

**An evaluation of the supportiveness of systems development methodologies
to strategic goals during business process reengineering**

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**Dissertation submitted in partial fulfilment of the requirements for the
degree *Master of Science in Computer Science* at the Potchefstroom
Campus of the North West University**

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June 2012

ABSTRACT

Professionals in system development have recognised and recommended the use of System Development Methodologies (SDMs) in South African organisations (Huisman and Iivari 2003). The first decade of South African independence has seen extensive restructuring of the Higher Education Institutions (HEIs) to form Merged Higher Education Institutions (MHEIs). The effects of the mergers on the Information and Communication Technology (ICT) side of the MHEIs saw the restructuring and redirecting of previously individual HEI's strategic goals and business processes thereby invoking Business Process Reengineering (BPR). Professionals in BPR have also recognised the need for specific SDMs for BPR (Hammer and Champy 2005, Muthu, Whitman and Cheraghi 1999 and Giaglis 2009).

This study aimed to evaluate the supportiveness of SDMs to strategic goals during BPR to find out whether they can be used as an effective artefact of change in MHEIs. The drive behind evaluating SDMs' organisational strategy support is basically informed by past research from BPR proponents that suggest that BPR has serious effects on the organisational strategy and that it is a process that needs a proper approach to be followed if it is to succeed.

In Chapter 2, evaluations of SDMs were done to determine the extent to which SDMs accommodate organisational strategy as well the extent to which they match with BPR success factors. The evaluations showed that SDMs can be used for BPR to satisfy requirements to a certain degree, but no specific SDMs were identified for BPR. The assumption has been based on the fact that in all the SDMs evaluated, not all required BPR success factors and characteristics were traceable in a single SDM at once to qualify them to suit BPR purposes. Future research may therefore need to consider developing some SDMs specific to BPR that emphasise on organisational strategy and include the success factors and BPR characteristics discussed. Chapter 2 also revealed that there has been very little research, specifically relating the use of SDMs in BPR. Findings on the relationship between BPR, SDMs and strategy therefore still remain almost non-existent.

To be able to establish the supportiveness of SDMs to strategic goals in practice during BPR, four South African MHEIs were identified for investigations. Qualitative analysis was done for the semi-structured interviews and documents which were used as data collection methods. A qualitative analysis tool called ATLAS.ti was used to analyse the transcribed

interviews and then the cross case analysis technique was applied to generate similar patterns among the findings.

The results gave an impression that SDMs are being either applied or recommended in MHEIs for BPR projects. However, none of the SDMs carried the required emphasis on strategic goals in all the phases and no specific SDMs were identified for BPR that carry full emphasis on strategic goals. Chapter 4 of this study revealed the results of the study and confirmed that universities still basically follow the Information Systems Development Life Cycle (SDLC). Some universities have developed their own framework of tools and an organized collection of techniques from different types of SDMs where developers can pick and choose from for different development projects. Most universities IT departments have taken up the use of newer SDMs to try and address the changed and more complicated IT environments and businesses processes brought through the merger. Top managers emphasised their strong support for strategy in SDMs and developers believe in the consideration of organisational strategy although they are not directly involved in strategic issues.

KEYTERMS

System Development Methodologies, Business process reengineering, Merged Higher Educational Institutions, Information and Communication Technology, strategy

OPSOMMING

Professionele stelselontleders beveel aan dat stelselontwikkelingsmetodologieë gebruik word in Suid-Afrikaanse organisasies (Huisman en Iivari 2003). Die eerste dekade van Suid-Afrika se onafhanklikheid is gekenmerk deur uitgebreide herstrukturering van die Hoër Onderwys Instellings (HOIs) om Saamgesmelte Hoër Onderwys Instellings (SHOIs) te vorm. Die effek van die samesmeltings op die inligting en kommunikasie tegnologie van die SHOIs het gelei tot die herstrukturering en heradressering van die vorige individuele HOIs se strategiese doelwitte en besigheid prosesse, wat besigheid proses heringenieurswese (BPH) genoodsaak het. Professionele BPH praktisyns het die behoefte uitgespreek vir spesifieke stelselontwikkelingsmetodologieë vir BPH (Hammer en Champy 2005, Muthu, Whitman en Cheraghi 1999, en Giaglis 2009).

Hierdie studie poog om die ondersteuning wat stelselontwikkelingsmetodologieë aan strategiese doelwitte bied tydens BPH te ondersoek, om sodoende te bepaal of dit as 'n effektiewe artefak van verandering gebruik kan word in SHOIs. Die rede vir die evaluasie van stelselontwikkelingsmetodologieë se ondersteuning van organisasies se strategieë kan gevind word in vorige navorsing waar gemeld word dat BPH ernstige effekte het op die strategie van 'n organisasie, en dat die proses 'n behoorlike benadering moet volg indien dit wil slaag.

In Hoofstuk 2 is 'n evaluasie van stelselontwikkelingsmetodologieë gedoen om die mate te bepaal waarin dit organisasies se strategieë akkommodeer, asook om te bepaal tot watter mate dit voldoen aan BPH se sukses faktore. Die evaluasies het getoon dat stelselontwikkelingsmetodologieë tot 'n mate gebruik kan word om aan BPH se vereistes te voldoen, maar geen spesifieke stelselontwikkelingsmetodologie kon geïdentifiseer word wat uitsluitlik op BPH fokus nie. Nie een van die geëvalueerde stelselontwikkelingsmetodologieë was geskik vir BPH nie. Verdere navorsing is dus nodig om stelselontwikkelingsmetodologieë te ontwikkel wat geskik is vir BPH en wat organisasies se strategieë beklemtoon, asook aandag skenk aan die sukses faktore van BPH. In Hoofstuk 2 word ook aangetoon dat baie min navorsing bestaan wat die gebruik van stelselontwikkelingsmetodologieë tydens BPH aanspreek. Bevindinge oor die verwantskap tussen BPH, stelselontwikkelingsmetodologieë, en die strategieë van organisasies bestaan feitlik nie.

Om die ondersteuning te ondersoek wat stelselontwikkelingsmetodologieë aan strategiese doelwitte bied tydens BPH, is vier SHOIs geïdentifiseer vir ondersoek. Kwalitatiewe ontleding van die data is gedoen wat m.b.v. semi-gestruktureerde onderhoude en analise van dokumente versamel is. 'n Kwalitatiewe ontledings hulpmiddel, ATLAS.ti, is gebruik om die getranskribeerde onderhoude te ontleed, en daarna is die oorkruis-gevalle analise tegniek gebruik om soortgelyke patrone in die bevindinge te identifiseer.

Die resultate toon dat stelselontwikkelingsmetodologieë gebruik word of aanbeveel word vir gebruik in SHOIs vir BPH projekte. Ten spyte hiervan fokus geen stelselontwikkelingsmetodologie op strategiese doelwitte in alle fases van die proses nie, en geen stelselontwikkelingsmetodologie kon geïdentifiseer word vir BPH wat ten volle fokus op die strategiese doelwitte nie. Hoofstuk 4 bevat die resultate van hierdie studie, en toon aan dat die universiteite steeds die tradisionele lewensiklus volg. Sommige universiteite het hulle eie raamwerke geskep deur tegnieke en hulpmiddels van ander stelselontwikkelingsmetodologieë te kombineer, waaruit ontwikkelaars dan kies vir verskillende projekte. Die meeste universiteite maak gebruik van nuwer stelselontwikkelingsmetodologieë om die veranderde en meer komplekse IT omgewings te bestuur wat as gevolg van die samesmeltings tot stand gekom het. Topbestuur steun stelselontwikkelingsmetodologieë met 'n fokus op strategie, en ontwikkelaars glo dat strategie oorweeg moet word, alhoewel hulle self nie daarby betrokke is nie.

SLEUTELWOORDE

Stelselontwikkelingsmetodologieë, Besigheid Proses Heringeniërswe, Saamgesmelte Hoër Onderwys Instellings, Inligting en Kommunikasie Tegnologie, Strategie

ACKNOWLEDGEMENTS

Firstly I would like to thank The Almighty God for giving me the strength, guidance; wisdom and courage that I badly needed to complete this work. Lord You made it possible when I thought it was impossible. May Your name be lifted high in my life.

This dissertation would not have been possible without the love and support of my husband Nehemiah; I dedicate all my hard work and success to you, in so many ways you strengthened me to push harder. I know you understand how I feel when I say ‘**thanks**’ to you.

I owe sincere and earnest thankfulness to my supervisor, Professor Magda Huisman; I would like to extend my heartfelt thanks for your unfailing patience, encouragement and friendliness throughout, and especially during the time when I felt I wanted to give up. May the good Lord continue to bless you and your family.

My sister Samantha and my kids Patience, Kudzai, Tinotenda and Kudzanai; thank you very much for your support, and your prayers. May the Almighty keep you around for me.

Finally I would like to thank all my interviewees from the different universities. Without your support, I would have never managed to discover anything. May your willingness to provide information extend to all academics who are still to come. I also wish to thank my language editor, Dr. Livingston Makondo, for patiently reviewing and revising my grammar and spelling as well as my boss Sonia Swanepoel for continuously encouraging me towards my completion.

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LIST OF ABBREVIATIONS

SDMs	- System Development Methodologies
HEIs	- Higher Education Institutions
MHEIs	- Merged Higher Education Institutions
ICT	- Information and Communication Technology
IT	-Information Technology
IS	-Information System
BPR	- Business Process Reengineering
SDLC	- Systems Development Life Cycle

CHAPTER 1

OVERVIEW OF THE STUDY

1. 1 Introduction

The higher education sector is one of the most important sectors in South Africa. The sector empowers the nation by producing knowledgeable and skilled individuals to service the country (Harman and Meek 2002). Like many other sectors, higher education has not been spared of the inevitable organisational changes which are meant to generate new business opportunities (Jansen 2002). Organisational changes influence specific business processes, thereby invoking business process re-engineering (BPR) and hence a re-look at the organisational strategy (Frenzel and Frenzel 2004). Towards the end of the first decade of South Africa's democracy, there has been an extensive restructuring of higher education institutions (HEIs) through mergers (Hall and Symes 2005). HEIs were combined into two, three or more campuses that were previously stand-alone universities to form a single university (Rothman 2005). This chapter will introduce the problem facing merged higher education institutes' (MHEIs) IT departments and the approach through which the study aims to address this problem.

From the Information Communication Technology (ICT) point of view, the mergers saw MHEIs IT departments generating substantial distributed computing facilities (Rothman 2005). These facilities had to be somehow re-engineered in order to accommodate the changes that had taken place. The mergers also saw the introduction of new technologies and new ways of solving problems in these MHEIs (Jansen 2002). It can be appreciated that the re-engineering of technology for the distributed campuses of these MHEIs can be very complex therefore the process requires to be managed properly. In light of this, some authors have suggested the use of system development methodologies (SDMs) to assist with managing the process (Huisman 2004) Odell 1996, Huisman and Iivari 2003, Avison and Fitzgerald 2006, Mavetera and Kroeze 2010, and Chapman 2007).

The main purpose of this research is to classify and examine major categories of existing SDMs and evaluate whether they accommodate major BPR characteristics such as organisational strategy use in mergers. This evaluation is useful in helping organisations, in

particular, MHEIs to appreciate the importance of SDMs when conducting BPR. The evaluation may also assist organisations in deciding on appropriate SDMs suitable for BPR that will support the organisational strategy.

1.2 Problem Statement

ICT is an essential part of all HEIs. It affects major strategic functions such as admissions, registration, library, marketing, communication and payroll systems among other functions (Jansen 2010). As a result, the MHEIs had to re-examine and reposition these strategic functions and also re-engineer their business processes hence triggering BPR (Senn 2001). The above statements give an insight to the problem of the study. Combining disparate business processes from different HEIs that are geographically dispersed can at times be very complicated. Some HEIs' information systems were simple involving less processes and older technology while others were already complex with more processes and newer technology. While the changes were taking place, there was need to maintain the status quo of customer satisfaction, reliability, security and efficiency and at the same time capture diversity at the lowest costs possible (Jansen 2010).

Using SDMs could help developers reduce some problems associated with engineering and re-engineering of information systems (Muthu, Whitman and Cheraghi 1999 and Giaglis 2009). These SDMs could help developers fulfil requirements as well as meet budgets, schedules and produce effective products (Jackson 1995).

For a long time SDMs have been a part of the organisational as well as information systems design process (Giaglis 2009). The discussion on SDMs precedes to yet another part of the problem statement. During mergers, business analysts and information systems professionals may sometimes fail to establish the link between BPR, existent or proposed SDMs and organisational strategy. They may not realise that BPR itself is a process that needs proper planning and direction of which SDMs could be the solution (Muthu et al. 1999).

There seems to be very limited support for predicting the impact that the three facets that is, BPR, SDMs and organisational strategy, have on each other (MacArthur 2004). Furthermore, MacArthur (2004) purports that while the benefits of aligning strategy with methodologies

during BPR should be apparent in theory such an integrated design has rarely been done in practice.

Since the mergers of HEIs took place in South Africa, a lot has been written by several authors (Hall and Symes 2005, Moore 2010, Martin and Roodt 2010, Jansen 2010 and Du Plessis 2010). Most of these authors have discussed the effects of the merger on staff or on students, but little has been written concerning the ICT side of the mergers. So far, little information can be found concerning the development practices deployed or used during the development of new systems in MHEIs.

The discussions above have attempted to bring out the impact of BPR on strategy, and suggested that some MHEIs had to re-examine and reposition these strategic functions and also re-engineer their business processes. There was also an attempt to bring out a relationship between BPR and SDMs. The context of this study therefore also intends to investigate the applicability of SDMs during BPR. If there are any SDMs being applied the study intends to determine whether they accommodate BPR characteristics such as organisational strategy for effective use during BPR in MHEIs.

1.3 Research Contribution

There have been studies concerning BPR and SDMs from authors such as Muthu, Whitman and Cheraghi (1999) and Giaglis (2009) as well as studies on BPR and organisational strategy from authors such as Mylopoulos and Yu (2001) and Hammer and Champy (2005). This research goes further to add to these studies by attempting to establish the relationship between BPR, SDMs, and organisational strategy.

According to Davenport (2000), BPR and organisational strategy are natural partners, however their relationship has never been fully exploited in practice. Hammer and Champy (2005) say that it is naturally expected that the organisational strategy will influence the design and structure of the organisational processes. Giaglis (2009) also notes that it is difficult for business analysts and information systems professionals to navigate through a maze of theoretical paradigms, methodological approaches, and representational formalisms that have been proposed for both BPR and organisational strategy.

Muthu et al. (1999) also contribute that there may be a need for SDMs whenever information systems are being developed or improved for BPR purposes. This study therefore also attempts to investigate the applicability of SDMs specifically for BPR. Giaglis (2009) says that the original enthusiasm for BPR has subsequently been tempered by a number of factors, and one of them could be the lack of SDMs to support the process. Clemons (2000) suggests that failures of BPR initiatives rate as high as seventy percent, while Hammer (2000) also quoted failure rates of fifty to seventy percent pointing the cause towards the failure to align BPR with strategy. This research's contribution therefore aims at playing a role in enhancing BPR processes through the use of SDMs and at the same time consider the organisational strategy.

1.4 Aims and Objectives

1.4.1 Aim

The aim of the research was to evaluate whether SDMs accommodate organisational strategy in order to determine their utility as a change tool during BPR.

1.4.2 Objectives of the Research

The objectives of the research can be summarised as the need to evaluate the effectiveness of available SDMs that satisfy the aim of the study. More specifically the objectives of the study are broken down as follows: to

- identify major categories of existing SDMs and create a list of criteria to use as evaluation dimensions for support to or accommodation of strategy;
- evaluate, by presenting the strengths and shortcomings of different SDMs for BPR purposes and
- investigate whether or not SDMs play a role in BPR in MHEIs.

1.5 Research Method and Design

The goal of this research is to evaluate whether SDMs support organisational strategy and to investigate the use of SDMs during BPR in MHEIs to determine their support to strategy. These concepts are subject to people's interpretations or literature analysis and hence the

nature of this research can be referred to as being 'socially constructed'. For this reason this research qualifies to be interpretive in nature and therefore follows the qualitative approach which allows the employment of case studies as a research method and semi-structured interviews as well as document analysis as data gathering methods. Four merged universities were selected for investigations. From these universities senior IT managers as well as system developers contributed to the data gathering process.

The choice of a research method depends upon the research approach chosen. The approach can either be qualitative or quantitative which is influenced by the research paradigm chosen. Research paradigms can either be interpretive, positivistic or critical research. As discussed above, the nature of this research qualifies it to be interpretive in nature; interpretivism is discussed in detail in chapter 3 of this research.

Quantitative research is the systematic scientific investigation of quantifiable properties and phenomena and their relationships (Oates 2008). Fitzgerald and Howcroft (2000) define qualitative research as a methodology that determines what things exist rather than how many they are. It is a less structured approach and it is more responsive to the needs of research. Since this research is interpretive, it also follows that the research approach should be qualitative which deals with interpretations rather than quantitative which concentrate on statistics.

The research approach influences the choice of the method. A research method is the overall approach to answering research questions (Oates 2008). This research will follow the case study method. According to Oates (2008), a case study focuses on one instance of the thing that is to be investigated in order to obtain detail of that case and its complex relationships with like cases. In the same light data generation methods largely depend on the research method chosen. A data generation method is a means by which empirical data or evidence is produced (Myers 1997 and Oates 2008). For each of the MHEIs investigated, semi-structured interviews were used to collect data. Document analysis was also used to complement the interviews.

This research follows the qualitative research approach therefore the data analysis method will be qualitative in nature. ATLAS.ti was used as the qualitative analysis tool for the

transcribed interviews and the content and cross case qualitative analysis techniques were used in reporting the findings.

1.6 Preliminary Chapter Division

Chapter One: Introduction

This chapter introduces the research. It brings to light the problem statement behind the research and highlights the aim and objectives as well as the research method of investigation. The research's contribution is also discussed in this chapter.

Chapter Two: System development methodologies, Business Process re-engineering, strategy and mergers.

The chapter reviews literature on the notion of SDMs, BPR, strategy and mergers and tries to synergistically merge the concepts into a coherent theme that provides the theoretical premise of this study. The chapter begins by discussing and classifying BPR according to its various definitions. This discussion is followed by an attempt to classify SDMs according to their definitions, and then according to the extent they accommodate organisational strategy. The chapter then proceeds to classify South African MHEIs and concludes by discussing the conceptualised synergy.

Chapter Three: Research Method and Design

This chapter outlines the research method and design for this study. It begins by discussing the philosophy behind the research. This discussion is followed by the research approach then the research method and then the data acquisition and analysis methods and the justification for them is discussed. The applicability of these methods relative to the research questions to be answered in the research is also discussed.

Chapter Four: Research Results Analysis and Discussion

This chapter analyses the data that was collected from the sampled MHEIs and discusses the findings of this study by providing a critical and contextually placed appraisal of each MHEI situation. Thereafter cross case analysis is performed in order to establish inter-university commonalities and differences.

Chapter Five: Conclusions and recommendations

This chapter highlights the findings of this study and makes recommendations as well as conclude the entire research. It places all observations in a contextual framework that is underpinned by the purpose of the study to investigate the accommodation of strategy in SDMs in-order to place them as an artefact that can be used during BPR for South African MHEIs.

1.7 Chapter Summary

This chapter provides the equivalent of an executive summary by providing an overarching overview of the research problem and objectives, the research methodology and the research contribution. The chapter that follows gives a detailed discussion on SDMs, BPR, strategy and mergers as introduced in this chapter.

CHAPTER 2

SYSTEM DEVELOPMENT METHODOLOGIES, BUSINESS PROCESS RE-ENGINEERING, STRATEGY AND MERGED HIGHER EDUCATIONAL INSTITUTIONS

2.1 Introduction

This chapter is dedicated to the elicitation of the concepts in system development methodologies (SDMs), business process re-engineering (BPR), strategy and South African merged higher educational institutions (MHEIs). The chapter begins by giving a brief description of the concept of strategy. There after the concept of BPR is thoroughly addressed where an attempt to identify an appropriate definition of BPR for the purpose of this study is done and then certain BPR characteristics that make it appropriate for this study are discussed. A discussion on the concept of SDMs then follows by firstly making an attempt to identify an appropriate BPR definition for this study and thereafter a tabulated comparison of SDMs based also on specific characteristics, especially accommodation of strategy is also presented and discussed. The background of South African MHEIs is then discussed and the HEIs involved are presented in a tabular format. The chapter also discusses possible relationships among SDMs, BPR, strategy and MHEIs from different schools of thought and attempt to formulate a synergy among them. Fig. 2.1 below presents an overview of how the discussions of the chapter are arranged.

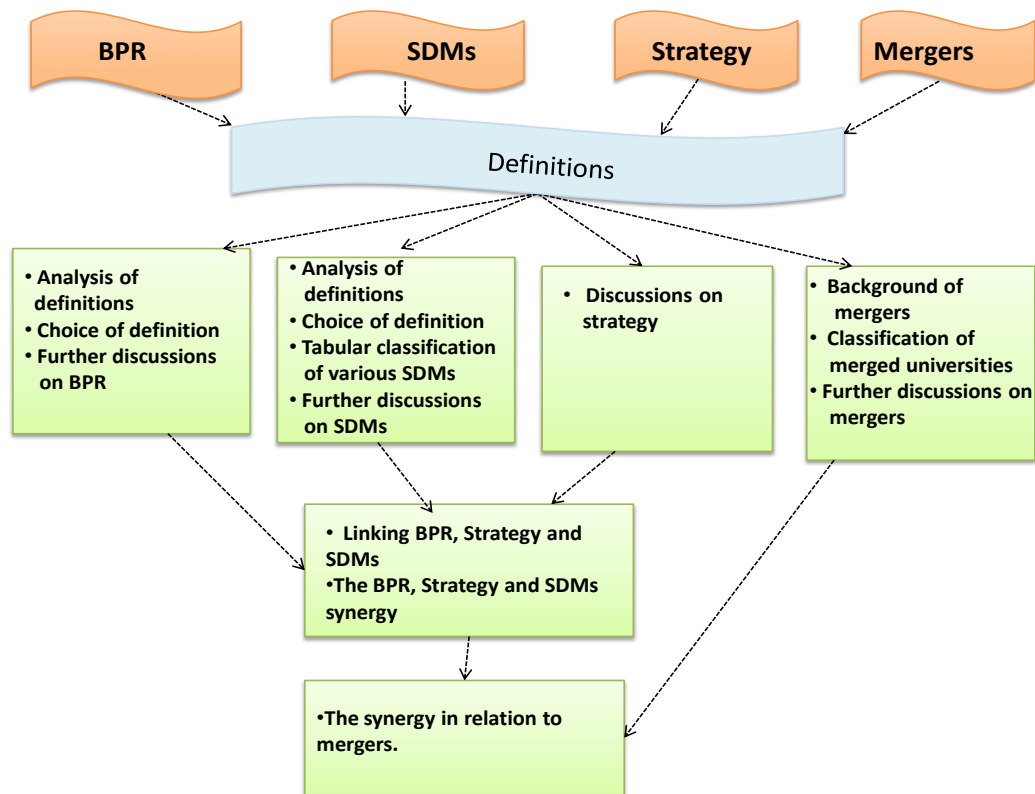


Figure 2.1: Overview of Chapter 2

2.2 Strategy

Frenzel and Frenzel (2004) define an organisational strategy as a collection of statements that express or propose a means through which an organisation can fulfil its primary purpose or mission. A chosen strategy must focus and coordinate the organisation's activities from the top to downwards towards accomplishing the organisation's mission (Kettinger and Grover 2005). Developing a strategy begins with a thoughtful understanding of the organisation's mission, analysis of the environment, and a detailed assessment of how various business units interact (Wacher 2006). Frenzel and Frenzel (2004) further explain that an organisational strategy foresees the future of the organisation and it is described by such critical elements as the mission, vision and competitive advantage. Schwalbe (2010) adds that organisational strategy clearly outlines the company's long term objectives and the manner in which it is differentiated from its competitors. Organisational strategy helps to clearly show the organisation's focused purpose, future perspective and strategic advantage including clearly

defining the organisation's direction (Weicher et al. 2006). It aligns financial and human resources, and instils accountability as well as determines critical measurements.

