of just shock treatment and changing systems for users, making sure that users are comfortable and they know that they are not gonna be given something and left in the dark. So from our point of view it's all forms an end user process just to make them comfortable with the new system.

Training is about skills, but at the back end because I assume that your people that are working at that level are fairly skilled in IT, is that very important to also make sure that they are trained?

I think what we've done is the right way to do it as well. Instead of outsourcing everything, get someone internally to be trained and then get those skills transferred to all the users, so what we did, because there was a skills shortage, we had 20 interns to come in and we actually trained them for a year on Linux and all that kind of stuff. They did OPIs, they did all their Linux exams, and we actually drafted them into the various areas where there is Open Source within SITA. So I've got a couple here and we did skills transfer to them and made them part of the migration, and actually give them the tasks and projects to run, there are many projects. So it's also about building capacity, not only about looking for a service provider to help you. It's important to build your own support base within the company itself. So that's what we did.

So overall, if you were to advise somebody who wants to migrate to Open Source, on issues to consider that are important, how would you summarise that?

Compatibility, I would definitely, you need to know what you've got on the network, you need to know what applications are running, and in my experience, coz we first did try to integrate the desktop router to the old back end, and several months down the line we decided this is not gonna work. So in my experience I would definitely look at the back end first and get the back end cleaned up and more open to various browsers and various OASIS and that kind of stuff, and the basically once that's done, half the job is done, it's just change management and your desktop.

Now on desktop, do you, what are you planning to do? So you're planning to just give it back to them with the Open Source applications?

Well yes. ***So you're not going to run parallel Open Source and proprietary at the same time?***

We will be running some proprietary, we've got, we've split the project so the mail will change, the Open Source will change, users will still have access to Micro Soft office for a 6 months period.

So you will run 2 operating systems?

No we'll run something called KVM which is a Kernel, so basically you can use an Micro Soft documents, it opens it up in an XP engine kind of document, so the software needs an operating system, but at least office runs in Windows itself. We'll do it for 6 months because we think the document migration process is just as big as what we've done now, instead of just bundling everything together. So we are going to finish with this and then move documents to open document format. Once that's done and all the user's templates are moved over and all the documents are done, then we will drop the office part and use Open office, then that's when we'll be pretty much close to the end of the project.

So I interrupted you there, you were still telling me what you would advise someone who wants to move to Open Source

Like I said it was the back end stuff, choose the right product for your company, you have to do thorough testing, you have to go to a testing lab, you have to do proof of concept, there is a lot of tools out there that work, there is a lot of tools that don't work within the enterprise environment. That's pretty much what I would say.

Then what about choosing the right support partner

Like I said at the beginning, it's hard to be picky because there is not a lot of support partners in the country, but I feel that there is enough support partners to provide you with a decent level of support, but I still believe as I said earlier that if you are going to make this step to go to Open Source, you are going to have to build skills within the company for Open Source. I don't think

you can depend on one company, depending on the size of the company, to support all your desk top, so definitely some kind of plan for skills transfer within the company.

What about the importance of internal company policies that support migration?
Yah, it's crucial, because 4-5 months before we did Open Source strategies, we did policies that govern Open Source within the company. I think without policies and strategies you're not going to,…

So you need to start there, you make it sort of mandatory over time?
Definitely, we did not look at one technical aspect until all those policies were written and the strategies were done.

I guess what helped SITA is that the new CIO came with a mandate, so it came from above?
So we had the support really, we had the budget, if we did not have that kind of support base, it would have been difficult.

Because although people could have had resistance, they knew that this thing had to happen?
Yes, we did a survey it was quite interesting, we asked the users what do you know about Open Source, and a lot of the users did not know what it was. They saw it basically as free software that's not gonna work very well, and a lot of the people said that they understand that it comes from the Minister, we had to do it, which I found quite interesting that we just have to do it, and then a small portion thought it's good for the country because we are not spending all the money overseas, we can keep it inside. So that's when we realised that there is a lot of people out there who do not know about Open Source, and see it as a burden on them. That's why we focused for about 2 years on change management.