2.3 Business Process Reengineering (BPR)

2.3.1 Definition of BPR

Research has shown that there still remains vagueness in reaching common ground as to the appropriate terms for a particular definition within the BPR community (Senn 2001). Various authors have described approaches such as business process re-engineering, business process re-design, business process management, business process improvement or core process re-design, yet referring to the same idea (Carter 2005, Harrington 2006, Hammer 2008 and Stalk 2010). This section of the research attempts to analyse the various definitions of BPR, firstly by presenting certain characteristics illustrated diagrammatically in Fig. 2.2. The purpose of this illustration is to present a base for comparison of the several BPR definitions and try to establish the most appropriate definition to suit the purpose of this study. The comparison is based on certain characteristics devised by authors who are gurus in BPR who include Hammer (2008), Stalk (2010), Carter (2005), Gant (2002) and Harrington (2006). Secondly, a comparison of various definitions from these authors is presented in a tabular form in Table 2.1. The table will also present the degree to which the definitions attempt to meet the characteristics mentioned for consideration as useful definitions for this study.

2.3.1.1 Characteristics that will classify the BPR definitions for this study

Maul and Childe (2003) say that the major difference in the BPR approaches lies in the characteristics that define; the degree of change (either radical or incremental), the scope of the exercise (either quality led or IT led) and the focus of attention (either single view - individual or multiple views - whole process), as shown in Fig. 2.2 below.

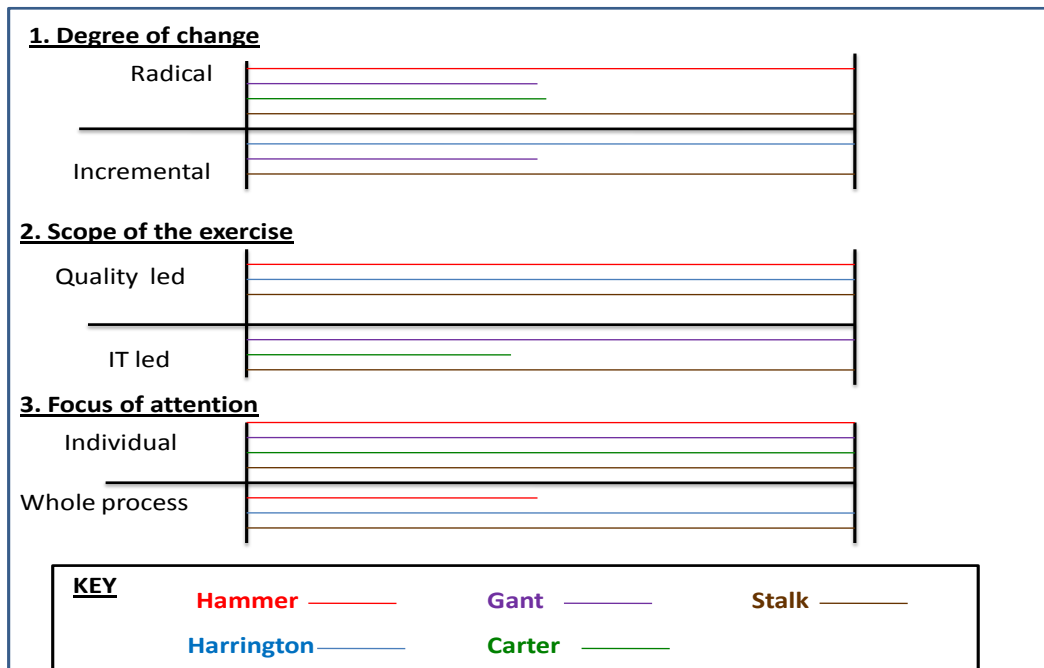


Figure 2.2: BPR Characteristics (Adopted from: Maul and Childe 2003)

2.3.1.1.1 The degree of change

Radical approach

The radical approach is also referred to as root-to-branch radicalism as far as business process improvement is concerned (Maul and Childe 2003). Radicalism promotes early risk mitigation by breaking down the system into mini-projects and focusing on the riskier processes first (Hammer 2008). These are believed to be the roots which must be strong enough first before branches can develop. The approach allows planning a little, designing a little, and implementing a little (Stalk 2010). Radicalism encourages all participants who are part of the process improvement to be involved earlier on. It allows the BPR process to change with each iteration; allowing corrections sooner and put into practice lessons learned in the prior iteration (Maul and Childe 2003). It focuses on the most important processes by improving one next process soon after the previous one is complete, but not exactly the once off final big bang deployments (Hammer 2008).

Incremental approach

The incrementalist approach allows for processes to change over time rather than be improved in one huge effort (Harrington 2006). It allows processes to improve by giving

enough time to the evolutionary process. It focuses attention on stability and the belief is that only a stable foundation can support multiple additions (Maul and Childe 2003). The incrementalist approach allows a subset of the processes to actually run much sooner than the other processes. It involves interim progress to continue through the stubbing of functionality and accommodates the management of risk by exposing historical problems earlier on in the process (Stalk 2010).

2.3.1.1.2 The scope of the exercise

IT-led approach

The IT-driven intervention views BPR as the redesign of processes to take advantage of the enormous potential of Information Technology (Gant 2002). This approach identifies BPR with traditional systems analysis and design and software engineering (Maul and Childe 2003). It involves developing a requirements definition, entity relationship models, normalised database, designs and eventually software solutions applying all this within existing usually functionally-oriented organisations (Stalk 2010).

The Quality-led approach

The quality led approach concentrates first on identifying the business processes then analyse and re-engineer each process that needs improvement (Hammer 2008). Quality of the process becomes the main focus with this approach. From this perspective IT ceases to be the focus of the analysis and design exercise and firms should delay consideration of integrated software solutions until quality BPR is complete (Maul and Childe 2003).

2.3.1.1.3 Focus of attention

The Individual approach or single view

Stalk (2010) points out that BPR intervention can vary in scope. BPR is viewed as an activity that varies from single view to multiple views. The single view involves an individual process within a function where the idea is to improve an individual part of the process and improvement is on a small scale (Maul and Childe 2003). The scope is usually internal, operational in outlook, low risk and addresses strategies within a particular function. The individual type of change can be regarded as mostly incremental change (Gant 2002).

The Whole process approach or multiple view

The multiple view covers a whole process, in other words it uses the systems view where the organisation's strategy is addressed as a whole rather than in parts (Carter 2005). Although the whole process is wider in scope than individual improvement, it is still essentially

operational in nature. The process involves higher risk to the organisation and can be regarded as radical change (Maul and Childe 2003).

2.3.1.2 Analysis of BPR Definitions

Table 2.1 below presents a collection of BPR definitions from different authors in an attempt to analyse them based on BPR characteristics required for this study.

Definition	Characteristics		
	Degree of Change	Scope of exercise	Focus of attention
The fundamental reconsideration and <u>radical redesign</u> of organisational processes in order to achieve <u>drastic improvement</u> of current performance in cost, service and speed. The main purpose for this being <u>value creation</u> to customers (Hammer 2008).	Radical	Quality-led	Whole process
The redesign of business processes, <u>associated systems</u> as well as <u>organisational structures</u> to achieve a <u>dramatic improvement</u> in business performance. The business reasons for making such changes could include poor financial performance, external competition and erosion of market share or emerging market opportunities (Stalk 2010).	Radical	IT-led	Whole process
Business process reengineering is the main way in which <u>organisations become more efficient and modernised</u> . Business process reengineering transforms an organisation in ways that directly affect performance (Carter 2005).	Incremental	IT-led	Not clear
Business process reengineering is one approach for redesigning the way work is done to better <u>support the organisation's mission</u> and reduce costs which starts with a <u>high-level assessment</u> of the organization's <u>mission, strategic goals, and then customer needs</u> (Harrington 2006).	Incremental	Quality-led	Individual
Involves changes in <u>structures</u> and in processes within the business environment changing the <u>entire technological, human, and organisational dimensions</u> , allowing business to be conducted in different locations with flexibility in manufacturing, permitting quicker delivery to customers and supporting rapid and paperless transactions (Gant 2002).	Radical	IT-led	Whole process

Table 2.1: BPR Definitions

This section attempts to identify an appropriate BPR definition for this study based on the characteristics discussed above. With so many BPR definitions from different authors belonging to the same school of thought as shown above it may be necessary to try and discover common ground based on similarities, points of differing and most importantly the characteristics discussed above. This exercise may assist in selecting the appropriate definition(s) to follow for the purposes of this research.

Hammer's contribution, referred to as the neutron bomb approach to business improvement was quoted as follows; We'll leave the walls standing and we'll nuke everything on the inside

(Hammer 2008). His approach exists at one side of a wide spectrum of opinions regarding the most appropriate BPR strategies for firms to adopt. His focus of attention may be classified as a whole process change in the sense that he looks at the radical re-engineering of all organisational processes at once. As far as Hammer's perspective is concerned, IT is not the main focus of the analysis and design task but quality in terms of his scope of exercise. Firms should delay considering integrated software solutions until BPR is complete or in other words until processes are quality certified (Hammer 2008). In this case, Quality Improvement Teams (QITs) are often formed to bring about some radical changes. These teams surpass centralised small-group improvement activities by also addressing every other functional area of the organisation instead of specialising in one (Maul and Childe 2003). The QITs are also at liberty to consider customer/supplier relationships and demands on the organisation's process. They are however, sometimes restricted to particular business function due to existing organisational boundaries.

Stalk (2010) considers business process re-engineering as the ability to capitalise on the organisational practices and business processes in which capabilities are rooted. Capabilities in this case refer to the functioning of the IT infrastructure. His scope of exercise can therefore be identified as IT-led. He emphasises on identifying a set of strengths in core processes, the roots, which enables companies to compete in entirely different competitive environments. Stalk's degree of change approach can safely be placed on the radicalists side since he addresses the issue of dramatic improvements. Dramatic improvement in this case can also refer to the whole process focus of attention.

Harrington (2006) has his BPR perspective biased towards the incrementalist side of BPR and his scope of exercise is also more on the quality led end. Harrington says that his approach is the first real type of process based change which brings about Process Simplification (PS) and focuses on individual process. Often, a Process Improvement Team (PIT) is established and their job is to analyse each individual process for even non value-added activities as filing, retrieval, checking as well as identifying who would be seeking to change these activities. In most organisations, the establishment of PITs is expensive and time consuming and often requires external consultancy help. While Harrington's focus of attention is classified under the individual approach, it also accommodates a degree of the whole process approach. This is highlighted in his definition where he addresses the idea of

assessing the organisation's mission and strategic goals. He implements the system's view for each process by applying the organisational strategy for each one.

Other authors like Gant (2002) have focused more on the IT-led approach. He refers to BPR as involving change in structures. He further addresses change in the entire technological dimensions, in which case we may assume that 'entire' refers to the radical change and the whole process approach. With Gant's approach approaches such as the SDLC are often applied.

Carter (2005) differentiates between process-focused approaches and traditional organisation and method (O&M) analysis. There are fundamental similarities between O&M and the lower levels of process improvement, for example individual based. These approaches do not focus on the whole process; they may be systematic, as in being methodically arranged according to a plan, but not systemic as in affecting a whole system.

2.3.1.3 Alternative definition for the study

Part of the aim of this research was to analyse the concept of BPR and evaluate whether it can be used as a change tool in MHEIs. From all the different approaches used to define BPR discussed above, it still remains difficult to singularise any particular one to use for the purpose of this study. While the extent to which they address the different characteristics used to compare them differs, common ground still remains among them because they all possess an element of each of the characteristics (Maul and Childe 2003). The researcher will therefore attempt to compose a suitable definition for the purpose of this research.

Firstly, the researcher believes that BPR should focus on individual processes based on the whole. In other words it should be noted that any degree of change must be based on the organisational strategy (Frenzel and Frenzel 2004). As discussed above, the incremental view looks at necessary change to individual processes in light of the evolution process. They consider change by firstly addressing the organisational mission and strategy. Radical change looks at change as the revamping of processes to try and keep up with the latest developments and considers changing the entire organisational processes, but one at a time. BPR in the context of this research addresses IT, but at the same time the quality of the IT processes should be a priority. The researcher therefore feels that all the characteristics discussed

should be apparent in any BPR definition, but they may be applied differently depending on the users.

BPR for the purpose of this study, based on the discussions of BPR characteristics above as well as the research aim and objectives, shall therefore be defined by the researcher as:

The fundamental radical change to IT focused business processes based on incremental steps where quality and organisational strategy are of importance.

2.3.2 What BPR entails

The discussed authors so far agree on addressing BPR as change. It may be necessary at this point to analyse the type of change that has been referred to. The BPR type of change seeks to reduce the number of cumbersome and redundant activities and at the same time provide real strategic benefits to the organisation (Clemons 2000). It is a pioneering attempt to change the way work is performed. BPR involves addressing issues concerning the organisational structure, the roles of process performers, the management system and the underlying corporate culture which holds the beliefs and values that influence everyone's behaviour and expectations (Cypress 2009).

The BPR type of change is not meant just to downsize, restructure, reorganise or re-automate. It is not an exercise of introducing new technology (Senn 2001). Although it involves the above mentioned processes, the main idea is on improving or building up on what already exists rather than starting afresh. It requires a cross-functional effort and usually involves innovative applications of technology (Gant 2002, Carter 2005 and Stalk 2010). This is done by simultaneously addressing all the aspects of work that impact performance, including the process activities, the people's jobs and their reward system (Carter 2005 and Stalk 2003).

Davenport (2006) adds that importantly BPR involves examination and change of five components of the business which include:

- **organisational strategy** - the long term goals and mission that are defined by strategic management (Harrington 2006);
- **processes** - the procedures or tasks that users, managers and IT staff members perform (Jackson 1995);

- **technology** - involves the use of hardware and software as well as telecommunications for the purpose of storing, transforming, retrieving and transmitting data (Gant 2002);
- **organisation** - the business as an entity (Schwalbe 2010) and
- **culture** - the specific collection of values and norms that are shared by people and groups in an organisation and that control the way they interact with each other and with stakeholders outside the organisation (Schwalbe 2010).

2.3.3 BPR success factors

Kettinger and Grover (2005) in their contribution to explaining BPR say that, it is achieved through benchmarking and the use of BPR success factors such as:

Top management sponsorship: top managers are the initiators and implementers of strategy. Their strong and consistent involvement is important because they are responsible for approving allocation of resources (Schwalbe 2010). BPR is mostly undertaken as a kind of project which has a serious impact on the organisational strategy and therefore its success is of importance. It must meet stipulated time, scope, cost and quality in line with strategic requirements. It should therefore be well funded and supported by top management.

Strategic alignment: Any organisation strongly relies on its strategic goals to survive. BPR should therefore align with organisation's strategic direction. The BPR goals should be aligned to the organisations strategic goals (Frenzel and Frenzel 2004). Part of this research's contribution is to emphasise that the BPR process should always attempt to prioritise organisational strategy, in order not to divert from the mission.

Compelling business case for change: the business case must contain measurable objectives, meaning that the problem at hand should be clearly understood for BPR to be a success (Frenzel and Frenzel 2004). This research emphasises support to change. Although change is inevitable, there must be detailed proof in the form of a business case to prove beyond reasonable doubt that it is necessary.

Proven SDM: that includes a vision process or a philosophy. The system development methodology that is chosen has to be well understood with a good track record and has to meet the needs of the project (Huisman and livari 2007). The main purpose of this research is to establish the use of system development methodologies during BPR, therefore if there are SDMs involved, it would make the process of attaining the objectives of the study easier.

Effective change management: address cultural transformation because change is not always embraced by everyone, it should be managed accordingly so that the BPR is

supported by every stakeholder (Frenzel and Frenzel 2004). BPR brings about change and change is an activity that should be thoroughly addressed and carefully handled. If is not properly handled it may worsen the problems identified instead of improving them.

2.3.4 Advantages of BPR

The advantages of BPR are highlighted by Muthu et al. (1999) as follows:

- BPR helps an organisation to identify both efficient and obsolete core activities and processes. From the BPR definitions discussed above, all the characteristics work together to achieve this objective (Maul and Childe 2003).
- It encourages staff to be more involved in the organisational processes and focus on the company objectives. The incremental and whole process approaches ensure that consideration of the mission is a priority and hence employees remain focused on the main objective of the organisation (Weicher et al. 2006).
- It can lead to new product development and improvement of process activity times thereby leading to a huge improvement in the business results. The IT-led approach focuses more on this (Carter 2005).
- It is the main way in which organisations become more efficient and modernised. For this point the radical, IT-led and the quality-led approach play major roles in enhancing efficiency and modernisation (Davenport and Short 1990).

2.3.5 BPR Challenges

While the advantages of BPR are many it has also earned a bad reputation because BPR projects are believed to have often resulted in massive layoffs (Guha, Smith & Shalley 2003). Further, critics say that BPR has not always lived up to its expectations while other critics warn that although BPR may lead to a competitive advantage, it is destined to be very short-lived Hammer (1990). Most of the critical challenges as highlighted by Hussein (2008) are as follows:

- Many believe BPR to be an excuse for automation, but rather as discussed in Section 2.2.2, it looks at the improvement of an already process-focused organisation and it is not the exercise of introducing new technology although new technology may improve functions of existent systems (Hammer 2000).

- It is most often associated with severe downsizing and cost cutting. Most organisations believe that whenever BPR takes place, the organisation intends to downsize processes, thereby leading to loss of jobs and other processes (Maul and Childe 2003).
- Many, especially the conservative type of employees, believe BPR to be an unnecessary change to a status quo that is working just fine. They do not realise that BPR is necessary change that addresses changing times (Hammer 1995).

2.3.6 BPR organisational alignment

The functionality and existence of any organisation revolves around its strategy. Organisational strategy is derived from the mission and vision of the organisation. It is therefore important that the strategic goals of the organisation be seriously considered during BPR (Venkatraman 2009). The mission statement where strategy is derived from defines the purpose of the organisation and describes what sets it apart from others in its sector (Frenzel and Frenzel 2004). Vision statements serve as milestones which define where the organisation is going, thereby providing a clear picture of the desired future position for the organisation (Davernport and Short 1990). Most importantly the mission and the vision must be built into a clear organisational strategy if objectives are to be attained.

The strategic goals must be kept in check to ensure that they are aligned with any business processes in use (Frenzel and Frenzel 2004). Business processes are the major cornerstones of operations in any organisation. Mylopoulos and Yu (2001) contribute that if everything else is going well in the business but processes are cumbersome and non-essential, organisational performance remains poor. BPR may therefore be the key to transforming processes in any organisation (Hammer and Champy 2005). Any changes in processes, no matter how minor, can have dramatic effects on cash flow, service delivery and customer satisfaction (Clemons 2000).

The actual BPR process begins by breaking down the mission and the vision into strategy statements then formulate business processes which can be further broken down into sub-processes (Hammer and Champy 2005). The performance of each process is then measured at optimal level to ensure correct output with regards to what the process is supposed to do (Aremu and Sidikat 2008).

2.4 System Development Methodologies (SDMs)

2.4.1 Introduction

It is widely believed that adherence to SDMs is beneficial to an organisation, yet many organisations claim that they do not pay much attention to the concept of SDMs (Hill 2009). Other organisations report that they are adapting SDMs, while others claim that they are using them and obtaining positive results (Huisman 2004). Apart from the claims above, it is still not very clear how SDMs are being applied or whether they are being used for BPR purposes.

2.4.2 Definition of SDM

When considering the study of problems still remaining in the SDMs community, findings reflect that significant progress has been made on most topics. This section in particular draws attention to a SDM topic involving the identification of a collective definition that will accommodate the study's major elements which include BPR, strategy and mergers. Surendra (2008), claims that there is not yet a universally accepted exact and concise definition of SDMs. This claim opens an opportunity for the study to contribute further to the pool of SDMs definitions.

For the purpose of this study, it cannot be proved that a collective definition already exists. It would be nevertheless noteworthy to claim that research has gained much insight into common characteristics that are used in most cases whenever SDMs are defined. Avison and Fitzgerald (2006) devised a framework based on these SDMs common characteristics which has traditionally been referred to most of the time when SDMs definitions are considered.

This section briefly discusses the characteristics referred to above in relation to a list of SDMs definitions. The purpose of the discussion is to assess the degree to which these definitions accommodate the characteristics of the framework. Most importantly the discussion intends to assess the accommodation of the research focus' characteristics like strategy. This exercise is necessary to assist the researcher in identifying a definition that maybe appropriate for this study. Later on in this section the same characteristics will used to classify different types of SDMs for an assessment that will assist us in suggesting suitable SDM(s) for this study.

2.4.2.1 Common Characteristics used in SDM definitions

The characteristics according to Fitzgerald and Avison (2006) include: a philosophy, a model, tools, techniques, outputs, products, implementation details, programming and testing as well as the field of practice for that particular SDM. The elements have thus far been the most used in most SDMs definitions and therefore will be equally important in coming up with a definition that may be suitable for this study. The preferred definition should address these characteristics as well as particular ones special to the study such as strategy which is discussed in Section 2.4.

2.4.2.1.1 Philosophy – a principle or set of principles that underlie the SDM. It is sometimes argued that all SDMs are based on a common philosophy to improve the world of Information Systems development (Fitzgerald and Avison 2006). A philosophy covers aspects on paradigms, objectives, domains and target applications (Mavetera and Kroeze 2010).

2.4.2.1.2 Model - It is the basis of the SDMs view of the world. It is an abstraction and a representation of the important factors of the Information System of the organisation (Booch 1991). Standing (2002) also says that it is a description of a process at the type level, roughly an anticipation of what the process will look like. Thus a model is helpful to document and communicate processes as well as enhance the reuse of processes (Rolland 1998)

2.4.2.1.3 Techniques - These are ways to evaluate the pros and cons or the costs and benefits of different solutions and methods needed to formulate the design necessary to develop computer applications (Huisman 2004). They are sets of steps and rule which define how a representation of an Information System is derived and handled using some conceptual structure and related notation (Smolander, Talvanainen & Lyytinen 2000). Examples of techniques are data flow diagrams and activity models.

2.4.2.1.4 Tools - help system analysts and other IT specialists in their work and they include items such as books or software packages (Fitzgerald and Avison 2006). They can also be computer-based applications which support the use of modelling techniques.

2.4.2.1.5 Processes - are traditionally executed in sequence from feasibility through to review and maintenance. However execution may differ depending on the SDM, some follow the

parallel, iterative, incremental or pilot approaches. Processes also include sub-processes which are usually spelt out clearly in the SDM documentation (Olle 2001).

2.4.2.1.6 Output - describes what the methodology is producing in terms of deliverables at each stage and in particular the nature of the final deliverable (Schwalbe 2010).

2.4.2.1.7 Practice - is measured according to the SDM background - whether commercial or academic; the user base - which include numbers and types of users; the participants in the methodology - that is whether it can be undertaken by users themselves or professional analysts and what skill levels are required (Standing 2002). Practice should assess difficulties, problems and perceptions of success or failure undertaken by investigating the experiences of prior users of the methodology (Rolland 1998).

2.4.2.1.8 Product - is what purchasers actually get for their money. It describes what is supplied when purchasing a SDM and at what cost (Schwalbe 2010). Some SDMs have a range of products and services available. Products can be manuals, academic papers, books or multimedia websites

2.4.2.2 Analysis of different SDMs definitions

SDMs are recent phenomena and are still under development. Different scholars have and are still having various views on what elements an appropriate definition for SDMs should possess (Mavetera 2004b, Huisman 2004 and Fitzgerald and Avison 2006) One of the reasons for the different definitions is the collection of SDMs characteristics associated with these definitions. Some of the definitions are tabulated in Table 2.2 below. These definitions are analysed based on the collection of SDMs' characteristics as said earlier, in an attempt to identify an appropriate definition for this study.

Definition	Characteristics of analysis
It consists of the combination of four elements, namely a system development <u>approach</u> , a system development <u>process model</u> , a system development method and a system development <u>technique</u> (Huisman and livari 2007).	philosophy, processes, techniques, tools
A recommended means to achieve development of Information Systems based on a set of rationales and an underlying <u>philosophy</u> that supports, justifies and makes coherent such a recommendation for a particular context. The recommended means usually includes the identification of <u>processes</u> , procedures, tasks, rules, <u>techniques</u> , guidelines, documentations and <u>tools</u> (Avison and Fitzgerald 2006).	philosophy, processes, techniques, tools
According to Benson and Standing (2005) a methodology is series of steps that are used in solving a problem through a general approach to problem solving. It includes the <u>philosophical</u> underpinning found in an approach, the " <u>processes</u> , procedures, rules, <u>techniques</u> , <u>tools</u> , documentation management and training for developers.	philosophy, phases, techniques, tools,
It is one's way of developing an Information System or part thereof, based on one's understanding and <u>philosophical</u> perspective where by a set of rules, procedures, <u>techniques</u> and <u>tools</u> are recommended (Booch 1991).	philosophy, techniques, tools,
A process tasked with structure, plan, and control of the development of Information Systems where depending on the social or economical environmental setting, different software development <u>practices</u> are used, (Mavetera and Kroeze 2010).	practice
The documented collection of policies, processes and procedures used by a development team or organisation to <u>practice</u> software engineering (Chapman 2007).	practice

Table 2.2: SDMs Definitions

2.4.2.3 Choice of definition for the study

The interest of this study lies in attempting to establish the accommodation of strategy in SDMs for use in BPR. It may therefore be logical that the SDM definition for this study accommodate the traditionally important characteristics for it to still be substantive as an acceptable definition in the SDMs community. Most importantly it must encompass one other major characteristic which is strategy for it to be a workable definition for this study. The definitions discussed above are all relevant to this study to the extent which they accommodate the selected traditional characteristics. However, each one of them lacks one or more of these same characteristics. The study will attempt to come up with a suitable definition that will accommodate all the characteristics required.

The researcher will therefore define a SDM based on the elements found from the definitions of SDMs from specialists of SDMs cited above as well as elements required for the purposes of this research as:

A strategy focused recommendable process of developing or improving a model based information system or part thereof, which is based on an underlying philosophy and includes the use of tools and techniques while following prescribed processes depending on the field of practice.

2.4.3 Types of SDMs

Thus far, research has shown that various SDMs have been developed for different purposes in information systems (Huisman 2004, Fitzgerald and Avison 2006 and Mavetera and Kroeze 2010). Part of the aim of this study is to identify specific types of SDMs for BPR purposes. A discussion SDMs for BPR follows.

2.4.3.1 Specific SDMs for BPR

As discussed in previous sections a major aspect to consider before undertaking BPR is the strategic goals of the organisation (Fitzgerald and Avison 2006). This enables the working out of an exact information systems support needed for the proposed processes (Chapman 2007). Organisations also need to understand that BPR itself is a process that needs to be properly planned, designed and implemented (Giaglis 2009). It needs to follow a particular process and make use of particular tools and techniques hence it requires following some sort of SDM (Muthu et al. 1999). The preferable SDM however should be one that considers organisational strategy. According to Frenzel and Frenzel (2004) strategy is a collection of statements that express or propose a means through which an organisation can fulfil its primary purpose or mission.

Thus far research has not shown concrete evidence that address particular SDMs that target BPR (MacArthur 2004 and Smolander et al. 2000). However, it may also be important to note that a few of the SDMs in existence which were originally developed for purposes other than BPR have been diverted to BPR use because of some appropriate BPR characteristics that they possess (Muthu et al. 1999). Some of the BPR characteristics are discussed in section 2.2.1.1. One of the important characteristic that these SDMs either miss or do not put enough emphasis on to qualify them for BPR is organisational strategy which is discussed in section 2.4. Based on this claim a collection of SDMs was identified for evaluation of whether or not they accommodate organisational strategy.

2.4.3.2 Evaluation of SDMs based on strategy and Fitzgerald and Avison's Framework

SDMs can and have been grouped or discussed together for different reasons (Fitzgerald and Avison 2006). For the purpose of this study, different types of SDMs are discussed together for evaluation reasons. Evaluation of SDMs for suitability to this study is based on the extent to which they accommodate the characteristics discussed in Section 2.4.2.1. These characteristics are based on Avison and Fitzgerald's framework. This study intends to extend this framework by adding one extra important characteristic for evaluation which is the organisational strategy. This evaluation is necessary for the study to provide assistance in identifying appropriate SDMs for BPR purposes. Strategy was discussed Section 2.2 of this study.

The evaluation is first presented in a tabular format in Table 2.3 below and then characteristics presented are later discussed. In Table 2.3 SDMs are classified according to their philosophical paradigms that define how the characteristics of the framework are implemented. A philosophical paradigm can be data oriented, process oriented or people oriented among others. A second evaluation is done afterwards in Table 2.4 with an attempt to evaluate these SDMs against the BPR success factors discussed earlier.

Methodology	Philosophy	Model	Support to strategy	Tools and Techniques	Phases		Output	Practice	Product
					Programming and Testing	Implementation			
Process Oriented STRADIS	<i>Paradigm</i> – Science <i>Objective</i> - For the development of strategic IT systems <i>Domain</i> – Specific problem solving <i>Target</i> – General purpose, any size of system	Data oriented, uses data flow diagrams	Recommends use of strategy at initial stage, but does not emphasise	Recommend use of specific tools and techniques	Less coverage	Addresses very little on aspects of implementation	Deliverables decline towards the end of development	Commercial	Range of manuals, academic papers and books
	<i>Paradigm</i> - Science <i>Objective</i> - Specific for the development of IT systems <i>Domain</i> – specific, problem solving <i>Target</i> – Large organisations	Data oriented, uses data flow diagrams	Mentions strategy, but does not emphasise	Recommend use of specific tools	Less coverage	Addresses very little on aspects of implementation	Deliverables mostly at the early phases of development	Commercial	Range of manuals, academic papers and books
Blended IE	<i>Paradigm</i> - Science <i>Objective</i> - Specific for the development of IT systems <i>Domain</i> – planning, organisational and strategy type <i>Target</i> – Large organisations	Data or process oriented, uses data flow diagrams	Include strategy aspects at first stages	Recommend use of specific tools and techniques	Cover programming, but less testing	Less coverage	Deliverables decline towards the end of development	Commercial	Generally have a range of products
	<i>Paradigm</i> - Science <i>Objective</i> - Specific for the development of IT systems <i>Domain</i> - specific, problem solving <i>Target</i> – Large organisations	Integrates data and processes	Mentions strategy but does not emphasise	Specific techniques, tools are helpful, but not essential	Less coverage	Less coverage	Deliverables at each stage of development	Commercial	Range of manuals, academic papers and books
Object Oriented RUP	<i>Paradigm</i> - Science <i>Objective</i> - Specific for the development of IT systems <i>Domain</i> – Specific problem solving <i>Target</i> – Any organisation	Integrates data and processes, use case driven	Include fuzzy aspects on strategy	Recommend use of specific tools and techniques	Considerable cover	Considerable cover	Deliverables at each stage of development up to the end	Academic	Range of books and multimedia websites

OOA	<i>Paradigm</i> - Science <i>Objective</i> - change in cases of problems or need, for IT systems <i>Domain</i> - Specific problem solving <i>Target</i> - General purpose/ Large organisations	Object oriented	Mentions strategy but does not emphasise	Object oriented techniques. Specific tools but not essential	Covers programming, and testing fully	Full coverage	Deliverables at each stage of development up to the end	Commercial	Has a range of products
Rapid Development	<i>Paradigm</i> - Science <i>Objective</i> - Specific for the development of IT systems <i>Domain</i> - Specific problem solving <i>Target</i> - Small/ medium organisations	Integrates data and processes, prototype driven	Include fuzzy aspects on strategy	Recommend use of specific tools and techniques	Covers programming, and testing	Considerable cover	Deliverables increase towards the end of development	Commercial	Targets development of a particular product
XP	<i>Paradigm</i> - Science <i>Objective</i> - for organisational/ general problem solving <i>Domain</i> - Specific problem solving <i>Target</i> - Large/ Small organisations	Integrates data and processes, uses prototypes	Mentions strategy but does not emphasise	No specific tools, but appropriate.	testing is integrated throughout development	Full coverage	Frequent delivery of products	Commercial	Targets development of a particular product
DSDM	<i>Paradigm</i> - Science <i>Objective</i> - for organisational/ general problem solving <i>Domain</i> - Specific problem solving <i>Target</i> - Large/ Small organisations	Integrates data and processes, uses prototypes	Mentions strategy but does not emphasise	No specific tools, but appropriate.	testing is integrated throughout development	Full coverage	Frequent delivery of products	Commercial	Targets development of a particular product
People Oriented	<i>Paradigm</i> - Systems <i>Objective</i> - Concerned with the process of change for IT systems <i>Domain</i> - Specific problem solving <i>Target</i> - large organisations	Process driven	Mentions strategy but does not emphasise	Specific techniques	Less coverage	Less coverage	Deliverables at each stage of development up to the end	Academic	Range of manuals, academic papers and books
ETHICS	<i>Paradigm</i> - Systems <i>Objective</i> - Specific for the development of IT systems <i>Domain</i> - expert systems <i>Target</i> - Small/ medium organisations	Models and processes	Considerable coverage of strategy aspects throughout the phases	Recommend use of specific techniques	Less coverage	Less coverage	Delivery at the end of development	Academic	Range of books
KADS	<i>Paradigm</i> - Systems <i>Objective</i> - Concerned with the process of change for IT systems <i>Domain</i> - large and complex problems <i>Target</i> - large organisations	Models data and processes	Include fuzzy aspects on strategy	Recommend use of specific techniques	Less coverage	Less coverage	Delivery at the end of development	Academic	Range of documents , academic papers and books
Organisational oriented	<i>Paradigm</i> - Systems <i>Objective</i> - IT systems and elsewhere <i>Domain</i> - Specific problem solving <i>Target</i> - Large/ Small organisations	Projects, business case driven	Mentions strategy but does not emphasise	Recommend use of specific tools and techniques	testing is integrated throughout development	Full coverage	Deliverables at each stage of development up to the end	Commercial	Generally have a range of products in the form or reports
SSM	<i>Paradigm</i> - Systems <i>Objective</i> - IT systems and elsewhere <i>Domain</i> - Specific problem solving <i>Target</i> - Large/ Small organisations	Projects, business case driven	Mentions strategy but does not emphasise	Recommend use of specific tools and techniques	testing is integrated throughout development	Full coverage	Deliverables at each stage of development up to the end	Commercial	Generally have a range of products in the form or reports
PRINCE	<i>Paradigm</i> - Systems <i>Objective</i> - IT systems and elsewhere <i>Domain</i> - Specific problem solving <i>Target</i> - Large/ Small organisations	Projects, business case driven	Mentions strategy but does not emphasise	Recommend use of specific tools and techniques	testing is integrated throughout development	Full coverage	Deliverables at each stage of development up to the end	Commercial	Generally have a range of products in the form or reports

Table 2.3: The Extended SDMs Framework (Adopted from Fitzgerald and Avison 2006)

2.4.3.2.1 Process Oriented SDMs

Process-oriented SDMs put emphasis on the analysis and design stages of the system development processes (Benson and Standing 2005). There is not much concern about what to do with the data (Avison and Fitzgerald 2006). Finding process models that would answer the questions of how the required process is structured is the main concern of SDMs under this category (Avison and Fitzgerald 2006). Examples of the techniques used include functional decomposition, data flow diagrams, decision trees, decision tables and structured English (Hill 2009). In most of the process oriented SDMs, processes are classified into sections in such a way that the completion or the initiation of one process leads to the other (Cashman 2004).

Complex problems are broken down into more detail in a structured manner that allows the execution or programming to be highly simplified. It also involves describing what the system is trying to achieve at the logical level and not how the computer will do it at the physical level (Standing 2002). Process oriented SDMs imply that process and data designs are separate; this enables one to modify processes without affecting the data. To compensate the lack of focus on data in the software development process, SDMs such as the Yourdon System Method (YSM) have a greater emphasis on the analysis of data than the others, (Avison and Fitzgerald 2006). Standing (2002) argues that generally, more focus is given to processes but data also remains significant and is given serious attention in software development, it is only the degree of focus that is different. Examples of process oriented SDMs include Structured Analysis, Design and Implementation of Information System (STRADIS), Yourdon System Method (YSM) and Jackson's System Development (JSD).

a) Structured Analysis, Design and Implementation of Information Systems (STRADIS)

STRADIS is concerned with the selection and organisation of program modules and interfaces that would solve a predefined problem (Benson and Standing 2005). Avison and Fitzgerald (2006) argue that while this SDM was acknowledged to provide significant benefits, these benefits are wasted if the original definition of the problem is not well stated or is inaccurate. STRADIS is conceived as being applicable to the development of any information system irrespective of size and whether or not it is going to be automated (Hill 2009).

STRADIS involves different phases which include an initial study, a detailed study, defining and designing alternative solutions as well as physical design stage (Avison and Fitzgerald 2006). The initial study of this methodology outlines that the analyst reviews documentation and assesses the proposal for the new system in light of any strategic plans that may exist within the organisation. The second stage of the methodology, the detailed study involves identifying potential users. These potential users include and start with the implementers of the strategy, who are the top management.

The major characteristic of this methodology important for the purposes of this research include the fact that its philosophy is the development of a strategic information system, a type of information system that is aligned with business strategy and structure (Standing 2002). Its initial stage recommends the involvement of the initiators of strategy and a look at organisational strategy, before moving to other stages.

Another important characteristic of this SDM is that it wastes no time on contributing to the definition of the problem. It mostly deals with the development of an information system which problems are already identified. For the development of new Information Systems, this becomes a practical limitation as the development of an information system requires both analysis and design aspects to be addressed. The same characteristic makes this SDM recommendable for BPR since it addresses improvement to existent processes rather than bringing a fresh start. A major limitation of this SDM is that it addresses very little on strategy in the first stages and does not put further emphasis on it in the rest of the stages. One other weakness of this SDM is that it falls short of detailed explanations of how information systems should be implemented. For BPR purposes implementation is an important stage and strategy should be emphasised at all levels.

b) Yourdon System Method (YSM)

YSM like STRADIS is a process oriented system development methodology. Unlike STRADIS however, this methodology uses the middle out approach rather than the top down approach (Avison and Fitzgerald 2006). The middle out approach begins with the analyst drawing a top level context diagram indicating the systems boundaries of activities of either a department or the organisation as a whole.

The first level involves little feasibility studies, but mainly entails interviewing users and little or no management input. The second stage of the SDM involves essential modelling of what the system will do to satisfy the users and, like STRADIS, this SDM does not give coverage on implementation aspects.

As discussed earlier, organisational strategy must be seriously checked if system development for BPR purposes is to succeed. YSM begins by outlining the system boundary before addressing any other stages. An assumption that drawing out the system boundary may refer to consideration of the organisational strategy may therefore be made. However, it worries that the SDM emphasises less on top management involvement, yet strategic issues are mainly governed by top management. Like STRADIS, the SDM is weak in that it has less coverage on implementation and strategic issues.

2.4.3.2.2 Blended System Development Methodologies

Unlike process-oriented SDMs, blended SDMs give a tremendous emphasis on the analysis of data (Mumford 1995). It tries to identify the problem behind the system from scratch. Avison and Fitzgerald (2006) add that the general philosophical view behind the blended SDMs is that data is the building block of the information system. Bubenko and Wangler (1992) support that data is more stable and reliable than processes, arguing that processes change more often than data does and creates a better ground for the development of an effective information system. These data oriented SDMs are also easier to understand because developers and end-users see the same data in graphical form and they are independent of any physical implementation (Welke 2006).

The SDM puts emphasis on entity relationship model that see the organisation as a collection of data elements is the main technique used in these SDMs. Welke (2006) also confirms that even if data modelling is used widely, process modelling is not completely left out in blended SDMs. Examples of blended SDMs include Structured System Analysis and Design Method (SSADM), Merise and Information Engineering (IE)

a) Information Engineering (IE)

IE is a comprehensive type of system development methodology that covers all aspects of the system development life cycle (Avison and Fitzgerald 2006). It is a static framework within which a variety of techniques are used to develop good quality information systems in an

efficient way (Zagarrio 2005). It has a number of philosophical underpinnings including that it is data oriented although processes are equally essential. Like STRADIS, it uses the top down approach which begins with the top management overview of the enterprise as a whole (Avison and Fitzgerald 2006). It therefore enables an overall strategic approach to be adopted.

Importantly noted within this SDM in relation to this study is that the better part of its first stage is concerned with the overall corporate objectives. It implies that the organisation's information systems should be designed to help meet the requirements of the corporate plan and that information systems are of strategic importance to the organisation (Zagarrio 2005). Specifically quoted from Avison and Fitzgerald (2006) is that with this SDM, "the information system's plan should indicate the business goals and strategies, outline the major business functions and their objectives, and identify the organisational structure". For the purpose of this study, the point above is considered important.

b) Structured System Analysis and Design (SSADM)

Like IE, SSADM is a highly structured SDM which is data oriented and involves the completion of a lot of pre-printed documents (Welke 2006). The first phase involves a feasibility study to prove whether the system is technically possible and whether the benefits of the system will outweigh the costs (Avison and Fitzgerald 2006).

The SDM facilitates the use of project management techniques such as defining the scope, determining project objectives, cost benefit analysis and defining system requirements (Khan 2004). SSADM includes very little top management involvement at planning and its emphasis on the organisational strategy is very vague. This SDM puts more emphasis on the use of project management techniques and elements such as scope, time, cost and quality (Welke 2006).

2.4.3.2.3 Object Oriented System Development Methodologies

Quoted from Khan (2004), object oriented SDMs are described as follows: "our world is a collection of collaborating agents/objects, therefore to bring reality closer to technology; software has to be organized according to the structure of our world to increase understandability and the changing nature of the software". Object oriented SDMs philosophy involve modelling of data and processes and do not view data and processes as

separate elements (Avison and Fitzgerald 2006). The name ‘object’ is a combination of data and processes which view data and processes as equally important in developing an information system (Doyle 2007).

According to some scholars, object-oriented SDMs are more effective for managing bulky systems, which arise in the design of large, and complex software artefacts that are more than either data-oriented only or process-oriented SDMs only (Khan 2004, Avison and Fitzgerald 2006 and Doyle 2007). Objects are used to combine data with the procedures that operate on that data (Khan 2004). Finding classes, objects, structures, subjects, attributes and services are involved in object-oriented SDMs (Doyle 2007). Examples of object oriented system development methodologies include Object Oriented Analysis (OOA) and Rational Unified Process (RUP). Important characteristics about this SDM noted for this study include the design of large and complex artefacts, but the SDM lacks emphasis on organisational strategy.

a) Rapid Unified Process (RUP)

RUP has its main focus on the use of the Unified Modelling Language (UML). The SDM pays no attention to the approach by which a system is developed whether top-down, middle-out or any other approach (Khan 2004). Welke (2006) emphasises that by approach, “we mean the type of activities that have to be carried out in discovering the requirements as well as the stages and tasks to be done”. RUP’s main focus (UML) is only a modelling language, but discovering what it is that needs to be modelled is not part any of the SDM’s major phases.