So in terms of the process of migration, if I understand what you're saying. You say you favour a more gradual process of getting there instead of just hitting people with big change at the same time. So it's a more phased process, you start at the back end and then come to the front end? Yah. ***It takes time, you started already some time back, you are not finished yet?***
Yah, the technical thing started in 2009, before that we were writing strategies and policies. There was also another side, that's the security side, there are big security issues around it. You need to make sure that you know what's happening on the security side of things. So it's been years, it's been a long drive but it's getting there.

What about issues of inter-operability with other departments, because you work with other stakeholders in the market, and have you experienced problems?

Basically what we did because when we sat down to start the project we had to run, our 1st thing was what do we have out there, what's running on our machines, and no one could answer that because there are lots of organisations that think they know but they don't know. So we rolled out an Open Source asset management tool. So got information, a database on what applications are running on each machine. From there we had to sort through all the ones that were not really SITA approved and which ones are SITA approved. From there we had to test. Does it work? No, Does it work? Yes. After that we had to sit and decide okay, that's not working, how do we fix it etc. Once that was done, then we could start looking at the back end. So quality is a key thing as well. You need to know what you're gonna be changing and what will work on your systems.

You can't just go blind folded, with your eyes closed?

No, because there are differences between the two operating systems and there always and there will be applications that don't work, and there will be applications that are replaceable and not replaceable. So that's what we did, we basically got a list of what we got on Windows and what we are going to replace it with.

And what about the role of stakeholders in general? Here I'm talking about both internal stakeholders like managers. What role should they play? And external stakeholders.

Yah, the internal stakeholders we've got quite a big group because we've got and R&D portion of Open Source, and we've got a SITA internal one. So we basically set up project meetings and we have stakeholder meetings as well on a bi-monthly basis where, I think just from getting a perspective you get caught up in your project, you get flustered and you don't have a bird's eye view of things. So having some that will do R&D for you while you're busy with implementation, and when you come to a meeting he's done some research on x which you did not know about. So I think that kind of interaction is pretty key to the project as well. So we've got the R&D stakeholders and the SITA internal, which is the CIO and Matshidiso who is the manager of the project. So yah, I think working with different departments and actually just looking at research like ….that's valuable information.

You mention working with other departments, can you be more specific, what kind of interaction with other departments?

Like I said the departments for us were R&D, an internal department, but they focus on doing R&D for government not just for SITA. So they do a lot more research on a range of other things like wireless, that kind of thing, so we interact with them. So whatever we did internally we provided them with proof of concept reports and implementation reports so they can have a look

at it and say this is what were their deliverables and they have achieved, can we plug this into government. So that's the kind of interaction we had with internal stakeholders.

So you use them to also externalise some of the things you have achieved? Yes***. How useful are they in doing that, in trying to push these things out?***
I'm not sure, we basically provide them with information, so I'm not sure how they are doing it.

But your responsibility only ends with what happens within the SITA, you are not responsible for supporting other departments, it's some other people that are doing that? Yah, I'll give you the guy's details and so on**.**

From an external point of view, did you have interactions with any stakeholders, including the service providers of course which you have mentioned?
No, Not really, purely like you said, just the service provider, that is it.

But you have a structured process of engaging with stakeholders, like you said bi-monthly meetings with R&D, but who are the other internal stakeholders?
Basically it's R&D and we've got representation from every department of SITA, so we have people nominated and they will have information about what is happening inside the project. They can raise concerns, it's more of an interactive meeting, so that's the kind of stakeholders we work with.

And it's a way of getting buy-in from them going forward? Exactly**.**
And I guess it helps the fact that there is a national policy adopted by government?
I think so, It's been a big thing and we had to do it first. I think as SITA we can't point fingers and say why haven't any departments done it when we have not done it ourselves. Once this is done I think there is gonna be a lot more pressure put on departments to move, because if it's proven to work, then what are you waiting for.