Jacobson (2005), one of the initiators of UML, does not believe the term method or SDM is appropriate to describe UML. He emphasises that it is a processified software engineering process, typically converted and delivered as a product. RUP’s philosophy is use case driven, architecture centric, iterative as well as incremental in nature. For the purpose of this study RUP is strong in aspects such as tools, techniques and implementation considerations, but greatly lacks in emphasising organisational strategy in all its phases.

b) Object Oriented Analysis (OOA)

OOA involves identifying relevant and stable classes and objects that will form the core of the system (Khan 2004). The problem domain is the general area under consideration. In

other words trying to understand the problem is the main concern with this SDMs. OOA's objective involves building systems that are responsible for being abstractions of the elements that are required for the system to be conceived (Pekkola 2006). With this SDM, the traditional system analysis and design remains substantive. This includes the assumptions that users and stakeholders do not know what they really require and must therefore be properly interrogated before actual work on the system begins (Cashman 2004). Like RUP, OOA puts strong emphasis in addressing other aspects of SDMs such as tools, techniques and implementation considerations, but issues of strategy are not spelt out in any of its phases.

2.4.3.2.4 Rapid Development (RAD) System Development Methodologies

This is a revolutionary concept that has risen from the difficulties associated with the lengthy development time and the inflexibility of methods incorporating new developments and enhancements before the system is implemented (Surendra 2008). One of the philosophies of RAD is that, not all of a system's requirements can necessarily be identified and specified in advance (Avison and Fitzgerald 2006). The system's interaction with the users will highlight more requirements that have to be added to the development process. In RAD requirements are not seen as a once-off documentation, they evolve from time to time and are bound to change (Zagarrio 2005).

For time saving, the system is divided and scaled according to importance. The most important parts are finished and delivered first (Pekolla 2006). Eighty percent of the functionality can be delivered with only twenty percent of the effort out of hundred percent requirements (Schwalbe 2010). All stakeholders participate through Joint Application Development (JAD). Prototyping is an important part of RAD, and tool sets are essential to facilitate development (Khan 2004) Examples of rapid development system development methodologies include Dynamic System Development Method (DSDM) and Extreme Programming (XP).

a) Extreme Programming (XP)

XP is an agile approach to system development which supports quicker development of software particularly for small and medium sized applications and organisations (Rolland 1998). It emphasises on team work and prefers to have two people working on a particular element at the same time. For this reason XP has gained its popular name 'pair

programming'. Its stages involve customers defining their requirements in user stories and then a prototype system is developed (Mumford 1995).

Extreme Programming is a combination of simple, common-sense practices stressing communication, teamwork, requirements, and customer satisfaction. It is based on particular values according to Poul (2002) namely:

- **communication** - in order to successfully create and deliver a software product on time, there must be constant and thorough communication between members of the development team;
- **feedback** - customer involvement and feedback are essential for customer satisfaction;
- **simplicity** - XP stresses the need to keep things as simple as possible while meeting the requirements laid out for the project and
- **courage** - developers must have the courage and confidence to bring change and produce quality results.

Fig 2.3 below illustrates the XP phases diagrammatically.

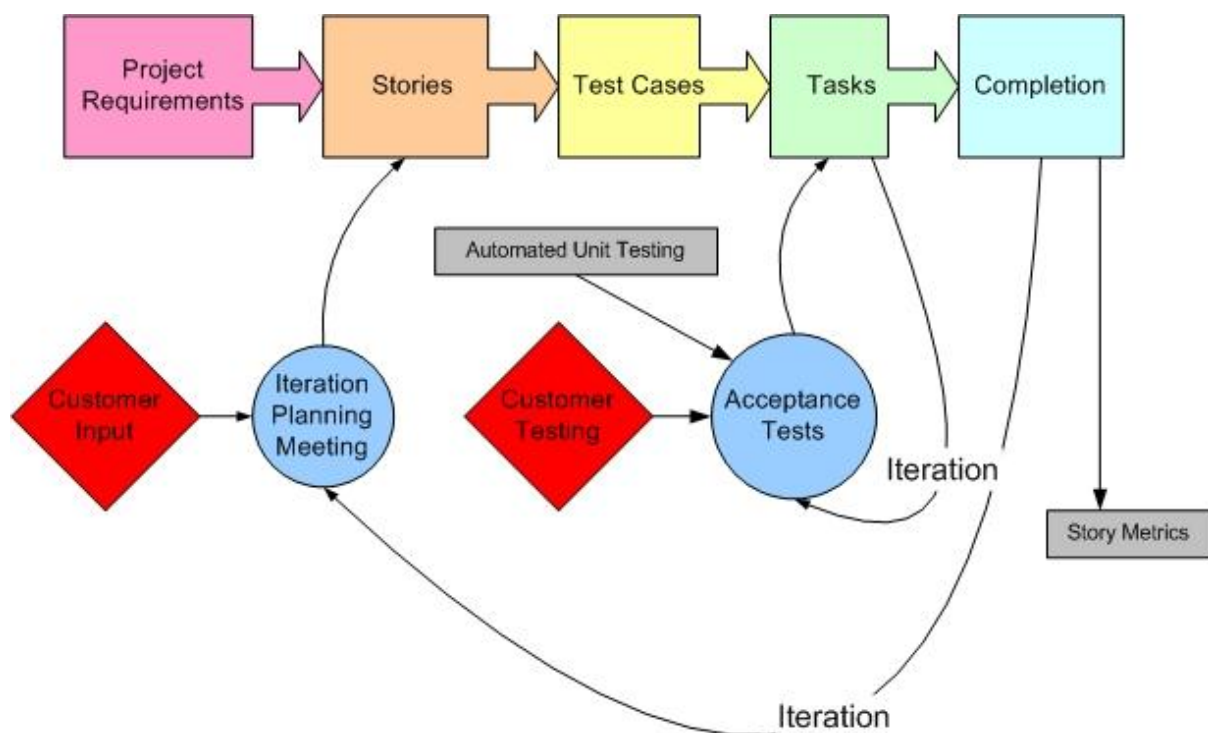


Figure 2.3: Extreme Programming Phases (Adapted from Shelly et al. 2006)

In assessing this SDM for the purpose of this study, an assumption can be made that it addresses very little on top management contribution, but rather emphasises more on customer involvement. The concept of organisational strategy is barely traceable in the phases of this SDM but there is more emphasis on other characteristics such as the output and the product. The strong contribution of this SDM is that systems are development with consideration of change in mind.

b) Dynamic Systems Development Method (DSDM)

Zagarrio (2005) argues that despite the fact that DSDM is categorised as a SDM, he strongly believes that it is more of a framework than a SDM. Much of the detail on how things should actually be done and what the various products will contain is left to individuals or each organisation's preference (Avison and Fitzgerald 2006).

The first phase of this methodology involves a feasibility study mainly for cost/benefit analysis purposes. More importantly the phase is aimed at determining whether DSDM is the correct SDM for a particular project (Olle 2001). DSDM is especially recommended for business systems where details of requirements are not clear. Since the SDM is dynamic in that it differs with each system developed, time is extremely critical. The SDM is not recommended for scientific or particularly computationally complex applications or projects where requirements must be delivered at once (Rolland 1998, Avison and Fitzgerald 2006). Although issues on strategy are hardly addressed in this SDM, it can be assumed that since an organisation is at liberty to implement this SDM in their own way, it is possible that strategy and other BPR characteristics may be considered.

2.4.3.2.5 People Oriented System Development Methodologies

This is more related to the social and organisational factors in developing an Information System (Mumford 1995). Systems developed using SDMs in this category need the technology used to fit into the socio-organisational culture if it is to be effective (Bubenko and Wangler 1992). The SDMs attempt to capture the expertise and knowledge of the people in the organisation. SDMs such as ETHICS see information system as an issue of an organisation and not that of entirely a technical matter (Khan 2004).

Peoples-oriented SDMs assume that the interaction of technology and people should produce effective work systems as well as social impact that may lead to job satisfaction (Mumford

1995). System analysts and programmers are considered educators and not sole responsible individuals for the job. When changes arise, they are brought to the front, discussed and taken up as updates only if they promote system efficiency and satisfaction (Zagarrio 2005). Examples of people oriented SDMs include KADS, CommonKADS and ETHICS.

a) Effective Technical and Human Implementation of Computer-Based Systems (ETHICS)

ETHICS encompasses a socio-technical view and its philosophy evolved from organisational behaviour (Khan 2004). Information Systems development is perceived not as a technical issue but as an organisational issue which is fundamentally concerned with the process of change (Welke 2006). The socio-technical approach is defined as one which recognises the interaction of technology and people. ETHICS produces work systems which are both technically efficient and have social characteristics which lead to high job satisfaction (Avison and Fitzgerald 2006 and Khan 2004). There are five elements of measurement identified to support the socio-technical philosophy of this SDM which are: knowledge fit, psychological fit, efficiency fit, task structure fit and ethical fit (Rolland 1998).

This SDM has a second philosophical strand which is participation which requires people affected by the system being part of the decision making process (Bubenko and Wangler 1992). They include direct and indirect users such as management, customers and suppliers. Participation also usually involves the setting up of a steering committee and a design group. This committee sets out guidelines for the design group and consists of seniors from different areas of the organisation and trade union officials (Avison and Fitzgerald 2006). Within the design group all major interests should be represented including each section and function, grade, group and so on.

The first meeting of the design group considers the question “why change?” as well as the current problems and opportunities. If no convincing statement for change is arrived at, the process is stopped (Zagarrio 2005 and Welke 2006). ETHICS follows the system development life cycle up to the end meaning it includes the implementation and evaluation phases as well. The strength of this SDM for the purpose of this research is the fact that it seriously supports necessary change and regards change management as a process that should be taken seriously.

b) KADS

KADS mainly focuses on modelling to develop expert systems. The system should not be filled only with knowledge extracted from a human expert but rather, it is also a computational model of desired behaviour reflecting behaviour of the expert (Avison and Fitzgerald 2006). KADS model does not necessarily imply the use of the linear top-down fashion but rather advocate the spiral approach with the first phase of the methodology looking at the organisational model (Pekkola 2006). At this stage the SDM defines the problem that the expert system is addressing in the organisation. This is a high level model of functions, tasks, and problems in the organisation, including assessing the effects of introducing the expert system (Khan 2004). KADS focuses on principles and models rather than processes, phases, steps and tasks that need to be followed and undertaken (Avison and Fitzgerald 2006). The strengths of this SDM lie in the fact that it firstly addresses the organisational model therefore we can assume that this means addressing strategy also assuming that the organisational model means picturing the organisation as a whole.

2.4.3.2.6 Organisational Oriented System Development Methodologies

The philosophy behind this category of SDMs is that properties of a whole are not entirely constituted by the parts or elements that is, 'systems thinking' (Olle 2001). Most of the SDMs that are used for developing Information Systems within this category break down complex systems into smaller elements for the sake of analysis and understanding (Khan 2004). Organisational oriented methodologies have the founding concept that 'the whole is greater than the parts'. Information System development in organisations cannot be viewed separately from the organisation's context (Mumford 1995 and Avison and Fitzgerald 2006). 'Systems thinking' maintains that the whole is greater than the sum of parts. The principle implies that we must try to develop application systems for the organisation as a whole rather than for a function in isolation. The system should always be looked at in terms of the wider system of which it is a part (Cockburn 2006). Examples of organisational oriented system development methodologies include Soft System Methodology (SSM), Projects in Controlled Environments (PRINCE) and Process Innovation (PI)

a) Soft Systems Methodology (SSM)

SSM is a SDM that models data and processes. It also considers people as an essential part of the model and uses soft systems thinking where understanding is achieved through debate

with the actors in the system (Smolander et al. 2000). SSM looks at addressing the how issues of a system. The first two levels of the methodology are concerned with gaining an understanding of the problem from as many people in that situation as possible, culturally and or politically (Welke 2006). SSM is dependent on the particular interpretation followed by those who use the approach. Checkland (2009) has attempted to adopt SSM as a practical SDM by trying to ensure that for any particular system, the study will lead to a subset of principles which can be applied uniquely for a particular system.

‘Systems thinking’ means addressing issues that affect the organisation as a whole. Based on this it can be assumed that the SDM vaguely addresses strategy because it emphasises viewing the organisation as a whole during system development. The same assumption can also be made based on the fact that this SDM attempts to bring out the problem from as many people’s views as possible.

b) Projects in Controlled Environments (PRINCE)

PRINCE is a structured and standard approach for project management which emphasises on delivery of the end product at a specified quality, within budget and on time and does not put emphasis on activities to achieve production (Avison and Fitzgerald 2006 and Olle 2001). The first stage of this methodology involves the development of a business case which defines the purpose, benefits and sponsor of the project. The first stage also includes the development of a project plan which is important in showing the overall project scope, major deliverables and resources required (Smolander et al. 2000). The technical aspects of this SDM include the Product Breakdown Structure (PBS) and Program Evaluation Review Technique (PERT) charts showing dependencies and end dates. PRINCE follows the complete system development life cycle (SDLC) process from the initiation stage through to delivering it to the customer as well as maintenance and post implementation review (Avison and Fitzgerald 2006). PRINCE puts strong emphasis in addressing other aspects of SDMs such as tools, techniques and implementation quality, but issues of strategy are not spelt out in any of its phases.

2.4.3.3 Evaluation of SDMs based on BPR Success Factors

In the previous sections, the study identified strong and weak points of various SDMs based on the characteristics they possess from the Fitzgerald and Avison’s (2006) framework as well as strategy. This section presents a second evaluation of these SDMs based on BPR

The *characteristics* that define BPR were discussed in section 2.3.1.1, BPR *success factors* were discussed in Section 2.3.3 and an evaluation of SDMs was done in section 2.4.3.2 of this study. Table 2.4 combines the above three discussions in an attempt to find a recommendable SDM for BPR purposes that is suitable for this study. A section of recommendations is also added to Table 2.4 above in an attempt to suggest possible SDMs for BPR.

In the key for Table 2.4 above an ‘S’ means that the SDM strongly supports the BPR success factor in line with it, ‘M’ represents moderate support, ‘W’, means there is weak support and ‘N’ means support is non-existent.

The evaluation in the Table 2.4 also shows the strongest BPR characteristic that defines a SDM in the second last column. At this point, the study can confirm that all the SDMs evaluated have one common characteristic which is IT-led. In the last column the study attempted to recommend probable SDMs for BPR purposes. The evaluation in the table shows that the discussed SDMs have at least one element that qualifies them to be recommendable for BPR. At the same time all the SDMs evaluated seem to lack adequate emphasis on or more of the crucial BPR characteristics thereby disqualifying them to be specific SDMs for BPR. It may therefore be safe at this particular stage to assume that there is no specific SDM for BPR purposes and therefore suggest that future research may need to consider developing some.

2.5 Summary on Strategy, BPR and SDMs

The challenge in selecting and following a SDM for this study that will deliver the qualities required is to do it right. Doing it right addresses avoiding SDMs with steps that waste time, squander productivity, demoralise developers, and create unnecessary administravia (Edwards, Thompson, and Smith 2009). The best approach for applying a SDM for the purpose of this study is to consider its degree of support to BPR success factors which include consideration of strategy and its ability to possess the recommended BPR characteristics. It is often tacitly assumed that the use of SDMs may improve system development productivity and quality. The discussions so far have however assumingly predicted that, thus far, no dedicated SDM exists for BPR purposes, yet SDMs are a recommended necessity.

2.6 The BPR, SDMs and Strategy Synergy

The part of Information Systems concerned with system development has continuously faced many recurrent problems (Huisman 2004). For the purpose of this study these problems are reducible to the conceptions that are given to the use of SDMs.

2.6.1 Justification for SDMs in BPR

Earlier discussions have assumed that so far there are no specific SDMs for BPR. The assumption has been based on the fact that all the SDMs evaluated failed to pass the criteria required to qualify them to suit BPR purposes. At present many Information Systems developed for BPR use the functionalist approach, a notion that has seen the development and implementation of mechanistic software products (Mavetera and Kroeze 2010). Mechanistic development practices view software development as a rational and deterministic process (Mavetera and Kroeze 2010). Aremu and Sidikat (2008) add that consequently, when resultant software products are implemented in Information Systems, they exhibit a mechanistic character that eventually limits their usability.

Mechanistic development approach addresses the data processing requirements of most organisations but fails to address the dynamic (ever changing) nature of organisational systems (Chapman 2007). In other words the assumption that Information Systems are therefore they should forge some type of humanistic, nondeterministic behaviour (Mavetera and Kroeze 2010). This behaviour can sometimes be captured in some sort of SDMs (Standing 2002).

Organisational systems or processes are dynamic hence BPR is an inevitable necessity to which is only accommodated in dynamic Information Systems if it is to accomplish tasks and achieve their information-processing goals (Hill 2009). The use of SDMs may enhance this dynamism, especially because SDMs belong with particular themes or philosophies that classify their purpose and behaviour as discussed in Sections 2.4.3.2.1 to 6.

Jackson (1995) says that organisational development is a continuous process. In a radically changing technological world, organisations enhance competitive advantage through business process re-engineering (BPR) by radically redesigning selected processes, (Muthu et al. 1999). BPR implies transformed processes that together form a component of a larger system

aimed at enabling organisations to empower themselves with contemporary technologies, business solutions and innovations (Hammer and Champy 2005). Giaglis (2009) also contribute that BPR is a multi-dimensional tool in that it accommodates the uses of several SDMs to examine processes from a holistic perspective with regards to the organisation. Earlier discussions on SDMs' BPR characteristics indicated that all the SDMs discussed were strong the IT-led characteristic. Hammer and Champy (2005) mention that, it is a fact that Information Systems and other types of technology spur productivity growth, but the BPR too leads to significant productivity gains.

2.6.2 Justification for strategy in SDMs

In Section 2.2 the organisational strategy was described as a general plan or set of plans intended to achieve business objectives especially over a long period. It was stated as the art of planning the best way to gain advantage or achieve success over an organisation's competitor (Lamb 2004). Competition is highly dynamic (ever changing) and it defines an organisation's advantages which are usually captured in the organisational strategy, this then also implies that organisational strategy is dynamic (Frenzel and Frenzel 2004).

In the paragraphs above, SDMs have been pinpointed as artefacts that may enhance dynamism in information systems. Strategy has also been discussed as dynamic driven by the inevitable element of competition. Dynamism is clearly addressed in SDMs like DSDM discussed in earlier sections of the study.

2.5.3 Justification for considering strategy during BPR

The first step of BPR is for the top management (strategy implementers) to recognise the need for change, and then develop a complete understanding of what BPR steps they need to take and how they plan to achieve it (Senn 2001). Once the understanding and commitment is made, the next step is to clearly consider the organisation's mission and vision; that is exactly what the organisation is intended for and where the organisation is intended to head (MacArthur 2004). Earlier discussion indicated that the organisational strategy is derived from its mission and vision, therefore the first step to BPR is to consider the organisational strategy. Davenport and Short (1990) emphasise that management should select business

processes that need to be reengineered and define clear and measurable objectives for reengineering based on the existent or intended organisational strategy.

2.6.4 The Synergy

The dynamic nature of the concepts discussed above, SDMs and strategy, automatically invokes BPR which is described as necessary change in earlier sections of the study. Major BPR efforts represent an organisation's commitment of millions of dollars for redesigning organisational processes. Redesigning organisational processes implies changes to fundamental product delivery and customer service procedures; in other words it is re-examining and repositioning organisational strategy (Clemons 2000 and Hammer 2000).

The success or failure of BPR lies in the good practices and measures applied into the process, more specifically the SDMs followed to accomplish results (Venkatraman 2009). BPR is about fundamental change, and emphasis is placed on the business processes but at the same time, it also encompasses managerial behaviour, work patterns and organisational structure (Fitzgerald and Avison 2006). BPR is thus a total approach involving top management, total organisational restructuring and a change in the way people think, collectively described as organisational strategy (Radwan 2001). Mylopoulos and Yu (2001) also mention that the BPR efforts should involve business executives and key staff members from the primary organisational units involved in the processes. Earlier discussions on SDMs like SSM by authors such as Checkland (2009), Smolander et al. (2000) and Welke (2006) assumed that involving all stakeholders implies systems thinking which in turn implies application of strategy

As far as recommendations for literature research on BPR and organisational strategy is concerned, more research needs to be done. Some aspects that need to be looked at include determining who is responsible for the implementation of BPR (Clemons 2000). Jackson (1995) also contributes by posing a question on whether it should be viewed as the responsibility of top management; since they are the implementers of strategy; administrators; consultants or whether there should there be specialised change managers for the task. Secondly more research needs to be done on organisational regulations, attitudes, policies, and practices which may be an impediment to BPR efforts (Hammer and Champy 2005). Further contributions may be needed to the development of SDMs with a focus on

BPR. There has been limited research, specifically relating to BPR and strategy and the use specific of SDMs in BPR is recommended but non-existent. Therefore findings on the relationship between BPR, SDMs and strategy still remain a path to be explored.

2.7 Mergers and Higher Education Institutions (HEIs)

2.7.1 Introduction

Fourie (1999), states that the global trend of transformation of HEIs that is taking place in most countries in the world is an undeniable fact. More often HEIs are seen as slow to change or downright resistant but in the last 25 years they have undergone rapid transformation throughout the world, especially in the form of mergers (Strydom 2010). A merger can be considered as a significant life event for an organisation and its employees (Beelen 2010). The way people cope with and respond to mergers can have a direct impact on the institutional performance both in the short and long run (Strydom 2010). This is considering the fact that the business processes that involve employees' daily activities maybe be restructured or redirected due the effects that mergers have on the overall organisational strategy (Reddy 2010). It is within this context that post-merger perceptions of a South African HEIs were investigated.

2.7.2 Definition of a merger

A merger is the combining of two or more separate institutions into a single new organisational entity (Moore 2010). Its control rests with a single governing body and a single chief executive body and all the assets, liabilities, and responsibilities of the former institutions are transferred to the single new institution (Hall and Symes 2005).

2.7.3 Background of SA's Higher Education Institutions' Mergers

2004 marked South Africa's first decade of democracy, and the same past ten years have seen extensive restructuring of various institutions and establishments of the apartheid state, as well as the resources of publicly funded HEIs (Harman and Meek 2002). The higher education system inherited by the first democratically elected South African government in 1994 was characterised by multiple divisions. Under the apartheid regime, the relationship between institutions and the state varied considerably (Sehoole 2005). About ten universities

were reserved for white students who enjoyed a substantial degree of autonomy. In contrast, the other remaining universities were being administered as branches of the racially defined government establishments (Martin and Roodt 2010). The divisions included the coloureds, Indians and Bantu Administration and Development. There were very tight controls over the appointment of lecturing staff and the control of the curriculum (Du Plessis 2010).