Apart from the fact that it is functional, and you save on cost, you mentioned about 40%, what other benefits does Open Source deliver?
I think it's got the flexibility. I think if like I said the skills is a problem, but if you do get the right skills within your organisation, the flexibility and customisation that you can make to that product is and that product is yours at the end of the day. It's like you bought it, that's gonna give you a platform to do whatever you want to do. I think it's the whole free, do what you want to do with it, if you don't like the way this works, change it. It's just freedom, that's the key.

You mentioned the factors that are responsible for success, do you see any interrelationship between these factors that one depends on the other one for it to succeed?

I think any product you pick you can train on, but I think any product you pick you have to make sure that the users are not afraid of the change. So I think those two go together, but I think any product you pick you can train on, but just make sure that the users are comfortable before you move on. We are also going to go through a users acceptance process, have a nominated a representative from each line of business who will come and sit with me and do his day to day tasks on this machine. Once he is comfortable that he can do everything he needs to do he will sign off. So we will not migrate any department before that sign off. So that's another way that we're trying to make sure that everything is working because there's high risk. So I would recommend that you go through that process, and it takes a lot of time but go through the process before just rolling out.

So are you saying each users…?

Basically what happens is that we send out a mail to all managers asking them what applications they use, then we say nominate someone and then that user will represent that department. Say finance, so the finance user will come and go through all the finance applications they use, check if it works, if it does, sign off.

That's a long process, it has not started yet?

No, it will start within a month.

What are your timeframes for this migration process, right up to the end?

I think we got to finish by March 2011, I'm not 100% sure what the date is, but we are looking at the desktop migration to be starting by the end of July.

And then, the same question with regards to the difficulties, any interrelationships between these factors?

(Silence….) I think the technical difficulties do come from skills shortage. So if the right skills in the right categories were available freely I think the technical difficulties would be far less. So there is a relationship between those two.

And then resistance and change management?

Yah, as I said just making sure that users are comfortable.

It would also relate to skills because the more resistant you are, it's difficult to get the skills?
Yah

Is there anything else that you would perhaps like to share with me on this project?
No I think that's all.

End

TRANSCRIPT 8

INTERVIEW WITH WERNER KOEKEMOER, PROJECT MANAGER –TASIMA (PTY) LTD, MANAGERS OF E-NATIS

28 JUNE 2010 – 10H00

Remember that my focus is on migration to FOSS, so I'll be discussing issues that relate to that, in relation to eNatis. But maybe you can just give me a bit of a background to the project.
Okay, the eNatis is a system that has come from the Natis system. And the Natis system came from 4 legacy systems that was in the old provinces, Transvaal, Free State, Cape and Natal. The original systems were separate systems developed by those 4 provinces. There was no integration between the 4. What happened in 1991, the 4 systems were migrated into the Natis system. And those days it was done on Scow Unix operating system, as well as the Ingris database and it was developed on a distributed architecture. Those days in 91 the server capacity could not deal with the volume of data and transaction volumes, that was needed for a centralised system so we put down, I think originally 1997 regional servers which was later reduced to 14 servers. The system operated like that from 1991 to round about 2003. When 2003, came, well prior to that in 2001 we redeveloped the whole system into the eNatis. The development cycle we made our 1st advances towards bringing in Open Source components. We started early on to decide that on the client side, what our users are going to use, we are going to use a Java application. So we are making use of Sun's latest version of Java that runs on the desktop. The desktop is a Java theme client with none of the functionalities sitting on a desktop. It's just a shell that talks to a server, which sits elsewhere. Then in our application, we make use of HP servers and we are running HPX as the operating system there, and we also making use of Oracle as well, database. But with that integration, we have integrated many free and Open Source applications. For instance we use Jasper reports, we make use in our application of…

Jasper reports is an Open Source based reporting system? Yes.

We make use, we've developed our applications such that you can use any of the proprietary browsers and non-proprietary browsers.

So you are running these thinks parallel?

So you can at the client side when you want to use, it will direct you to a browser and that browser can be Internet Explorer, or you can use something like FireFox or Opera or any of the FOSS browsers.

But what are you finding in terms of the usage on the client side, are people tending to go more towards Open Source on the client side or … ? Well it's about 50:50.