Jansen (2010) mentions that the idea of merging was a necessity for reasons such the need to eliminate divisions by racial inequalities with the white and black institutions marked with the material, cultural and social postures of their separate histories. Students were constantly in conflict with the institutional leadership over tuition and registration fees. Staff members were in conflict with vice-chancellors and senates with councils who were also divided especially over the issue of management (Jonathan 2008). At some point within the first decade, South African institutions witnessed a dramatic and unexpected decline in student enrolments (Du Plessis 2005). Moore (2010) adds that around 1999 for example, the total number of enrolments per headcount at universities and technikons dropped by approximately seven percent and this had severe consequences on the already struggling black universities.

2.7.4 The South African Merged Higher Education Institutions (MHEIs)

The idea of merging institutions, as suggested by the then Minister of Education, Kader Asmal, caused mixed feelings (Hayward 2004). However, the mergers took place and a new plan for higher education ministry was implemented (Jansen 2010). The government's plan was to build a framework for transforming the thirty-six existent HEIs with differing missions that were based on racial grounds, into twenty-one MHEIs with new institutional and organisational forms thereby creating a new institutional type termed, the comprehensive institution (Humphrey 2008).

Jansen (2010) emphasises that, the new higher education scenery consists of three types of institutions namely; the University of Technology, the traditional research-focused university, and the new comprehensive university that combines academic and vocationally oriented education. All three types are aimed at enhancing student access and expanding research opportunities and market responsiveness (Study SA 2008).

Tables 2.5, 2.6 and 2.7 below show a summary of the MHEIs in South Africa according to the groupings discussed above (Traditional Universities, Comprehensive Universities and Universities of Technology) respectively.

Institution	Nickname	Merger	Year	Location
University of Cape Town	Ikeys / UCT	N/A	2 April 1918	Cape Town
University of Fort Hare	UFH	University of Fort Hare and East London campus of Rhodes University		Alice, East London
University of the Free State	Kovsies / UFS	University of the Orange Free State, Qwa Qwa Campus of the University of the North and Bloemfontein campus of Vista University	1 January 1950	Bloemfontein
University of KwaZulu-Natal	UKZN	University of Natal and University of Durban Westville	1 January 2004	Durban, Pietermaritzburg, Pinetown, Westville
University of Limpopo		Medical University of South Africa and University of the North	1 January 2005	Polokwane, Ga-Rankuwa
North-West University	Pukke	Potchefstroom University of Christian Higher Education, University of the North West and Sebokeng campus of Vista University	1 January 2004	Mafikeng, Mankwe, Potchefstroom, Vanderbijlpark
University of Pretoria	Tuks / Tukkies	N/A	10 Oct 1930	Pretoria, Illovo (Johannesburg)
Rhodes University	Rhodes	N/A	1 January 1947	Grahams town
University of Stellenbosch	Maties	N/A	2 April 1918	Stellenbosch, Saldanha Bay, Bellville
University of the Western Cape	UWC	Dental Faculty of University of Stellenbosch and the University of the Western Cape	1 January 1970	Bellville (Cape Town)
University of the Witwatersrand	Wits	N/A	1 January 1922	Johannesburg

Table 2.5: Traditional Universities (*Adopted from Rothman 2009*)

Institution	Nickname	Merger	Year	Location
University of Johannesburg	UJ	Rand Afrikaans University, East Rand and Soweto campus of Vista University and Technikon Witwatersrand	1 January 2005	Johannesburg
Nelson Mandela Metropolitan University	Madibaz / NMMU	University of Port Elizabeth and Port Elizabeth Technikon (including the Port Elizabeth campus of Vista University)	1 January 2005	Port Elizabeth, George
University of South Africa	Unisa	UNISA, Technikon SA and Vudec	1 January 2004	Headquartered in Pretoria, Campuses in Muckleneuk & Sunnyside - Pretoria, Midrand & Florida - Johannesburg
University of Venda	Univen	N/A	1 January 1982	Thohoyandou
Walter Sisulu University	WSU	University of Transkei, Border Technikon and Eastern Cape Technikon	1 January 2005	East London, Butterworth, Mthatha, Queenstown
University of Zululand	UniZulu	N/A	1 January 1960	Empangeni
Cape Peninsula University of Technology	CPUT	N/A	1 January 2005	Bellville, Cape Town

Table 2.6: Comprehensive Universities (*Adopted from Rothman 2009*)

Institution	Nickname	Merger	Year	Location
Cape Peninsula University of Technology	CPUT	Cape Technikon and Peninsula Technikon	1 January 2005	Bellville, Cape Town
Central University of Technology	CUT	Technikon Free State and Welkom campus of Vista University	1 January 1981	Bloemfontein, Welkom
Durban University of Technology	DUT	Technikon Natal, Umlazi Campus of University of Zululand, Mangosutho Technikon and ML Sultan Technikon	1 January 2002	Durban, Pietermaritzburg
Mangosuthu University of Technology	MUT	N/A	1 January 1979	Umlazi
Tshwane University of Technology	TUT	Pretoria Technikon, Technikon Northern Gauteng and North West Technikon	1 January 2003	Pretoria
Vaal University of Technology	VUT	Vaal Triangle Technikon and Sebokeng	1 January 2005	Vanderbijlpark

Table 2.7: Universities of Technology (*Adopted from Rothman 2009*)

2.7.5 The negative effects of the mergers

One of the major problems that faced the merging initiative includes the lack of experience of the Department of Education in operational issues facing merging institutions (Stumpf 2008). Humphrey (2008) suggested that the mergers should rather have been headed by an active institutional member, for example an ex-Vice Chancellor. Another concern was the absence of a best practice guide for many of the issues facing merging institutions (Hall and Symes 2005). There was also lack of merger funding during the merger period. Most merging institutions suffered from student enrolment decreases due to ‘market confusion’ which resulted in funding cuts (Moore 2010). Another factor included the fact that the merging institutions suffered from severe staff shortages (Hall and Symes 2005).

Jansen (2010) mention that currently, South African higher education is making an attempt to implement a curriculum restructuring policy aimed at the development of degree programmes that are aligned and coherent among campuses as well as universities. Based on the merger, this endeavour is one of the BPR initiatives that MHEIs are undertaking. This requirement presents a considerable challenge for faculties who will have to work in teams to develop, deliver and evaluate these programmes (Moore 2010). The policy anticipates significant shifts in the nature of academic practices, academics’ identities, and in the forms of authority used to regulate curriculum decisions (Hall and Symes 2005). Merging has also raised concerns with regards to the allocation of duties among administration staff whose roles were the same with each different campus (Jansen 2010).

2.8 Strategy, BPR, and SDMs’ synergy in relation to mergers

A lot of research has been done on the South African MHEIs mergers as is evident in the discussions above. Research however seem to lack in aspects concerning the effects of the mergers on the Information Communication Technology (ICT) side of the institutions. Davenport and Short (1990) posted that Business Process Reengineering requires taking a broader view of both ICT and business activities and of the relationships between them. ICT should be viewed as more than automating or mechanizing force to fundamentally reshape the way business is done (Clemons 2000). It should be viewed as an essentially enabling tool to strategic functions. ICT and BPR have a recursive relationship in that ICT capabilities should support business processes and business should be in terms of the capabilities ICT can

provide, (Senn 2001). Davenport and Short (1990) refer to this broadened recursive view of ICT and BPR as the new industrial engineering of business process.

Muthu et al. (1999) consider SDMs as a key factor in BPR for organisations that want to witness organised change in its operations. They prescribe the use of SDMs to challenge the assumption inherent in the development processes that have existed long before the advent of modern computer and communications technology.

Aremu and Saka (2006) add that ICT and BPR are strategic resources that facilitate major changes in competitive behaviour, marketing and customer service. Hammer and Champy (2005) are concerned that the original enthusiasm for BPR has however been subsequently tempered by a number of factors, one of them being lack of SDMs. Clemons (2000) adds that failure rates of BPR initiative are as high as seventy percent, while Hammer (2000) also quoted failure rates of fifty to seventy percent giving the cause of failure as the lack of alignment of BPR to organisational strategy.

For this study mergers are viewed as the central implementation vehicle of BPR. MacArthur (2004) says that mergers like BPR, are viewed as necessary change essential in an organisation. Implementing change may also mean change to strategy and will inevitably lead to BPR which also leads to the original business processes being re-evaluated and redesigned (Venkatraman 2009).

Earlier discussions in this research highlighted that for BPR to succeed, it should be aligned to the organisational strategy. The issue of BPR/ strategic alignment plays an important role therefore hence any BPR initiative should be aligned to the organisations strategic goals (Radwan 2001). Cypress (2009) elaborates that, basic questions should be asked, such as "Does our mission needs to be redefined? Are our strategic goals aligned with our mission? Who are our customers?" An organisation may find that it is operating on questionable assumptions, particularly in terms of the wants and needs of its customers. Radwan (2001) also adds that it is only after the organisation rethinks, rethinking refers to BPR in this case, what it should be doing, which refers to strategy, does it go on to decide how best to do it, here we assume this refers to SDMs.

2.9 Focus of the research

The sections above discussed a number of concepts such as strategy, BPR, ICT, mergers and SDMs. At this point it may be necessary to note that these concepts are all major focus areas to this study. The merger initiative by South African HEIs is viewed as a BPR endeavour which invoked many other BPR initiatives within it and this study will focus on the ICT BPR initiatives. As discussed above BPR has an effect on the organisational strategy. With this in mind an assumption that the mergers had an impact on the HEI's original strategic arrangements is also made. The study also intends to prove that as discussed above BPR is a process that has an impact on organisational strategy and that needs proper planning and management. SDMs are viewed as leverage to BPR provided they accommodate the required BPR characteristics as well as organisational strategy. The study is therefore going to focus on evaluating SDMs to assess whether they accommodate strategy for use in BPR initiatives of MHEIs.

2.10 Chapter Summary

The aim of the research is to evaluate whether SDMs accommodate organisational strategy in order to determine their utility as a change tool during BPR. The aim was broken down into three objectives which are to:

- identify major categories of existing SDMs and create a list of criteria to use as evaluation dimensions for support to or accommodation of strategy;
- evaluate, by presenting the strengths and shortcomings of different SDMs for BPR purposes and
- investigate whether or not SDMs play a role in BPR in MHEIs

The discussions from Sections 2.2 to 2.4 of this chapter on Strategy, BPR and SDMs have managed to partly satisfy the requirements of the research aim and the first two objectives above. Section 2.7 introduced the other concept of the study which is MHEIs and Section 2.8 highlighted how MHEIs relate to strategy, BPR and SDMs. The last objective which requires an investigation on whether SDMs are being applied in MHEIs forms part of the data gathering process of the study which is discussed in detail in Chapter 4.

For the first objective, major categories of SDMs were presented in Table 2.3 and the criteria for evaluating them was introduced in Section 2.4.3.2 The major criterion used to motivate SDMs to succeed as useful tools during BPR is the extent to which they support organisational strategy. The findings from these discussions show that none of the SDMs identified emphasise on the accommodation of strategy as is required for the purpose of the study. Some SDMs have briefly highlighted issues of strategy in passing, but no particular phases within them are dedicated to strategy.

After several SDMs were discussed in the rest of Section 2.4 the main task afterwards was to evaluate these SDMs and motivate their suitability to the purpose of this study. This was presented in Table 2.4 to satisfy the requirements of the second objective. Findings from this evaluation and the rest of the discussions on this from Section 2.2 to 2.4 revealed that none of the SDMs met all the required success factors of BPR including the major one which is accommodation of strategy. As a result no specific SDMs were strong enough to meet the requirements needed for them to be identified as specific for BPR. However some SDMs were recommendable based on the extent that they meet some BPR characteristics and success factors.

Chapter 2 discussed in detail the major concepts of this study (BPR, strategy, SDMs and MHEIs) and how they are and should be related to each other. Section 2.6.4 summarised the BPR, strategy, SDMs synergy and Section 2.8 related the synergy to MHEIs. Discussions in this chapter revealed that BPR success is determined by its alignment to strategy. In the same light for BPR to be well structured, SDMs are recommended. The overall benefits of this are adequate and include proper ICT integration to strategic goals an element which could yield positive benefits to MHEIs. Chapter three follows this chapter and it looks at the how the study structured the fact finding procedure for the research.

CHAPTER 3

RESEARCH METHOD AND DESIGN

3.1 Introduction

The applicability of research methods relative to the research questions to be answered in the research will be discussed in this chapter.

The aim of this study in section 1.4.1 was broken down into three objectives which are to identify major categories of existing SDMs and create a list of criteria to use as evaluation dimensions for support to or accommodation of strategy; evaluate, by presenting the strengths and shortcomings of different SDMs for BPR purposes and investigate whether or not SDMs play a role in BPR in MHEIs. The first two objectives were addressed in Chapter 2 and in this chapter (chapter 3) the main research questions in relation to the requirements of the third objective were derived as follows:

- *Are there any SDMs being applied in MHEIs for BPR purposes?*
- *Do SDMs accommodate strategy for use during BPR in MHEIs?*

These questions are addressed by sourcing information from four cases of MHEIs. This study is based on the interpretive research paradigm and follows the qualitative approach. The case study research method is applied together with unstructured interviews and literature analysis for data acquisition. The reporting of the results will be done in chapter four where content analysis and cross-case analysis are used as data analysis techniques and Atlas.ti as the qualitative data analysis tool.

This chapter begins by defining research in order to derive coherence with regards to choice of research methods and design. Thereafter the structure of the research method and design is presented diagrammatically and the components of this diagram are then related to the study and explained in detail in sections that follow.

3.2 Definition of Research

Research is a particular kind of everyday thinking; a type of thinking done on most days which brings about the creation of new knowledge not known about before (Mavetera

2004b). Oates (2008) adds that research is the creation of new knowledge using an appropriate process to the satisfaction of the users of the research. Doing good research means following an appropriate process. In this process, the researcher finds sufficient and appropriate sources of data, properly record, analyse and interpret that data and draw well founded conclusions based on the evidence found (Remenyi 2008). Thereafter the researcher can present the findings in an acceptable way in the form of a report, thesis, conference presentation or journal article (Remenyi 2008).

The research process should be based on a philosophy underlying the choice of the research question(s) and research process of answering (Myers 1997). The philosophy can also depend on an individual's own views about the nature of the world we live in and therefore about how they might investigate it (Oates 2008). The philosophy directs the researcher into choosing an appropriate approach to the research. There are two main approaches that can be applied in research which can be either qualitative or quantitative (Denscombe 2003). The approach determines how the rest of the research process can be organised. Fig. 3.1 shows the outline of the research methods and design from the philosophical grounding to data acquisition.

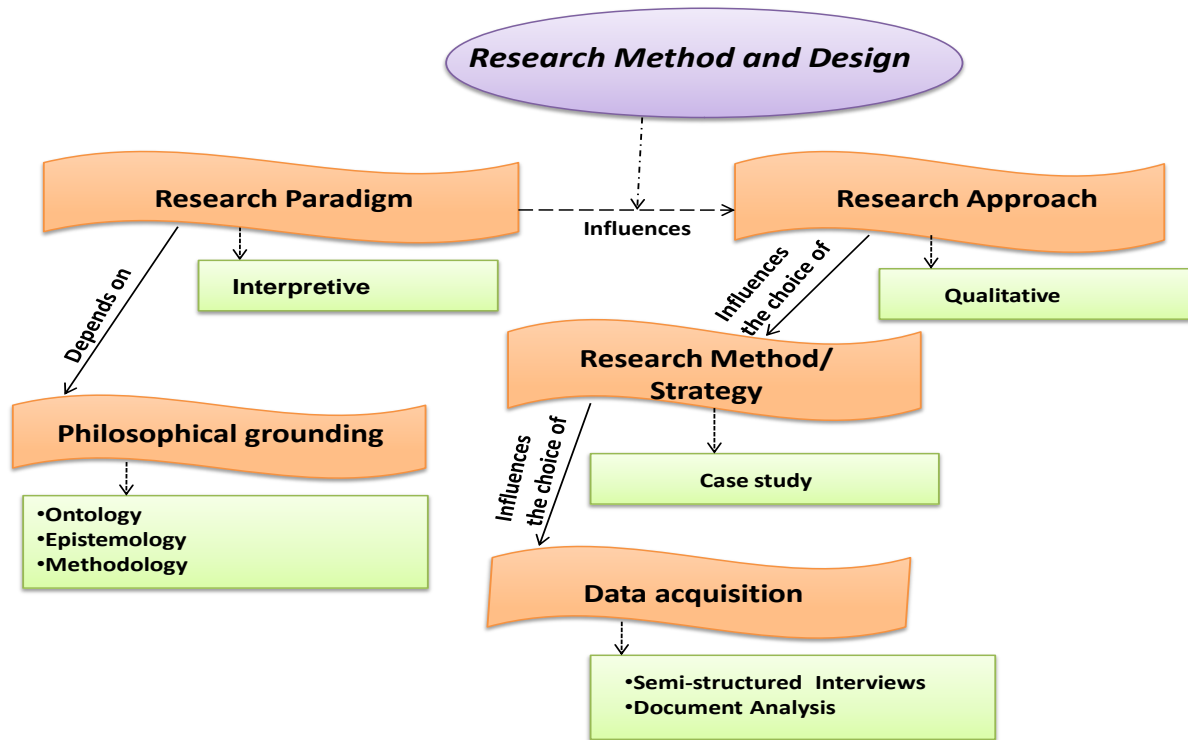


Figure 3.1: Overview of Chapter 3

3.3 Philosophical grounding

Philosophy plays an integral role in the social situations involved in research and practice (Mavetera 2004b). Continually applying philosophy leads to the ultimate success of any resultant research (Istance 2001). Philosophy helps researchers and readers by being under-labourer that is, clearing the ground a little and removing some of the debris that lies in the way of knowledge (Locke 2004). Understanding of different philosophical positions helps researchers to argue for the acceptable way of thinking and choosing their own way of activities (Dobson 2002).

In research it is important that one understands the research's paradigm(s). However it should also be understood that these paradigms can usually only be understood if the necessary assumptions or philosophical groundings about the research become clear to the researcher (Denscombe 2003). It is important to know these, sometimes hidden, assumptions so that appropriate paradigms and research methods can be selected (Hart 2002). The philosophical groundings are the bases on which choice of paradigm(s) can be derived from, hence the

research paradigms are sometimes referred to as philosophical paradigms (Mavetera 2004b). Philosophical groundings can be ontological, epistemological or methodological and are briefly described as follows:

Ontology - specifies the nature of reality that is to be studied; it helps the researcher to understand what exists in the world and what can be known about this world (Locke 2004).

Epistemology - specifies the nature of the relationship between the researcher (knower) and what can be known (Istance 2001).

Methodology - specifies how the researcher may go about practically studying whatever she believes can be known (Hart 2002).

Table 3.1 below shows the differences in research paradigms based on the philosophical groundings and then a discussion on paradigms follows.

	Philosophy		
Paradigm	Ontology	Epistemology	Methodology
Positivist	- Stable external reality - law like	- Objective - Detached observer	- Experimental - Quantitative - Hypothesis testing
Interpretive	- Internal reality of subjective experience	- Empathetic - Observer inter-subjectivity	- Interactional - Interpretive - Qualitative
Critical social	- Socially constructed reality - Discourse	- Suspicious, political -Observer constructing versions	- Deconstruction - Textual analysis - Discourse analysis

Table 3.1: Research Paradigms Vs Philosophy (*Adapted from Burrell and Morgan 1979*)

3.4 Research Paradigm

Researchers have different ways of classifying research paradigms, some suggest four ways and others three (Myers 1997). The main research paradigms which will be discussed in this study as outlined by Orlikowski (1991) are positivist, interpretive and critical social as also shown in Table 3.1 above.

A paradigm is a set of beliefs about the nature of social reality, that is, the nature of the world and the individual's place in it (Guba 2004). A paradigm is a set of shared assumptions or ways of thinking about some aspect of the world (Remenyi 2008). It is a broad framework of perception, understanding or beliefs within which theories and practices operate a collection of ideas about the nature of the world (Orlikowski 1991). Dobson (2002) describe research paradigms as the critical examination of the grounds for fundamental beliefs and an analysis, explanation and understanding of the basic concepts employed in the expression of such beliefs.

Researchers group themselves into these beliefs and rotate their thinking around them (Shanks 1997). Paradigms are simply human constructions that are neither right nor wrong. They are not subject to proof but they are pre-structured perceptions and conceptualizations that are helpful in interpreting social reality (Guba 2004). A research process must have a guiding framework, grounded in the philosophical understandings of nature and the guiding research paradigms (Remenyi 2008). Subsequently, this framework will dictate the research approach, the research methods and the quality of the research process. Research paradigms can either be positivistic, interpretive or critical social.

3.4.1 Justification for using paradigms

Researches differ in approach and in how evaluation is done on whether it has been carried out well because of the different philosophical paradigms (Shanks 1997). Mavetera and Kroeze (2009) mention that different research paradigms have different views about the nature of the world, (ontology), and the ways knowledge is acquired about it (epistemology). The quality and relevance of any research is mainly reflected in the research paradigms used and accepted as appropriate. Agerfalk (2004) adds that an agreed set of thinking makes up a coherent body of knowledge that can guide an actor to execute a certain action in social

practice. This is the reason why researchers need to identify the philosophical paradigm behind any research.

3.4.2 Positivistic research paradigm

The positivism paradigm assumes an objective world which scientific methods can more or less readily represent and measure (Giddens 2009). It seeks to predict and explain causal relations among key variables (Guba 2004). In particular, the positivistic quantitative measures often exclude members' meaning and interpretation from data which are collected (Dobson 2002). These methods impose outsiders' meaning and interpretation on data (Myers and Avison 1999). They require statistical samples which often do not represent specific social groups and which do not allow generalization to or understanding of individual cases (Hart 2002). The positivistic research paradigm tends to exclude discovery from the domain of scientific inquiry (Giddens 2009).

The primary goal of the positivist approach is to limit the impact of the researcher on the results (Olivier 2004). Conford and Smithson (1996) add that positivist research regards true knowledge from research as a result of an observation or experience of real phenomena in an objective and real world. The end product is regarded as undisputed facts, that are timeless and without any social values attached to them (Mavetera 2004a). The researcher does not influence the results of an investigation, and assuming that all variables are kept constant, other researchers can reach the same conclusion as the first researcher regardless of differences in personal traits (Olivier 2004).

3.4.3 The critical social research paradigm

The central idea within critical philosophy is the belief that everything, be it humans, organisations or society, is historically constituted (Orlikowski 1991). Burke (2007) states that human beings and organisations and society are not confined to existing in a particular state, they can challenge and change the status quo. Everything possesses an unfulfilled potentiality, and people, by recognizing these possibilities, can challenge and change their material and social circumstances (Istance 2001). The role of the researcher is to bring to consciousness and emancipation to the restrictive conditions of the status quo (Orlikowski 1991).

The aim of this paradigm is also not only to voice the concerns of the subjects or phenomena studied, but it to promote change to what is being done (Istance 2001). The goal is to return power to those who need it the most Burke (2007). The paradigm sheds light on human injustices, but does not aim to address these issues. It gives a new dimension to the thought process involved when conducting a research (Burke 2007).

This critical social theory can also be referred to as realism and can be split into empirical and critical realism (Bryman 2004). Critical social research in particular elaborates that an external reality exists, and is separate from the observer's description of it. It contends that the social world can be understood and so changed if we manage to identify the structures at play that generate events and discourses in the social world (Locke 2004). The critical social research which is based on the grounding of critical realism, balances between positivist qualitative research and interpretive qualitative type (Shanks 1997). It is grounded on the fact that any artefact observed by a researcher in a society is socially constructed (Conford and Smithson 1996).

According to Mingers (2003) the critical research approach assumes the existence of a domain of structures and mechanisms, events and experiences; the real. These structures may be physical, social, or conceptual, and may well be unobservable except through their effects, (Guba 2004). It also recognises that knowledge is always provisional and historically and culturally relative. People do not have observer independent access to the world (Hart 2002). This however does not make all theories or beliefs equally valid. Critical realism argues that scientists' conceptualisation of reality are just one way of trying to understand or know that reality (Denscombe 2003).

3.4.4 Interpretivism research paradigm

Olivier (2004) defines interpretive research as studies that generally attempt to understand phenomena through the meanings that people assign to them. Kaplan and Maxwell (1994) also add that it does not predefine dependent and independent variables but focuses on the full complexity of human sense making as the situation emerges. Schwandt (2004) on the same issue elaborates that interpretive research is fundamentally concerned with meaning and it seeks to understand social members' definition of a situation. Dobson (2002) conceives that interpretivism represents the major alternative for social science which is concerned with

mental phenomena. It involves empathic understanding, which is naturally a different type of task from those which the schemes of the exact natural sciences in general can seek to solve (Giddens 2009).

Interpretive studies assume that people create and associate their own subjective and inter-subjective meanings as they interact with the world around them (Istance 2004). Interpretive researchers thus attempt to understand phenomena through accessing the meanings participants assign to them including themselves (Orlikowski 2001). Walshman (1993) mentions that interpretive methods of research start from the position that our knowledge of reality, including the domain of human action, is a social construction by human actors and that this applies equally to researchers. Thus there is no objective reality which can be discovered by researchers and replicated by others, in contrast to the assumptions of positivist science (Mavetera 2004b). Research is interpretive if it is assumed that our knowledge of reality is gained only through social constructions such as language, consciousness, shared meanings, documents and other artefacts (Denscombe 2003).

In Information Systems interpretive research is aimed at producing an understanding of the context of the information system and the process whereby the Information System influences and is influenced by its context (Walshman 1993). Interpretive research often involves using qualitative methods from which to understand the data collected and analysed during the research process (Dobson 2002). Nevertheless research is not necessarily interpretive just because the type of data collected is qualitative (Locke 2004). Moreover there are ways of using numerical data in interpretive research, as there are ways within positivistic research of using non-quantitative data (Istance 2001). The most important distinction between positivistic research approaches and interpretive research are the underlying philosophical assumptions as shown in Table 3.1. A key task in interpretive research is seeking meaning in context; the subject matter must be set in its social and historical context so the reader can see how the current situation emerged (Myers and Avison 1999).

The epistemological grounding of interpretivism lies in the understanding of human behaviour that is arrived at through a series of cyclic processes of interpretation (Conford and Smithson 1996). Emphasis is on understanding human action not on the forces that act on it and understanding is subjective depending on culture language, and background of the researcher

(Olivier 2004). Since language is socially constituted, the interaction between the researcher and participants will have an impact on the results (Myers 1997). Giddens (2009) adds that language is subjective, and all the interpretations arrived at depict the researcher or observer's point of view.

Table 3.2 below shows a distinctive comparison of the discussed research paradigms, allowing the researcher to give a bird's eye-view of the discussed characteristics of each paradigm.

	Positivism	Interpretivism	Critical social
Assumptions	Objective world which science can mirror with privileged knowledge	- Inter-subjective world which science can represent with concepts of actors. - social construction of reality	Material world of structured contradictions and/or exploitation which can be objectively known only by removing tacit ideological biases
Key focus or ideas	Search for contextual and organisational variables which cause organisational actions	Search for patterns of meaning	Search for disguised contradictions hidden by ideology; open spaces for previously silenced voices
Key theories in paradigm	Contingency theory; systems theory; population ecology; transaction cost economics of organising; dustbowl empiricism	Symbolic interaction; ethnomethodology; phenomenology; hermeneutics	Marxism; critical theory; 'radical' perspectives; post-structuralism; postmodernism; deconstructionism; semiotics
Goal of paradigm	Uncover truth and facts as quantitatively specified relations among variables	Describe meanings, understand members' definitions of the situation, examine how objective realities are produced	Uncover hidden interests; expose contradictions; enable more informed consciousness; displace ideology with scientific insights; change
Nature of knowledge or form of theory	Verified hypotheses involving valid, reliable and precisely measured variables	Abstract descriptions of meanings and members definitions of situations produced in natural contexts	Structural or historical insights revealing contradictions
Research methods and type(S) of analysis	<i>Experiments</i> : questionnaires; secondary data analysis; quantitatively coded documents <i>Quantitative</i> : regression; Likert scaling; structural equation modeling <i>Qualitative</i> : grounded theory testing	Ethnography; participant observation; interviews; conversational analysis; grounded theory development Case studies; conversational and textual analysis; expansion analysis	Field research, historical analysis, dialectical analysis deconstruction, textual analysis

Table 3.2: Characteristics of Research Paradigms (*Adapted from Mavetera 2004b*)

3.4.5 Choice of research paradigm for this research

Chapter 1 of this study mentioned that this study follows the interpretivism research paradigm. The aim of this study is to evaluate whether SDMs' support organisational strategy as well as to investigate their use during BPR in MHEIs to evaluate their support to strategy. The nature of the problem under investigation is bound to yield mostly subjective results; hence this research process qualifies to be interpretive in nature. Its subjective nature means that respondents contribute actual facts that are taking place within their own settings rather than assume events (Locke 2004). For this study respondents are people who are involved with the ICT departments of MHEIs, hence the findings provided are the actual reality on the ground. Interpretivism was introduced in Section 3.4.4 of this research, and since it is the paradigm of choice for this study it will be discussed further in the sections that follow.

3.4.6 Characteristics of Interpretivism Research

Oates (2008) outlines the characteristics of interpretivism as follows:

a) Multiple subject realities: There is no single version of truth. What reality or knowledge is, can be a construction of minds either individual or group (Oates 2008). In the case of this study, all interviewees from the different MHEIs had their own versions of how they view and apply SDMs or how strategy is accommodated for every BPR phase they go through.

b) Dynamic, socially constructed meaning: whatever is reality can only be assessed or transmitted to others through more social constructions such as language, shared meanings and understanding (Orlikowski 2001). Although all the MHEIs interviewed went through some sort of BPR process, most of them admitted that they were unaware of any specific SDMs for BPR.

c) Qualitative data analysis: involves analysing data through the words people use, the metaphors they employ and the images they construct (Schwandt 2004). A discussion on data analysis will follow in later sections, but as briefly introduced in previous sections, data analysis for this study is qualitative in nature using cross case and content analysis. Here the researcher will analyse the data in their own way based on the findings gathered.

d) Multiple interpretations: researchers do not expect to arrive at one fixed explanation of what occurs in the study (Oates 2008). Here the researcher will interpret the data in their own view of the findings gathered. It can be assumed that if a different researcher undertakes this same research in future it is highly likely that the conclusions will be different.

e) *Researcher reflexivity*: researchers own assumptions, beliefs, values and actions will inevitably shape the research process and affect the situation (Orlikowski 2001). Naturally interpretivism accommodates liberty of expression of researchers' views.

f) *Study of people in their natural social settings*: research aims to understand people in their worlds, not in the artificial world of a laboratory (Giddens 2009). For this study, people in ICT departments of MHEIs involved with SDMs contributed to the findings.

3.4.7 Benefits of interpretive research

Positive faith in the interpretive approach is what brings out soundness of an interpretive research (Hayward 2004). With this in mind proponents of the interpretive paradigm claim four main advantages of the interpretive approach as follows:

- The researcher can never escape from his/her interpretive scheme that is, construction of the world (Bryman 2004). The researcher has liberty to construct their own version/world of truth where other people may have no grounds to dispute.
- Interpretivism is simple to understand and interpret because it does not pay attention to the conflicts in society. It ignores the contradiction that is existent among action, shared meaning and rules (Mingers 2003).
- It does not outline ways by which participants are restricted to their self-understanding and social practices. Researcher is not restricted to following particular criteria of finding and interpreting results (Schwandt 2004).
- The researcher can to a certain extent step out of their own interpretive scheme and understand the various worlds of those observed, therefore correctly interpreting actions and events instead of making a general assumption about everything (Hart 2002).

3.4.8 Limitations of interpretive research

As opposed to positive faith discussed above, blind faith in the interpretive paradigm can potentially jeopardize the soundness of research in the social sciences. In identifying the weaknesses of the interpretive paradigm, Skinner (1998) highlights five main advantages of the interpretive paradigm as follows:

- In interpretive research, there are no universal truths that are identical to everybody. The world is created or constructed by each viewer according to their own previous

experiences and understanding. Subjective biases and value system, in other words there are no independent objects which are not influenced by the actors (Dobson 2002).

- Generalization is difficult because each set of circumstances is unique to a certain extent. The uniqueness is because a particular phenomenon is seen differently by different people (Fay 2007).
- Social process is not captured in hypothetical deductions, co-variances and degrees of freedom. Instead, understanding social process involves getting inside the world of those generating it (Hart 2002).
- The researcher can never assume a value-neutral stance, and is always implicated in the phenomena being studied. The researcher is involved and his reaction is material to the research. There are no pre-defined assumptions about reality; reality can only be understandable through self-involvement (Giddens 2009).
- This paradigm fails to explain historical change that is impossible to control. It explains the present situation. It does not explain how things came to be the way they are and the likelihood of what they will become (Orlikowski 2001).

Figure 3.1 and earlier discussions have shown that the choice of paradigm influences the research approach taken. This research follows the interpretive paradigm and this paradigm is biased towards the qualitative research approach. The following section discusses the research approach.

3.5 Research approach

There are two basic approaches to social research that are governed by whether one is a positivist or anti-positivist (Mavetera 2004b). In this study anti-positivism is regarded as interpretivism. The two approaches that can be followed are either qualitative or quantitative and basically, the anti-positivists are biased towards the qualitative approach while the positivists are biased towards the quantitative approach. Both approaches will be discussed in the section that follows and then a justification of the choice of approach for this research is also discussed.

3.5.1 Quantitative approach

The quantitative approach is mainly concerned with the analysis of numerical data (Denscombe 2003). Quantitative research manipulates variables and control natural phenomena and as such it is impersonal and experimental (Fay 2007). This approach is generally associated with systematic measurement, statistical analysis and mathematical models (Wan 2003). It proceeds with deductive logic, beginning with a hypothesis or a set of hypotheses and moving on to design and experiment which would provide the data against which the hypotheses may be supported or rejected (Bless, Higson and Kagee 2006).

The main purpose of the quantitative research approach is to test the theoretical conceived null hypothesis against the facts of reality and represent the data in numerical values (Mingers 2003). Data must be quantified in order to increase the reliability, the comparability and the precision of theoretical propositions (Wan 2003). Quantitative researches were originally developed for the natural sciences but nowadays, a greater number of quantitative researches are being used for the social sciences as well (Shanks 1997). Examples of the quantitative approaches include surveys and laboratory experiments.

3.5.2 Qualitative approach

Wan (2003) defines qualitative research as the methodology of study which produces descriptive data, people's own written or spoken words and observable behaviour. In this case, words and sentences are used to qualify and record information about the world, then this is a qualitative approach (Denscombe 2003). Fitzgerald and Howcroft (2000) also define qualitative research as a methodology that determines what things exist rather than how many they are. It is a less structured approach and it is more responsive to the needs of research. The qualitative approach was developed in social sciences to enable researchers to study social and cultural phenomena (Cornford and Smithson 1996).

With qualitative research, researchers must make an attempt to use methods and collect data that allow them to understand people's social and cultural contexts in which they exist (Kaplan and Maxwell 1994). Qualitative research has been associated with the interpretivist position as explained from the epistemological anti-positivist view of the real world (Cornford and Smithson 1996). Qualitative research does not rely on quantitative

measurement and mathematical models, but rather it uses logical deductions to decipher gathered data dealing with the human element (Wan 2003). It is relatively more expensive to conduct and involves smaller sample sizes than quantitative research (Schutz 2003).

Using the qualitative research approach means that subjects of the research will have the opportunity of expressing themselves (Walshman 1993). This is so because emphasis is on expressing words and feelings rather than numbers, thus there is a variety of information from which researcher can make deductions (Myers and Avison 1999). With qualitative research the researcher gets involved with the actors and tries to understand their perspective in detail through thorough interviewing and questioning and there is no limit as to how far the respondent or participant can go in answering the questions (Mavetera 2004b).

Examples of qualitative methods include action research, case studies and ethnography. Qualitative data sources include observations and participant observations (fieldwork), interviews and questionnaires, documents and texts as well as the researcher's impressions and reactions (Olivier 2004).

3.5.3 Choice of research approach

This study follows the qualitative approach, mainly because of the study which is interpretive in nature, qualifies to generate qualitative data. Qualitative data includes all non numeric data which is words, images or sounds found on interview tapes, researcher's diaries, written documents or websites (Fay 2007). This study used data gathered from unstructured interviews and written literature on the phenomena under study to complement the interviews. The qualitative approach use case studies as its main data gathering method (Oates 2008). This study followed the qualitative research approach, therefore for data gathering the case study research method was used. Case studies are discussed in section 3.6. Qualitative data is also the main kind of data used and analysed by interpretive researchers (Oates 2008). As already discussed in Section 3.4.5, this research followed the interpretivism research paradigm and therefore used the qualitative approach to analyse findings.

Whether the research is qualitative or quantitative in nature there is always an underlying assumption it is based on. To validate a research and evaluate what types of methods are appropriate for it, it is imperative to know the supposition behind it (Myers 1997). Section

3.4.5 gives an indication that this study assumes the interpretive paradigm of which philosophies are explained in Section 3.3. Fig 3.1 also illustrates the process that guides the research in selecting appropriate research methods and eventually data gathering and analysis methods. Based on this, the research method for this research is discussed next.

3.6 Research Method

According to Oates (2008), a method is the overall approach to answering research questions. Following from the research paradigm and approach chosen for this study, which is interpretive and qualitative in nature respectively, the case study method will be used as the strategy or method to answering questions.

3.6.1 Case Study - Introduction

Robson (2002) defines a case study as a strategy for doing research which involves a social investigation of a particular contemporary phenomenon within its real life context using various sources of evidence. It is most preferable when the boundaries between phenomenon and context are not clearly evident (Oates 2008). Case studies are suitable for descriptive and explanatory research and they mostly answer the why and how questions rather than what and how much (Shutz 2003). Creswell (2008) also elaborates that it is one of the most commonly used strategy especially when specific context is being extensively studied. Myers (1997) adds that case studies help to gain deeper and insightful information in a way that the phenomena under study can be clearly defined and expressed and that it is highly suitable for information systems research. It involves collecting data through interviews or observations and the results could be exploratory if it is carried out in the interpretivist tradition (Struwig 2004). In this study, the case study involved the use of unstructured interviews with four MHEIs and literature analysis as data acquisition methods.

3.6.2 Characteristics of Case study

The characteristics of case studies are outline by Oates (2008) as follows:

a) *Focus on depth rather than breadth*: researcher obtains as much detail as possible about one instance of the phenomenon under investigation (Bryman 2004). Case studies allow the use of data gathering techniques such as interviews which involve prompting and detailed discussions. Unstructured interviews were used for this research where the interview

questions used by the researcher carried very little detail, but pages of data were generated from a single question from the discussions held.

b) Natural setting: the instance or case is examined in its natural settings, not in a laboratory or other artificial situation (Fay 2007). The researcher held interviews with respondents from the different MHEIs from their own offices where their daily operations take place. There was no need for the respondents to change their usual setting to suit the interview needs.

c) Holistic study: The researcher focuses on the complexity or relationship and processes and how they are interconnected and interrelated (Wan 2003). For example, some of the interviews questions required answers that related to the interviewee's personal information. The main idea was to try and understand how BPR processes are handled in relation to SDMs and strategy in merged universities.

3.6.3 Justification for using Case study

Case studies place more emphasis on full contextual analysis of fewer events or conditions and their interrelations (Struwig 2004). Although only four MHEIs were interviewed for this study, each interview took participants providing more detail and emphasis to concepts than they would have if they were using methods like experiments. Case studies usually place emphasis on detail thereby providing valuable insight for the problem solving evaluation and strategy (Olivier 2004). This detail allows evidence to be verified and avoids the problem of data being missed. A single well designed case study can provide a challenge to a theory and provide simultaneously, a source of new constructs (Blumberg 2007).

Blumberg (2007) also says that case study research is the most common qualitative method used in information systems. It explores a single entity or phenomenon, the case that is fairly tightly circumscribed in time and space (Walshman 1993). It collects rich and detailed information, desirably through using a variety of complementary techniques and/or sources. Using more than one technique is called triangulation (Orlikowski 1991). Hart (2002) suggested six phases that a case study research may follow if detailed information must be collected. The six phases will be discussed as applicable to this research in the next section.

3.6.4 Stages of Case study

Hart (2002) discusses the six phases of case studies as follows:

Phase i - Decide on the research questions and define them

A Research question is a statement that identifies the phenomenon to be studied (Robson 2002). It is important that the researcher formulates questions that will allow her/him to critically assess the phenomena under study in a way that will allow the problem to be sufficiently addressed. In chapter one highlighted that this study aims to:

- evaluate whether SDMs accommodate strategy in to be used as a change tool during BPR.

Up to this point in the study, it has not been difficult to gather information on the merger initiatives that South African HEIs have undergone or information on SDMs or BPR or strategy as separate concepts. However sparse information has been found with regards to the use of specific SDMs in South African MHEIs for BPR. Very little information has also been found on the relationship among SDMs, BPR and strategy as a synergy. The researcher assumes that the above statements lay good grounds to formulate research questions suitable for a quality research. The main research questions formulated and that the study attempted to address are:

- Are SDMs being applied in MHEIs for BPR purposes?
- Do SDMs accommodate strategy for use during BPR in MHEIs?

Phase ii - Decide on a sample and establish the data gathering and analysis techniques

Here the researcher justifies their choice of cases to be studied. The researcher must be able to explain the criteria they used to select the target population, cases where their data was gathered. At this stage the researcher must determine the data gathering and analysis techniques (Schutz 2003).

The cases for this study were South African MHEIs, because as explained in Chapter 2, a merger falls in a perfect position to bring about change which in this study was assumed to be BPR. When the South African HEIs were merged, certain grouping criterion was formulated as demonstrated in Tables 2.5 to 2.7. Based on this criterion random institutions were selected as cases for this study. The grouping criterion saw these institutions being grouped into traditional universities, comprehensive universities and universities of technology. Based on this type of grouping, the researcher preferred interviewing at least one senior ICT person and one junior from each one of the MHEIs. The researcher assumed that senior

people would be more involved in BPR decisions as well as SDMs in use. From the junior person, the researcher expected to obtain more information on how SDMs are being implemented at the operational level.

For data gathering the study used semi-structured interviews so that the discussions with interviewees would neither be too closed nor too open ended meanwhile allowing flexibility. The researcher also did some document analysis based on some documents obtained from HEIs as well as independent documents obtained from the Internet and the library. The aim of using these documents was to allow the researcher to trace back and understand what BPR activities took place as a result of the mergers and find out whether the stages followed can provide answers to the research questions. For data analysis the researcher used ATLAS.ti as the main data analysis tool, as discussed in Section 3.8.4 of this study as well as content and cross case analysis techniques, discussed in Section 3.8.2 and 3.8.3 respectively.

Phase iii - Plan to collect data

A data generation method is the means by which empirical data or evidence is produced, (Bryman 2004). In this phase the researcher needs to understand the data gathering techniques which they need to apply so that they may know how to plan a collection process that will give relevant data (Kaplan and Maxwell 1994). For this research, semi-structured interviews and document analysis were used to collect the data. The interviews were used to allow in-depth discussions with ICT people involved with MHEIs in South African

Interviews

An interview is a particular kind of conversation between people that is planned and has an agenda where one person, the researcher wants to gain information from the other, the interviewee (Olivier 2004). One of the main reasons why interviews were chosen is because they deal with topics in depth and in detail (Blumberg 2007).

This section gives an insight of the questions used during the interview sessions as shown in Tables 3.3 to 3.6. The purpose or motive that the researcher had in mind while planning to ask these questions is also discussed in these tables.

1. General questions

In the questions in Table 3.3 below the researcher aimed to get to know the interviewee's professional life in relation to information required for the study.

Questions	Purpose
What is your job title, your job description and your job responsibilities?	The question was meant for introductory purposes. It was meant for the researcher to familiarise with the interviewee thereby establish proper grounds to address them and start the conversation.
Are you involved in decisions concerning BPR (mergers) and to what extend?	This question helped the researcher to understand whether the interviewee was the right target to provide the necessary answers with regards to mergers and or BPR.
Are you involved with information systems development?	This question helped the researcher to understand whether the interviewee was the right target to provide the necessary answers with regards to SDMs.
How many years of experience do you have in system development and or BPR?	The researcher was trying to establish how experienced the interviewee was with the belief that greater experience means greater knowledge on the subject.

Table 3.3: General Interview Questions

2. The organisational strategy and Business Process Reengineering (BPR)

In the questions in Table 3.4 below the researcher aimed to get information from the interviewee on the relationship between BPR and strategy in their university.