And then what we have done is, we've integrated into our application the adobe PDF suite so all our output documents are directly generated to PDF, which is Open Source. So from a short high level description I've given you can see that we're still stuck with a fairly proprietary system in the sense that our databases applications Oracle and our servers are HP and our operating system are HPX. But on the client side, we've gone Open Source and we continuously investigate how we can bring in more Open Source products.

Now when you say the client side you are talking about the department of transport?

Yes, let me explain to you how that sits. In all three levels of government, with the national department being responsible for the procurement and custodianship of the eNatis system. So we do all the procurement at the national level, but the function of registering vehicles, licensing cars in terms of the constitution is the competence of local government then the provinces in turn appoint agents, which are the local authorities where the transactions are done. So strictly speaking on our side, our client are local government where transactions are done or private institutions.

Thanks for that background, that helps a lot. Now in your mind because you moved from the old system, you migrated to this, you introduced some elements of Open Source, how successful would you say you've been in introducing Open Source, and if so, what factors would you say account for that success?

I think we were very successful in promoting the Open Source platform. In terms of our architecture probably our client that operates on the desktop portion is probably the most stable of the whole platform, as well as our reporting structures that we use. We did manage to integrate it very successfully and I think the reason why we were able to do it in such a way is that we

worked on an extremely formal structure manner. Each component that was introduced was properly specked and developed, properly tested, user acceptance testing and sign off before it was put in the field. And obviously a lot of consultation with the users getting them to buy into the introduction of Open Source.

How did you do that, how did you get them to buy in?

What we did is, because we worked nationally, we adopted a train the trainer concept where we trained provincial users in all 9 provinces. In that training programme we specifically addressed the whole change from what they were used to, from proprietary to Open Source, and the transfer of that information to the users was all right

So the trainers took the responsibility of taking this training to the other users? Yes.

So this training, you exposed them basically to this new environment. It entailed them trying out new things and so on? Yes

But what we did is, we focused on the design of our applications in trying to make the look and feel of the transaction look very similar to the old transaction. So that the users of the old system, if they did it in a character based transaction, you know 161 transaction was for a vehicle query, now bringing this into a thin Java client, we tried to keep the look and feel the same, not to bring too much new things.

(Phone rings and he picks up) ***So you made sure that the look and feel was not very different from what they were used to?*** Yes.

So to introduce small changes, that was initially, and then subsequent to our initial release we started changing things quite dramatically. Okay, but we made sure that the users first got comfortable with the first change from a proprietary system to Open Source and then slowly we started bringing in the new changes, not to rock the boat at the beginning,

Otherwise you might not get people to buy into it initially? Yes.

And the trainers, who exactly did you select as trainers?

Well, in terms of train the trainer concept, it was the responsibility of our service provider to train the provincial trainers, 8 trainers, but the provincial trainers were actually government officials that were appointed within the provinces.

Were these people within the IT?…

Yes, so you had the outsourcing model for the train the trainer concept and you had appointed government officials that trained the users, but we gave provinces specifications on the trainers.

You know what skills they would require and it was quite a strong IT background required for the trainers.

And that worked? Yes***. So the training aspect that you say assisted you in this, also the aspect of not introducing radical changes at the beginning?***

It's almost, like in our environment more buy-in from the users than training. These people had worked in the licencing offices and so on and for some reasons have been there for many years. So they are very skilled in the transaction itself, some of them even, you know the whole system was slower, and the screen refresh was slow. They would work two or three screens in front of what is being displayed. That is the level of comfort they had with the system and they were very scared that we were going to take that away from them. So we designed the system so that within a week, they were back where they were. The difference is that the screens were updating at the rate they were working and that was also interesting fact that we found out right at the beginning. And we used the rationale process system development methodology. The methodology says take on your big risks upfront in the cycle, don't delay them for later in the cycle. We developed the system and we first adopted that approach that we were going to rock the boat at the beginning, and the first user acceptance test, because RAP also says you must develop modules, small ones. Perform your isolated testing and then do integrated testing later on, and in those first stages we saw that these people are not going to cope and because of adopting that methodology we actually had to redesign the whole method of thinking and we came with the concept that we are going to keep it the same, and introduce at the back end all the changes and keep what is on the users the same. I think any migration, government department that migrates from legacy systems to new systems take the users along, don't try to do too much quickly.

So those are the main things, but was there any other factor that you would attribute this success to?

No, you know we did not use lesser-known Open Source products. We went for the big ones. I mean Sun's Java products are widely used, the Adobe suite is widely used. We did not take an Open Source package that was not truly tested and shown to be able to stand up in production.

So there was a lot of confidence in the systems you were introducing in any case, and the level of support from Sun, was that an issue that you needed to address? No the support we received was more than adequate, in some cases better than the proprietary.

That's from the success side, but I assume there were some difficulties here and there that you confronted in that process, can you talk to me about those?

We had many difficulties with implementing the eNatis. The biggest one you can't blame it on the actual concept of Open Source. We underspecified and the under estimated, the effect it would have moving from a decentralised to a centralised architecture, and the amount of processing power requirement that it would put on the servers and so on. So our problems in migrating were more underspecification problems than with Open Source. We did however initially, because we launched with HP servers and we loaded Linux and the operating system, and we did experience problems. There was incompatibility between Linux and the HP servers, we migrated on HP's recommendation to HPX, which is their operating system specifically designed for their servers. Saying that we operated on the Linux operating system for maybe 2-3 months but the performance was not the same as with HPX, on that specific case, although we wanted to, we found that the proprietary product was better.

So, Linux basically was technically not up to speed?

I think Linux is a good system but it's generic to all platforms and it specifically did not work well with HP platform. And the support we got from Linux could not solve our problems as going to the alternative HPX product. So unfortunately we missed that boat, (stands up saying .. I just want to check something …). So all the servers are still HPX, but at this stage we are considering putting in a, because we work in a rack environment where we have 3 database servers, and a rack configuration and three applications (servers) we are considering converting one of those servers to a Linux server just to see if those problems that we experienced are overcome. We have enough capacity on the other servers to carry on in case of problems, so we can put a Linux server through the rack and start filtering through that servers, monitoring through that server, as soon as there are problem you just shut it down.

So proceed with always running things parallel so that if there are problems on this side, ?

Yes we always adopt that.

But is the intention to, if Linux operates well to fully migrate?

Yah, we fully support the government's intention to move to Open Source. We will continuously try to take some of our proprietary stuff to convert it to Open Source.

So that was one major difficulty, was that the only difficulty, Yes.

And funny enough what people sometimes think is the skills base in the Open Source environment, but we experience no such problems. It is in fact harder to find Oracle people than to find Open Source people. There's quite a number of people that are supporting Open Source

That's interesting, because that's one of the major stereotype that people say where will you find the support for this thing? No, it's there.

If we go back to what you said to me about what accounted for success. Do you want to speak about it, how did training help you and the approach to training that you adopted, how did that help you to succeed?

I think the fact that we adopted a train the trainer concept, first of all what we achieved we created a skills base across the 9 provinces and also in terms of the training, we followed an accredited process. We made sure that before we started the training, we made sure we had approved unit standards that the service provider that was providing the training to the provincial trainers were fully accredited, to make sure that all the facilities we used in the provinces were fully accredited.

Were these facilities provided by you or by the service provider?

By ourselves. So we went through the whole SAQA process and we got all 9 service centres accredited and 9 trainers accredited, so the users received unit standards or NQF points towards a qualification. And that put a whole new spin on the training. So all the users who did training before that system would not come to the training because they think they know the system and they don't, so with the extra incentive of getting points towards a qualification created more positivity towards the training.

So that incentives, so these incentives applied to both the trainers that you trained and to the end users, they also got some points towards a qualification? Yes.

So an incentive is one of the important things in actually driving training in this context? Yes. ***Then you mentioned also the fact that you introduced small changes at the beginning and you speeded up later, introduced more radical changes. How was that important, why, how did it make you succeeded?***

You see we knew that our users were going to be challenged with a new system that will have probably technical performance issues in the beginning. Ehh service centres where there were already existing long queues from the old system, as well as unfamiliarity with the new system, that's a recipe fro disaster. You already have service centres that can't cope with the demand, now you introduce a new system with technical issues upfront and then with users who were not

familiar with the application, so we tried to manage those three and we spent a lot of time on training so that at least we knew we could deal with that one, at least we should not lose efficiencies there.