Questions	Purpose
In relation to the merger initiative that your university has undergone; what major BPR steps have you undertaken in your organisation?	The researcher tried to understand the application of relevant concepts, for example whether the changes were BPR related or just changes and whether the changes were merger related
Was it obvious that your organisational strategy was a priority as you were considering BPR steps to satisfy the merger initiative, or otherwise?	The researcher tried to establish the importance of strategy to the organisation so that its relevance in SDMs can be justified.
What has been the impact of BPR decisions that you have made particularly on the organisational strategy since the merger?	Again the researcher tried to establish the importance of strategy to the organisation but in relation to BPR to establish whether BPR of priority to strategy or vice versa
What do you think were the possible causes of this impact?	The researcher tested the interviewee's experience and knowledge gained and the ability to evaluate the impact of their decision

Table 3.4: BPR/Organisational Strategy Questions

3. System Development Methodologies (SDMs)

In the questions in Table 3.5 below the researcher aimed to get information from the interviewee on the application of SDMs in their university.

Questions	Purpose
Do you know about SDMs?	The question targeted the interviewee's degree and awareness with regards to SDMs.
What SDMs have you or are you using for the new system brought about by the merger?	Here the researcher targeted to find out the types of SDMs being applied in the organisation
What success factors are involved with this/these methodologies, and what are its failures?	The researcher targeted to establish the users' level of satisfaction with their SDMs in place as well as their degree of dissatisfaction.
What are the main causes of the successes and the failures?	The question was meant to establish possible causes of successes or failures. Possible answers to this question also suggest the accommodation of strategy in SDMs.

Table 3.5: SDMs Questions

4. If there are no SDMs; is there willingness to adopt?

In the questions in Table 3.6 below the researcher aimed to get information from the interviewee's view on SDMs if they were not being applied at all or if they were not applying appropriate ones. The interviewee also hoped that the interviewee will give suggestions of possible new SDMs that future research may need to consider developing.

Questions	Purpose
Do you think if methodologies were to address the organisational strategy as a priority they would be ideal for the merged higher educational institutions?	This question aimed to gather the interviewee's view with regards to accommodation of strategy in SDMs. Possible answers could lead to the establishing of new SDMs that prioritise organisational strategy
Do you think if there were suggested SDMs to be considered for BPR processes that support the organisational strategy it would benefit the merger initiative of higher educational sector?	This question aimed to gather the interviewee's view with regards to the idea of creating new SDMs that accommodate strategy. Possible answers could lead to the establishing of new SDMs that prioritise organisational strategy and are meant for BPR initiatives of mergers
Do you think merged higher educational organisations will be willing to switch from their current SDMs to try new ones?	The question targeted to find out whether organisations are willing to adapt SDMs if they are not using any and whether or not they will be willing to adapt if new ones are established.

Table 3.6: Willingness to Adopt SDMs

Phase iv - Collect the data

Four MHEIs were selected as the main sources of information according to the grouping criterion discussed in Section 2.6.4. The researcher had interviews with one university from the Traditional group of universities, one from the Universities of Technology and two from the Comprehensive Universities. Interviews were held with these MHEIs and from some of them the researcher managed to collect relevant documents with regards to the steps taken during the merger procedures. The researcher used a recorder digital to capture data during the interviews conducted.

With University A, the researcher managed to conduct two interviews from two ICT specialists. One of the interviewees is the solutions delivery manager based at one of the MHEI's campuses who was involved with the mergers for 5 years and with BPR and strategic decisions for 15 years. The second interviewee is a system developer who is involved with software development of information systems meant for the merger.

From another MHEI, University B, the researcher managed to conduct two interviews as well. One of the interviewees is an ICT director based at the main campus of that MHEI. He is currently involved with the merger, BPR and strategic decisions at a higher level. The second interviewee is involved with the process of software development at an operational level.

At the third MHEI, University C, one interview was conducted with an ICT specialist who is involved with the merger, BPR and strategic decisions at implementation level.

At the fourth MHEI, University D, three interviews were conducted. The first interviewee is the business systems manager of the university's ICT department. She has been involved with the merger for 5 years and BPR and SDMs for 15 years. The other two interviews involved a senior system analyst and a system integrator who is both involved with the merger, BPR and strategic decisions at implementation level.

The researcher also managed to obtain three documents relevant to the research. One set of documents was obtained from one of the MHEIs and the other documents were from the internet and the library.

Phase v - Evaluate and analyse the data gathered

Two different data gathering instruments were used for this research and both of them qualify for qualitative data analysis. For the transcribed interviews a qualitative data analysis tool referred to as ATLAS.ti was used and for the literature documents a technique called content analysis was applied. The cross case technique was thereafter used to analyse both interviews and literature analysis combined. The cross case analysis performed enabled the researcher to develop patterns from the data gathered and also establish similarities in the different cases.

Phase vi - Prepare the final document

Here the analysis done in phase five is well documented in a way that makes up logical content with regards to the data collected. The researcher managed to formulate propositions based on each analysis done of the different MHEIs. The propositions formulated in relation to the research questions allowed possible relevant answers to be suggested.

3.7 Data acquisition methods

The richness of qualitative data lies in the fact that they are usually unstructured, unbounded and textual in form (Mavetera 2004a). This richness is often lost when researchers attempt to aggregate or summarize them (Olivier 2004). Qualitative research data collection can capture complex and subtle social and behavioural data (Cornford and Smithson, 1996). This research's data acquisition process was done through two techniques namely unstructured interviews, and literature analysis. The two methods are both part of the case study method and are qualitative in nature.

3.7.1 Document analysis

Document analysis are used to gather evidence and an in depth understanding of particular phenomena under study through exploring documents such as minute of meetings, planning documents, yearend reports or even journals, articles and conference papers (Oates 2008). Through document analysis, a researcher can gain an understanding of peoples' views on a certain subject. Naturally they also stand a chance of being categorised as interpretive in nature because they represent people's views on a particular matter and user can interpret these views or documents in their own way (Guba 2004). This study sought to find views from different authors concerning SDMs and the extent to which they accommodate

organisational strategies. The research also sought organisational literature or documents with regards to mergers, strategic issues, MHEIs BPR initiatives as well as application of SDMs.

Document analysis is often used as a method of informing the research rather than for data gathering (Oates 2008). However, we can argue that in some respects it may be regarded as a more creative data gathering method than many others in clearly distinguishing insights on a particular topic (Denscombe 2003). Document analysis in some respects may be regarded as more creative in that data gathered is formulated from different authors (Blumberg 2007). This gives the research ample evidence that allow the formulation of laws that capture essential features of a problem and allow us to make predictions both into the future and about other current situations (Guba 2004).

The major disadvantage encountered with the use of document analysis is that documents are written with a specific purpose and addressed to a specific audience (Locke 2004). Unlike using interviews with document analysis relevant information is hardly found in one place (Dobson 2002). Some recent articles on SDMs, strategy, mergers and BPR were used to gather some of the data required for this study. Organisational documents with specific information for particular universities concerning mergers, strategy and SDMs were extremely difficult to obtain, but the researcher managed to work with the few obtained.

Document analysis and interviews supplement each other in that documents prepare a researcher for interviews and interviews can lead to these documents (Oates 2008). Although document analysis does not involve face to face conversation with people expressing their ideas like interviews, they are similar in that people express their views on paper (Walshman 1993).

3.7.2 Interviews

An interview is a particular kind of conversation between people that is planned and has an agenda where one person, the researcher aims to gain information from the other, the interviewee (Oates 2008). Interviews are often unstructured or in the form of quiet informal discussions (Olivier 2004). Interviews can be divided into three types namely: structured, semi-structured and unstructured interviews as discussed below.

3.7.2.1 Structured Interviews

These use pre-determined, standardised and identical questions for every interviewee (Blumberg 2007). In the interview scenario, the questions are read out and the researcher notes that interviewee's responses. It is important that all the questions are read out in the same way and answers are noted without comment, in fear that the researcher may indicate their own views to the interviewee (Bless et al. 2006). The only conversation that is allowable with these interviews is when the interviewee seeks clarification of questions asked.

3.7.2.2 Unstructured Interviews

Here the researcher has less control. The interviewer only introduces a concept and then the interviewee is left to develop their ideas, talking freely about their own beliefs views and behaviour while not being interrupted (Fay 2007). Open ended questions are often crucial during unstructured interviews as they enable the interviewee to provide valuable insight into case study issues (Blumberg 2007). Unstructured interviews can also point researcher towards other sources of evidence, for example relevant documents, archival surveys and internal archives. The major disadvantage of unstructured interviews is that they can jeopardise validity if interviewee provides a biased picture of the case issue hence in some cases semi-structured interviews can be used (Bless et al. 2006).

3.7.2.3 Semi-structured Interviews

According to Myers and Avison (1999), these are more focused than unstructured interviews because the researcher schedules interview with people who possess relevant information and follow a particular structure. Semi-structured interviews also use a set of open ended questions. The interviewee is free to add to the list of questions or to change the order of the questions, but the interviewer makes sure that they still hold on to the original theme (Blumberg 2007). Their main objective is to allow the researcher to know the interviewee's perspective, and to know whether the interviewee can confirm insights and information the researcher already holds (Bless et al. 2006). For this reason semi-structured interviews are preferable for this research.

3.7.2.4 Justification for using semi-structured interviews

Semi-structured interviews were preferable for this study for such advantages as follows:

- they allow the researcher to ask probing questions that can lead to more detail on issues raised (Blumberg 2007);
- they are used for in-depth and detailed investigations especially those aimed at exploring personal accounts and feelings and quality (Bless et al. 2006);
- their suitability to the nature of this study which is interpretive. The researcher sought to find out different views from different MHEIs concerning the use of SDMs for the purposes of BPR which was as a result of the mergers and how organisational strategy was accommodated (Blumberg 2007).

3.8 Data Analysis Methods

3.8.1 Introduction

The nature of this research generated qualitative data. Qualitative data includes all non numeric data which is words, images or sounds found on interview tapes, researcher's diaries, written documents or websites as discussed in earlier sections. It is the main type of data or evidence generated by case studies (Oates 2008). It is also the main kind of data used and analysed by interpretive researchers. It therefore follows that data analysis for an interpretive research should be interpretive in nature and follows the qualitative approach. The qualitative data analysis methods used in this research include the cross case analysis and content analysis techniques as well as the ATLAS.ti as a data analysis tool.

3.8.2 Content analysis

Content analysis can be defined as the method of analysing and interpreting written, verbal or communication messages (Denscombe 2003). Conford and Smithson (1996) mention that content analysis dates back to stages where it was only used for analysing multimedia publications such as newspapers and magazines. In modern days, it does not only encompass analysis involving multimedia but any form of written text, and everything in the interpretative process (Myers 1997). It allows the researcher to test theoretical issues to enhance understanding of data. It makes it possible to distil words into fewer content related

categories under the assumption that when classified under the same categories words and phrases share the same meaning (Denscombe 2003).

Content analysis has an established position in research and offers researchers major benefits, one of them being the fact that it is a content-sensitive method and it is flexible in terms of research design. It can be used to develop an understanding of the meaning of communication and identify critical processes (Myers 1997).

3.8.3 Cross case analysis

This is an analysis method that aims to reveal similar patterns among cases in an attempt to assist the researcher to identify areas where respondents agree as coherent (Denscombe 2003). It is an effective way of analyzing data from multiple-case studies and thereafter generates theory about particular phenomena (Olivier 2004).

For the purpose of this study, the cross case analysis method was preferred mainly for its ability to search for factors from a stack of literature that could influence change for particular phenomena, especially in those areas identified as burdensome, in this study's case, it concerns SDMs (Denscombe 2003). From the stack of transcribed interviews from different the universities and literature documents used, the researcher sought to trace the use of SDMs in BPR processes done and assess their success and failure in addressing strategic issues. The cross case analysis allowed the formulation of propositions for each MHEI and these propositions were continuously reviewed in an attempt to generate a coherent story across the different MHEIs studied.

Data was analysed using codes in such a way that propositions were matched to their supporting data collection instruments. For example if a proposition is supported by both interviews and literature documents then the code would be [AI, AD]. In this case the 'A' represents the source of data, which are the different merged universities and 'I' represents interviews while 'D' represents literature documents. Each merged universities' propositions were formulated and thereafter combined propositions were formulated where the combined propositions included data from each one of the merged universities. The propositions formulated will be discussed in Chapter 4. The tool that was used in connection with the

discussed techniques for this research is a qualitative data analysis tool referred to as ATLAS.ti.

3.8.4 ATLAS.ti

This is a qualitative data analysis tool used for mainly for analysing interviews, literature or any other data that captures the opinions and perceptions of the respondents (Olivier 2004). It is especially important when theory from cases intends to be generated. This research consists of seven separate interviews conducted at four merged universities. The interviews were first transcribed then they were stored inside a hermeneutic unit (HU) created in ATLAS.ti. At this stage the interviews are known as primary documents (PD). Each of the PD's was read into this software so that codes could be assigned to parts of the interview that can be applied to the subsequent PD's. These assigned codes then formed a guide to compare the PD's so that a general view or perception on particular issues can be easily identifiable.

The researcher then used the assigned codes to formulate propositions from each one of the MHEIs' interviews. These propositions were the initial propositions which were later revised when data from the literature analysis was presented. An iterative process is used to formulate propositions for all the cases being presented until the final propositions encompassing results from all the MHEIs presented. Thereafter the onus is on the researcher to interpret the qualitative data in a way they deem suitable. Denscombe (2003) states one of the major disadvantages of ATLAS.ti is that it does not assist in establishing the meanings of constructs.

3.9 Chapter Summary

In this chapter the research method and design was presented by firstly exploring the different concepts involved with research methods and design such as philosophy, paradigms and research approach. Secondly the extent to which they relate to this study was also discussed, mostly with the concepts itself. Research questions formulated to aid in addressing the research problem were also discussed and data analysis was also highlighted. The chapter that follows discusses data analysis and results obtained in detail.

CHAPTER 4

RESULTS AND DISCUSSIONS

4.1 Introduction

This chapter presents the findings of the interviews and document analysis done with the four MHEIs introduced in chapter 3; see Appendix 1 for interview questions. The findings are presented in such a way that each MHEI's results are first discussed individually, then a tabulated summary of the all the MHEIs' interview findings is presented. Thereafter document analysis results and discussions are also presented. After reporting the interviews and the documents, cross-case analysis is done in order to generate common propositions among the four MHEIs that will allow the formulation of a coherent story regarding SDMs for BPR in MHEIs. The study intends to generate theory on the supportiveness of SDMs to strategic goals, during BPR in South African MHEIs. A qualitative analysis tool termed ATLAS.ti was used for analysis of transcribed interviews. In-order to maintain respect of anonymity to the MHEIs interviewed, the researcher referred to the MHEI's as university A, B, C and D. Fig. 4.1 below gives an overview of how the discussions in this chapter will be presented.

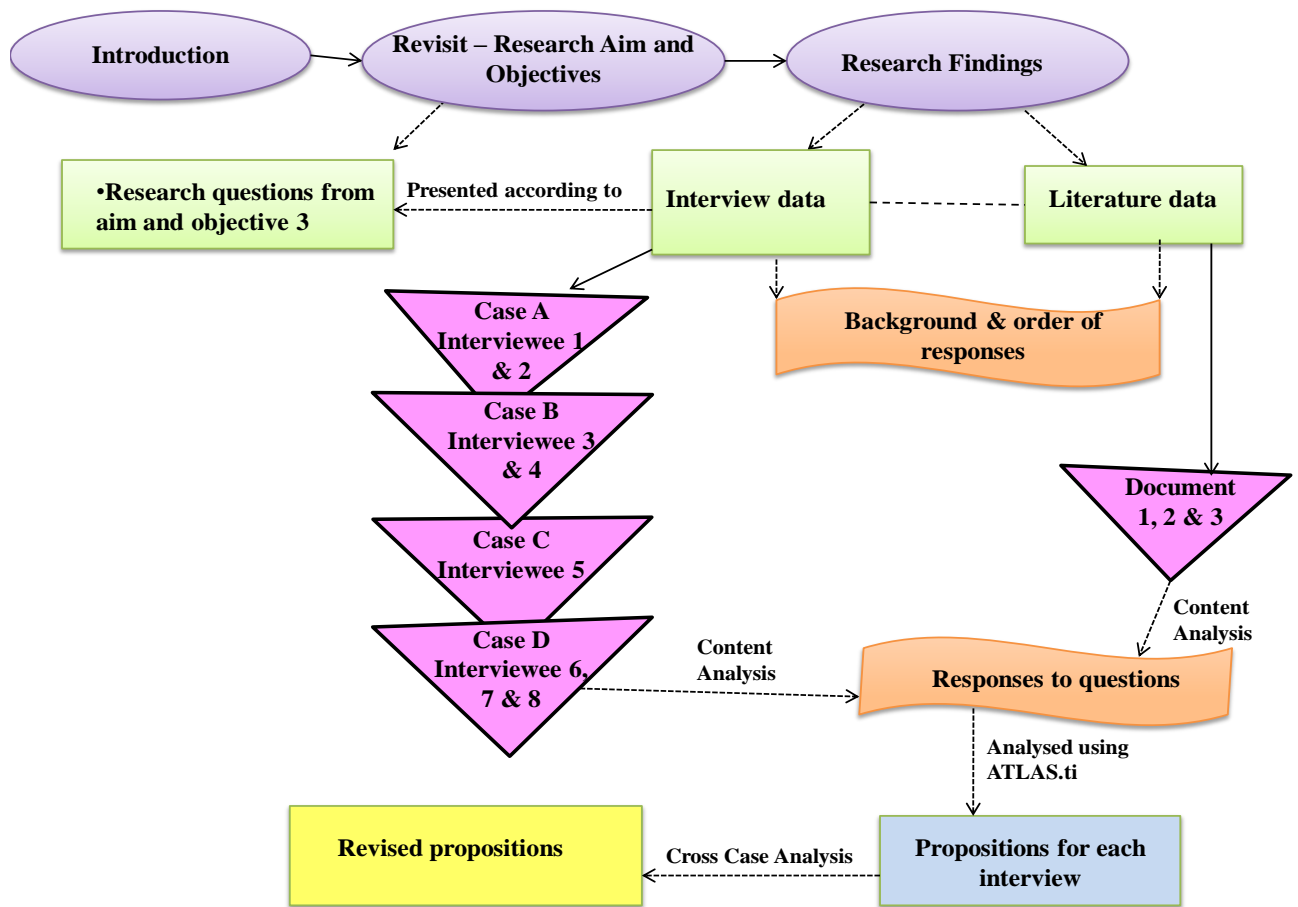


Figure 4.1: Overview of Chapter 4

4.2 Research Aim and Objectives

The aim and objectives of this research as well as the research questions that were derived from this aim will be highlighted once again to give an insight of what the findings of this study addressed. The aim of the study was to evaluate whether SDMs accommodate organisational strategy in order to determine their utility as a change tool during BPR. The objectives of the study can be summarised as the need to evaluate available SDMs that satisfy the aim of the study. More specifically the objectives of the study are broken down as follows: to

- identify major categories of existing system development methodologies and create a list of criteria to use as evaluation dimensions for support to or accommodation of strategy;

- evaluate by presenting the strengths and shortcomings of different SDMs for BPR purposes and
- investigate whether or not SDMs play a role in BPR in MHEIs.

As already discussed in Section 2.10 of this study, the first and second objectives have been covered and partly discussed in Chapter 2. Based on the research aim and the third objective, a set of research questions was then derived to represent research questions for this study.

Roode (1993) elaborates that most researches have what investigators refer to as main and minor research questions. The main research question if comprehensively answered, will holistically meet the requirements of carrying out an investigation (Saunders, Lewis and Thornhill 2007). Schindler (2005) adds that the main research question can further be decomposed into smaller questions whose sum total is equivalent to the single main question. These smaller questions are referred to as minor research questions in this study. The success of any investigation depends on the ability of the researcher to formulate and answer these research questions that are derived from the aim and problem statement (Mavetera 2004a).

Two main research questions were formulated to answer questions and provide information that satisfies the requirements of the aim and the third objective. To give deeper insight to these main research questions, five minor research questions were derived from them. The main and minor research questions are as follows:

Main research question 1: Are there any SDMs being applied in MHEIs for BPR purposes?

Minor research questions:

- *Which specific or other SDMs are currently being applied in the organisation for BPR purposes?*
- *What success or failure factors are associated with the current SDMs*
- *Is there readiness to adopt if there are none or to take up new SDMs to replace current ones?*

Main research question 2: Do SDMs accommodate strategy for use during BPR in MHEIs?

Minor research questions:

- *Are the current SDMs structured to in a way that allows strategy to be accommodated?*
- *Is there a need to develop specific SDMs that accommodate strategy to suit BPR purposes?*

The motivation behind these research questions was derived from the studies of Muthu et al. (1999), Giaglis (2009) and Hammer and Champy (2005) who have written on SDMs and BPR as well as BPR and strategy. This research contributes to the SDMs, BPR, strategy and merger research community by applying these concepts to merged South African MHEIs.

4.3 Research Findings

4.3.1 Interview Data

Semi-structured interviews were used to conduct at least two interviews from each MHEI that contributed to this study. The structure of the interview questions allowed the researcher to lead the interview sessions and the interviewees to answer the questions provided in a way that suited their particular settings. The researcher however made sure that the discussions remained focused on the theme of the study. The duration of each one of the interviews was approximately 30 to 45 minutes.

The responses to the interview questions as grouped in 3.6.4 are organised in such a way that they basically address the research questions as follows:

- Interview questions group 1: General questions

A discussion on the interviewee's background; job title, job description and job responsibilities

- Interview questions group 2: BPR and organisational strategy

A discussion on BPR and strategy initiatives and involvement

- Interview questions group 3: SDMs

A discussion on specific or other SDMs being applied in the university to suit the merger business processes

- *Interview questions group 3: SDMs*

A discussion on success or failure factors involved with the SDMs being applied

- *Interview questions group 4: Willingness to adopt SDMs and support to strategy*

A discussion on SDMs support to strategy

- *Interview questions group 4: Willingness to adopt SDMs and support to strategy*

A discussion on readiness to adopt if there are no SDMs or to take up new SDMs to replace current ones

From the responses generated through the interviews, propositions were formulated for each interview following the answers required for the study. A summarised presentation of all the interview propositions is then presented. The propositions from the interviews are supported by a set of propositions from documents with relevant literature on the study. Thereafter a summary of all propositions from both the interviews and documents is presented giving responses according to the groupings formulated from the interview questions shown in the paragraph above. These propositions will assist the study to form a coherent story that will answer the research questions of this study and eventually satisfy the aim and objectives of the study.