So that helped you manage that complexity that you don't bring big changes all at once and cause problems. So coming back to the Linux issues, you said the difficulties were those of compatibility, but have those issues been dealt with?

The documentation says yes, but the crucial thing is that the proof of the pudding is in the eating. So it's difficult because you know that you had all those problems in the beginning. The documentation point to that all have been resolved, but if something works don't fix it. So we have to really motivate ourselves in the cause of moving to Open Source, to assume those risks. Because the system is stable, the performance is good, the availability is good, so you sort of go into a mode of complacency to bring in… and the only reasons you would do it is probably for costs and to support the Open Source concept,

But how did you convince managers in the department to try this given all the risks people perceive in the system, in terms of Open Source?

You know how it works in the procurement, those were specifications that service providers had to comply with. It was already the idea from the word go from the side of the department. I don't think the department fully understood what they were asking for. And we were a department that acted outside SITA. We were not participating in the SITA processes, so those decisions were made in a department where IT is not a core function. Probably because of that there was less fear. Probably less fear due to a lack of knowledge.

That's an amazing observation, because you are saying were people to more cognisant of the risks they were taking, it would be harder to convince them? Yes I think so.

That could explain why many departments have not taken this thing up actually. That's absolutely fascinating.

So TASIMA is a company that's established to service this contract, it's not part of the department?

Yes, it's a private sector entity that performs the function for the department

For a period of time, like a PPP arrangement?

It's not a PPP, there's no sharing of risks, it's a like an outsourced contract, turnkey outsourced contract.

So just broadly then Werner, if I may come back to these issues and ask in conclusion, what you would consider as important in migrating IT to FOSS?

I think your technical analysis in understanding what requirements will be put on the system. I need to explain to you in this case, we had to build a dataset of 80 million rand to implement this system. Because the equipment we needed to implement this was so expensive, there are no reference sites around the country that are configured in that similar environment where you can take an application and simulate the true scenario when you go live. I mean HP could not help us with a configuration like ours, loaded with Linux to test if it will work. You run tests and do simulations and stuff like that, but it's not the same. So if I would approach something like this, from whomever I would procure, I would insist on a reference site. And you know when you roll out a major Oracle system and you going to procure the hardware, let's say on HP platform, Oracle have facilities all over the world where they will build a configuration like yours, or where you can test if it works. That's not necessarily available in the Open Source market. I would say it's absolute if, … yes one can migrate into Open Source, but you will have to invest in putting the infrastructure in place and testing and testing before going live, and if we had to criticise ourselves, that's where we fell short a bit. We probably could have tested more and tried to simulate something closer to the reality.

But who should carry the cost of doing these things, should it be the client or the service provider?

You see the service provider will test according to industry standards that are acceptable. they would have stress testing, they would have user acceptance testing, but there is very few service providers that will provide you with a similar situation that you have and so it can be tested on that, it's too costly.

So at the end the client has got to carry that can? Yes

Any other important consideration?

I don't think so.

From the management side, how would you say the process of migrating should be managed? Did you have to set up separate management structures just to deal with these issues?

Yes, that's very important, the entire deployment of the eNatis from its early days of the project was done via a formalised national steering committee. We had a project sponsor in the national Department of Transport, and we had representation from the client, in our case all 9 provinces. And all decision making was done through that body, so there is no single person that made the

call. It was a collective decision making process and it was done via formal change control procedures as required by the contract. Highly structured, where change made for every change was preceded by resolutions taken by that committee.

So this was crucial?

Yes that's crucial, you know I think that what stops a lot of stuff happening especially in government, they take young inexperienced project managers and they put them in charge of large complex projects. So what they do they throw them to the wolves. And on daily basis these projects managers must take huge decisions. So they end up too scared to take decision so they do nothing. The project starts stagnating, because if you don't do anything you don't make a mistake. And some time in these projects you have to make the big call. And how we managed that, although I was a project manager I never took those decisions as a person. There was a steering committee with full delegation. The people that came there could take decisions and then it was collective decisions. And the decision you would think it's bureaucracy and red tape, but it's not, it actually enhanced the decision because the people there deliberated and take the decision. Then if thing go right they, the steering committee took a good decision and if things go bad they say the steering committee to a bad decision. And that was because we had that, we did not have delays in decision-making process. Another thing that sinks these types of projects is, you know, and it's something for your department. We've got so much fraud and corruption that goes in these big deals, that Treasury and through all the acts and the regulations and stuff, these contracts are awarded and you have to go to the floor and make it happen. But it's so stringent after the award, there is no room for flexibility. You got a project of R510 million, you can only go 10% out. You are not allowed to change products, you are not allowed to change this. You go to the ground and find that things are different, but you are not allowed to change, you have to live with it. I say Treasury should really try and consider that when you do the award of these contracts, have a flexible change control process. I'm not talking about scope creep, I'm talking about having a change control procedure that will allow you to quickly change things when you know it's not going to work. Rather than trying to flog a dead horse. A lot of these things, they say R500 million, and come year 2, there are difficulties and things cannot be changed. You've spent ¾ of that money, rather than if you had a mechanism there to make the necessary changes. Even if you needed R100 million more, then you would have spent R600 million but you have something in the field.

So it's issues of procurement and how procurement is done?

It's procurement then after procurement, change control procedures.

But you've said it, I guess it comes from lack of flexibility and the low risk appetite sometimes?
But we've been sought of forced that way because you have to curtail, you know the opposite side of that is outright wastage etc.

Because that form of procurement also presupposes that on the client side there is enough capacity to be able to see when there is a need for that flexibility, that when the service provider comes and say this issues needs to be addressed, that there is capacity to understand, and in most instances that capacity is not there. Yes
So you try to go Open Source and then Open Source failed but it had nothing to do with Open Source, it was something different.

And then the final questions Werner, on the stakeholder side on this project, who were the stakeholders and what role did they play in migration?
Okay, we had many stakeholders. All 3 levels of government in the transport environment and many other government departments. On the national level like Police, Home Affairs, all the systems that link, and then private institutions, banks, insurance companies, private testing station holders, profilers. I mean there is over 120 interfaces to eNatis, so the stakeholders were wide and we developed a migration strategy for all the groups, we had consultation we what we call our inner circle, the 9 provinces with the agents. And then we had stakeholder sessions in the financial area, banks and insurance companies there. Then we had consultations in the law enforcement environment, all the traffic officers. Then we had a stakeholder session in terms of policing, the national prosecuting authority, Scorpions, SARS. So we had all those channels and once again what we did, these people all connected to the eNatis via ESC based character based interface. So what we did we gave them both options, we said we will build a system on our side that will still talk to that ESC system, but we are going to build an industry standard XML interface which we want you to migrate to over time, and that's how we dealt with it. So on migration day, some of the stakeholders did not even know there was a difference, apart from the fact that they were down a bit, but in terms of what they had to do was zero, and then over time, we targeted them one by one to move them from the old ESC interface to the modern interface.

So you basically tried to make it easy? As little as possible impact on the stakeholders, phased approach, testing.

What about stakeholders internally within the client environment, managers, end users etc, was there any strategy that you used for those?

Within the department, also same the process. We, when we started with the project it was a requirement from the beginning that they must receive ISO9001 accreditation. From the beginning we worked because it was a new project company, that was our strategy from the beginning to work in that formalised structured way. By the time we go live to get that accreditation, we followed that process through between management, the technical teams, the deployment teams, structured meetings, minutes, instructions, works orders all documented. I mean to the level that when one of our technicians goes out, he had a checklist to say, check this, do this, do this, he has to go through all the check boxes, sign off. Site representative must sign off, that document pack must come back here, once that document pack is recorded here onto the asset register. Only then can they claim their last 10% for that deployment. So it was a highly structured process.

End