4.3.1.1 Interview Responses

4.3.1.1.1 University A - Background Information

University A forms Case A of this study and it consists of two interviewees who will be referred to as interviewee 1 and 2. The propositions for the interviews shall be formulated as of Case A for interviewee 1 and 2, for example; AI1 and AI2

The university was formed as a result of a merger between a former Technikon and two other former independent universities on the 1st January 2005 (Moore 2003). University A consists of a number of faculties and has four campuses in the Gauteng province of South Africa. It also has more than 600 000 square meters of buildings under roof, which includes teaching, research, administration, support, sport, recreational and living space (Hall and Symes 2005). The university was chosen because it is one of the largest academic institutions in South Africa both in size, enrolment and offering. The complexity in size, type and geographical location of the merged campuses' ITC facilities was also found appropriate for investigation. Interviews at this university were held at one of their campuses in

Johannesburg.

4.3.1.1.2 Interviewee 1- Responses to interview questions form group 1 and 2: General questions; BPR and organisational strategy

The interviewee has worked with university A's IT department for approximately 11 years since around the year 2000, before the merger took place. He has been involved in the university's BPR plans to suit the merger for almost 8 years, commencing 2003. The interviewee also has more than 15 years experience in system development of which he already had 4 years system development experience before he joined university A. Currently the interviewee works as the solutions delivery manager, a position which he has been promoted to for 6 years now. The interviewee's job description includes ensuring the provision of solutions to systems and business processes integration for all the university's strategic functions which include finance, human resources, academic and research staff, admissions and the student body; in a nutshell we can say; the whole support and academic staff systems and business processes. The interviewee also oversees the support of daily communications within and outside the organisation through email, as well as overseeing the running of the website, organising backup for university data and collaboration environments, coordinate programming tasks as well as databases, system management and overall collaboration of all programs to accommodate and organise university data. Although interviewee 1 has had hands on involvement with systems development of about 15 years, for the past 6 years has been involved at a higher level where he does more planning than implementation.

4.3.1.1.3 Responses to interview questions from group 3: SDMs

According to Interviewee 1, University A has basically been following the change process with respect to individual processes or projects, where the development team uses tools and an organized collection of techniques to achieve or maintain a particular objective. The interviewee explained that they still basically follow the traditional waterfall model approach where systems are developed according to the phases of the formalised systems development methodology called the Information Systems Development lifecycle (SDLC). The interviewee explained that at the beginning of the merger, (at least the first two years), there was more focus on analysing and aligning common business processes among their merged

campuses, hence it was easier for them to follow the phases of the SDLC. He however also explained that, the merger also saw a lot of expansion, reduction and shift of business processes. This led to the improvements and adjustments of information systems as well as the introduction of a few new ones. The university has applied several SDMs to the improving, adjusting and building of these new systems. Some of the SDMs include agile RUP, which they have considered because they intend to move towards agile system development. He also said that they have applied other SDMs such as PRINCE which they believe is appropriate for their BPR tasks which are tackled as projects. Currently, they are working more on changing the mostly manual business processes such as the movement of documents from one person to the next. They have therefore taken up other necessary SDMs such as ITIL, TOGAF and agile SCRUM. Interviewee 1 pointed out that he is not aware of any specific SDMs meant for BPR projects. Instead they have tuned the usual SDMs that are normally used for new systems to suit their BPR projects.

4.3.1.1.4 Responses to Responses to interview questions from group 3: SDMs

Generally, interviewee 1 is of the sentiments that the use of SDMs has actually brought more benefits than losses to their development endeavours. He says that the order and organisation inherent has made accountability easier. He says using SDMs have allowed their IT department to assign 'process-owners' who are accountable for certain processes, more like owning the process. These individuals are assigned accountability of development and oversee the process to its implementation and maintenance. He also explained that the use of SDMs have helped organise their development processes and give evidence that other users can later on refer to in the form of documentation. Interviewee 1 however raised concern over the fact that most SDMs that they would prefer to use lack when it comes to addressing the soft part of system development. By this he was referring to SDMs phases that emphasise on change management. He said that although most of their development endeavours have been successful through the use of SDMs, the biggest challenge still is getting the users to accept, use and live with the changes.

4.3.1.1.5 Responses to interview questions from group 4: Willingness to adopt SDMs and support to strategy

Interviewee 1 explained that all their BPR plans emanate from the organisational strategy. He however said that the SDMs they have used thus far are not very specific on the consideration of organisational strategy. He said that so far their BPR endeavours have met quite a degree of resistance from some of the stakeholders of their several campuses. Although the formulation of strategy for their university always involves all the university stakeholders, a major problem that still remains is the reluctance to relinquish previous individual identities and adopt new ones. As a manager however, it is his responsibility to ensure that their IT strategies align with the organisational strategy, lest changes to some business processes may go unaccounted for in the project plans.

4.3.1.1.6 Responses to interview questions from group 4: Willingness to adopt SDMs and support to strategy

Interviewee 1 explained that with changing times they would be impelled to replace current SDMs with new ones. He however suggested that it would be more appropriate to replace some obsolete stages within the SDMs in use rather than to completely discard them. He also said that they would prefer to have a framework developed which can assist in guiding them with SDM choices for their different projects. They would be very willing to adapt to SDMs that can assist them to capture important aspects like organisational strategy and cultural and personality diversity. They would also prefer a developed framework that would outline the minimum required steps for any project, is cost effective and mostly importantly capture the human element into the system. They also believe that if SDMs had narrower and specific phases it would be easier to communicate with users, to share work and enhance communication between developers. Interviewee 1 also said that the best SDM that they would prefer would of course be the one that puts more emphasis on organisational strategy in all its phases. The SDM should capture the vision and mission of the organisation at all levels.

4.3.1.2 Propositions for interviewee 1

In this section propositions about what is currently being done in university A with regards to SDMs, BPR and strategy are formulated. These propositions are formulated as a way of

generating theory about what is happening regarding SDMs in universities by using only the information gained from the interviewee 1.

4.3.1.2.1 Proposition 1

Developments still basically follow the traditional waterfall model approach where systems are developed according to the phases of the formalised systems development methodology which is the Information Systems Development lifecycle (SDLC). [AII]

4.3.1.2.2 Proposition 2

Several SDMs have been applied to the improving, adjusting and building of new systems for the mergers. These include agile RUP, PRINCE ITIL, TOGAF and agile SRUM. [AII]

4.3.1.2.3 Proposition 3

There is unawareness of any specific SDMs meant for BPR; instead they have tuned the usual SDMs that are normally used for new systems to suit their BPR projects. [AII]

4.3.1.2.4 Proposition 4

SDMs are very beneficial to system development. [AII]

4.3.1.2.5 Proposition 5

SDMs do not adequately address the incorporation of strategy organisational strategy within their phases. [AII]

4.3.1.2.6 Proposition 6

There is willingness to adopt new SDMs that can assist them to capture important aspects like organisational strategy as well as cultural and personality diversity [AII]

4.3.1.2.7 Proposition 7

SDMs should capture the vision and mission at all levels [AII]

4.3.1.2.8 Proposition 8

SDMs phases should be narrower and phases should be specific [AII]

4.3.1.2.9 Proposition 9

SDMs should replace obsolete stages [AII]

4.3.1.2.10 Proposition 10

SDMs should capture the softer side of development that involves change management [AII]

4.3.1.2.11 Proposition 11

The best SDM would be the one that captures and puts more emphasis on organisational strategy in all its phases [AII]

4.3.1.3 Interviewee 2 - Responses to interview questions from group 1 and 2: General questions; BPR and organisational strategy

Interviewee 2 works as a system and web developer in the ICT department for university A. He has worked in this position for almost 6 years since 2005. He is involved with development of the university's website as well as other Information Systems. On a daily basis he performs all steps to programming including designing algorithms for programs and coding. Interviewee 2 is not directly involved with issues of strategy but understands organisational strategy is always considered first in their organisation whenever new developments are being introduced. He has been involved with BPR initiatives through the developing of a new integrated website that captures all the campuses of the universities as well as the development of other new systems introduced as a result of the merger. He strongly believes that the BPR initiatives that took place as a result of the merger had a strong impact on the strategy. Although he is not directly involved with issues of strategy he knows their organisational strategy has had to be also revisited and reengineered.

4.3.1.3.1 Responses to interview questions from group 3: SDMs

Interviewee 2 explained that he does not have a strong background with regards to SDMs but said he was more aware of the development languages used by the university such as those supported by the .Net framework which include Java and C#. He explained that although he knew little about SDMs, he also understands that the choice of the development language was dependant on the SDM that is being used. He said that development of systems in their university follow particular phases and uses certain tools and techniques which he also understands are a part of SDMs. He also explained all their staff members involved with system development have undergone training along the lines of SDMs in ITIL and TOGAF which they have already started applying for their development practices.

4.3.1.3.2 Responses to interview questions from group 3: SDMs

The interviewee said that so far they have enjoyed almost 85% success rates in system development through the tools and techniques they have applied. As explained earlier, he understands that these tools and techniques are dependent on SDMs. Interviewee 2 mentioned that as a developer he is "happy" with the way that the systems are being developed so he

believes that the SDMs they are currently applying are effective. Interviewee 2 also mentioned that as a challenge he believes that there is still need to bridge the gap between developers and users or stakeholders. He said that if SDMs could be applied to suit this challenge it would be beneficial to the system development industry.

4.3.1.3.3 Responses to interview questions from group 4: Willingness to adopt SDMs and support to strategy

Interviewee 2 explained that as the IT department, they have their own goals and objectives which are always entwined in their development plans. He explained that he is not directly involved with issues of organisational strategy but he understands that the department's goals and objectives emanate from the overall organisational strategy. He thereafter explained that he believes that their goals and objectives are ultimately aligned to the overall organisational ones. He was however not very clear whether the organisational strategy is entwined in the SDMs being employed in their university. He however suggested that if SDMs could involve the organisational strategy requirements would be clearer across the board, from top management to end users.

4.3.1.3.4 Responses to interview questions from group 4: Willingness to adopt SDMs and support to strategy

Interviewee 2 said that as explained earlier, he believes that all the decisions were informed by the overall strategy of the organisation. Having to change the current SDMs would mean to get buy-in from the rest of the stakeholders. He raised concern over the cumbersomeness of this process. He however explained that as IT people change for them is inevitable and is always accommodated.

4.3.1.4 Propositions for interviewee 2

In this section propositions about what is currently being done in university A with regards to SDMs, BPR and strategy are formulated. These propositions are formulated as a way of generating theory about what is happening regarding SDMs in universities by using only the information gained from the interviewee 2.

4.3.1.4.1 Proposition 1

Developers know little about SDMs, they are more knowledgeable about development languages [AI2]

4.3.1.4.2 Proposition 2

Developers are undergoing through training for SDMs such as ITIL and TOGAF. [AI2]

4.3.1.4.3 Proposition 3

They have enjoyed almost 85% success rates through the use of SDMs, therefore SDMs are effective and they are happy to use them. [AI2]

4.3.1.4.4 Proposition 4

Developers are not directly involved with issues of strategy, but understand that the IT department strategy is part of the organisational strategy and should be prioritised in their development tasks. [AI2]

4.3.1.4.5 Proposition 5

There is willingness to adopt new SDMs. [AI2]

4.3.1.5 University B - Background Information

University B forms Case B of this study and it consists of two interviewees who will be referred to as interviewee 3 and 4. The propositions for the interviews shall be formulated as of Case B for interviewee 1 and 2, for example; B11 and B12.

University B was formed as a result of a merger between a former distance education university and a Technikon on the 1st of January 2004. It also incorporated the distance education component from another university on the 2nd January of 2004. The merger consolidated knowledge bases built up over previous years and brought together vast resources and infrastructure from the three former individual institutions. The structure of the academic units within the new university B was approved on the 5th of January 2004 resulting in the creation of five new colleges. University B is the largest university in South Africa and is one of the five mega distance learning university in the world. The university has a student headcount (formal and non-formal) of over 310 000 students represented in all provinces of South Africa and also includes African and international students in 130 countries worldwide. It is a dedicated open distance learning institution (ODL) that gives students flexibility and choice over what, when, where and how they learn. These characteristic of the university provides them with extensive student support. The university was targeted for this research

because of its uniquely complex of academic offering in distance learning. Interviews with this university were held at one of its campuses in the Gauteng province of South Africa.

4.3.1.5.1 Interviewee 3 - Responses to interview questions from group 1 and 2: General questions; BPR and organisational strategy

Interviewee 3 works as the executive director of ICT for university B. She has held this post for almost 4 years since 2008. She has been working with the university's ICT department for almost 7 years since 2004. She joined the university as a deputy director. Before being employed at university B, interviewee 3 worked for 5 years as an IT manager for a well renowned company in South Africa from 1998 to 2003. Overall interviewee 3 has had close to 19 years experience of work in system development and BPR since her completion of tertiary education in 1991. Interviewee 3 is in charge of university B's ICT department and oversees the smooth running of the whole ICT sector for the university. She ensures the provision of a centrally co-coordinated ICT solution, through business-aligned ICT services and infrastructures among their disparate campuses. She is also responsible for the support of the university's core business needs and enhancement of competitive advantage in accordance with the mission, vision and strategic objectives. On a daily basis she liaises with divisional managers within the IT departments well as other functional managers outside the IT department on projects being done and to be done. She also gives feedback to and delivers feedback from the universities top management.

4.3.1.5.2 Responses to interview questions from group 3: SDMs

Interviewee 3 explained that university B already had a devised SDM developed in-house by their ICT development team since the 1980s. This SDM was officially commissioned around 1991. The university however follow steps from other commercial SDMs such as the traditional SDLC. She explained that they find the SDLC a bit inflexible for them as it requires following development in a structured approach. For university B, the idea of merging geographically dispersed institutions started as early as 1946. This was way before the government's initiative of merging South African universities. The need to accommodate their several geographically located campuses motivated the development of their own SDM. The idea was to cut the system development time and save costs. According to interviewee 3 their SDM combines the traditional waterfall and prototyping development approaches

besides the structured approach. University B's SDM contains a series of checklists of activities that a development team should adhere to as well as a suggested set of tools and techniques and possible guidelines for a particular project.

While their own in-house SDM remains substantive they have also done a lot of work to improve it in line with current technological times and the merger initiative. Through consultancy and collaboration with other international system development groups they have incorporated SDMs such as agile RUP and XP. They are also looking at other development approaches that are not so structured like RAD and more flexible techniques such as JAD.

4.3.1.5.3 Responses to interview questions from group 3: SDMs

Interviewee 3 said their current in-house SDM remains very effective for them because they are familiar with it and they understand it better. They are able to flexibly tune the SDM to suit any BPR initiatives or project every now and then. With the introduction of new business processes through the merger, the new SDMs have also come in handy to assist with successful development. They have managed to capture a number of issues of concern such as customer relationships and the flexibility in adoption to changing user requirements. Major challenges have been factors such as the inability of these SDMs to capture the change management.

4.3.1.5.4 Responses to interview questions from group 4: Willingness to adopt SDMs and support to strategy

As the IT executive director in university B, interviewee 3 explained that it is of importance that whatever decisions they make in their department incorporate the organisational strategy. She explained that the absence of a relationship between SDMs and strategy for them indicates that there is no thorough planning of BPR projects. She also explained that for them the scope of their BPR projects is very wide and includes many business processes. It is therefore expected that there is a corresponding increase in implementation problems. It would then be appropriate to ensure that goals and objectives of the organisation are included in the BPR plan. Intuitively interviewee 3 believes that the more thorough the BPR project plans are the lower the extent to which implementation problems will occur and the greater the likelihood that projects will succeed. This also guarantees the accomplishment of the

organisational goals and objectives. Their own in-house SDM put strong emphasis on organisational strategy.

4.3.1.5.5 Responses to interview questions from group 4: Willingness to adopt SDMs and support to strategy

Interviewee 3 explained that the difficult task they face as practitioners in IT is to choose appropriate SDMs. They struggle to choose SDMs that allow the development of adaptive software products and capture beliefs, culture and the human varying nature. She said that their university enjoys being diverse and therefore the idea of taking up new SDMs is a welcome gesture for them. They would readily embrace SDMs that would assist them to capture the aspect of cultural diversity. She also explained that adopting new SDMs is not new to them. She however raised concern over how cumbersome this initiative can be since their information systems are extremely massive and disparate.

4.3.1.6 Propositions for interviewee 3

In this section propositions about what is currently being done in university B with regards to SDMs, BPR and strategy are formulated. These propositions are formulated as a way of generating theory about what is happening regarding SDMs in universities by using only the information gained from the interviewee 3.

4.3.1.6.1 Proposition 1

They make use of an in-house SDM which has been in use for several years since the 90s. The SDM involves the use of phases derived from traditional SDM techniques such as the waterfall and prototyping models. [BII]

4.3.1.6.2 Proposition 2

The in-house SDM has undergone major changes to suit current technological times and the merger initiatives. The IT staff members have also gone through a lot of training through consultancy and workshops that involve other international groups. [BII]

4.3.1.6.3 Proposition 3

Through consultancy and collaboration with other international system development groups they also make use of SDMs such as agile RUP and XP. They are also looking at other development approaches that are not so structured like RAD and JAD. [BII]

4.3.1.6.4 Proposition 4

The current in-house SDM remains very effective because the procedures are familiar and it's well understood. It can be flexibly tuned to suit any BPR initiatives or project. [BII]

4.3.1.6.5 Proposition 5

The scope of mergers includes many business processes and therefore there is a corresponding increase in implementation problems. Their own in-house SDM put strong emphasis on organisational strategy. [BII]

4.3.1.6.6 Proposition 6

They struggle to choose SDMs that capture beliefs, culture and the human varying nature, but they are willing to adopt new ones. [BII]

4.3.1.7 Interviewee 4 - Responses to interview questions from group 1 and 2: General questions; BPR and organisational strategy

Interviewee 4 works as a system integrator for university B. She is responsible for overseeing the progress in the development of the university's systems. She ensures that the systems being developed focus on the requirements identified, monitors implementation, as well as the review and maintenance of the universities systems. She also ensures proper integration among the developed systems to ensure that business processes are well coordinated. She oversees information flow among the systems from one department or function to another. Her main responsibilities can be ascribed to usability and user acceptance monitoring. Interviewee 4 has worked with university B's IT department for 8 years since 2003. She started as a senior developer until recently in October 2011 when she was promoted to her current position. She has been involved with system development for these 8 years and with BPR initiatives for about 5 years.

4.3.1.7.1 Responses to interview questions from group 3: SDMs

Interviewee 4 explained that their university has been fortunate to have an in-house SDM which has remained substantive for several years since the 90s. Their SDM involves the use of phases derived from traditional SDM techniques such as the waterfall and prototyping models. She also emphasised that recently their SDM has undergone major changes and scrutiny in an attempt to revamp it to suit current technological times and the merger initiatives. As staff members they have also recently gone through a lot of training through

consultancy and projects that involve other international groups. They have managed to incorporate the use of other more recent SDMs such as agile RUP and XP. Their development approaches are now less structured and make use of techniques such as rapid application development (RAD) and joint application development (JAD).

4.3.1.7.2 Responses to interview questions from group 3: SDMs

The major advantages that their university's IT department have enjoyed include the fact that SDMs have worked as a way to control development and to formalise their work. As a system integrator SDMs have assisted her to orderly trace back accountability for each business process where necessary especially through the use of documentation. She explained that the procedural nature of SDMs assists to solve problems of duplication, fragmentation and lack of access to information among departments of the university. She also said that their university has not introduced new SDMs for BPR or the merger initiatives as such but they have made available SDMs to suit their BPR endeavours. The major challenge with this however has been the inability within these SDMs to distinguish between new system development tasks and reengineering tasks.

4.3.1.7.3 Responses to interview questions from group 4: Willingness to adopt SDMs and support to strategy

Interviewee 4 explained that she is not directly involved with issues of strategy as such but she understands that their departmental strategy emanates from the university's strategy. She explained that from her experience she has not come across SDMs that directly emphasise on issues of strategy. She understands that most SDMs especially the ones that they have used are more enlightened towards developing systems that work and then maybe the organisation may have to tune the SDMs to suit their strategy. She however also explained that suppose there were SDMs that focus on organisational strategies it would give development a more narrowed focus.

4.3.1.7.4 Responses to interview questions from group 4: Willingness to adopt SDMs and support to strategy

Interviewee 4 expressed that as IT people they are always ready to embrace any recipe that would make their tedious work easier in any way. She said that the introduction of new

SDMs is not unusual to them. They are willing to take up any SDM that will give them direction of where their organisation intends to head.

4.3.1.8 Propositions for interviewee 4

In this section propositions about what is currently being done in university B with regards to SDMs, BPR and strategy are formulated. These propositions are formulated as a way of generating theory about what is happening regarding SDMs in universities by using only the information gained from the interviewee 4

4.3.1.8.1 Proposition 1

They make use of other newer SDMs such as agile RUP and XP. Their development approaches are now less structured and make use of techniques such as RAD and JAD.

[BI2]

4.3.1.8.2 Proposition 2

Their SDM involves the use of phases derived from traditional SDM techniques such as the waterfall and prototyping models.

[BI2]

4.3.1.8.3 Proposition 3

SDMs have benefited them in several ways which include formalising their work, trace accountability for each business process where necessary especially through the use of documentation. The procedural nature of SDMs assists to solve problems of duplication, fragmentation.

[BI2]

4.3.1.8.4 Proposition 4

One of the major challenges experienced with SDMs has been the inability to distinguish between new system development tasks and reengineering tasks.

[BI2]

4.3.1.8.5 Proposition 5

No new SDMs were introduced for BPR as a result of the merger; they have made available SDMs to suit their BPR endeavours.

[BI2]

4.3.1.8.6 Proposition 6

From experience they have not yet used any SDMs that directly emphasise organisational strategy. Most SDMs especially are more enlightened towards developing systems that work and then organisations have to tune the SDMs to suit their strategy.

[BI2]

4.3.1.8.7 Proposition 7

SDMs that focus on organisational strategies will give development a more narrowed focus.

[BI2]

4.3.1.8.8 Proposition 8

IT people they are always ready to embrace any recipe that would make their tedious work easier in any way. Introduction of new SDMs is not unusual to them. There is willingness to take up any SDM that will give direction of where their organisation intends to head. [BI2]

4.3.1.9 University C - Background Information

University C forms Case C of this study and it consists of one interviewee who will be referred to as interviewee 5. The propositions for the interview shall be formulated as of Case C for interviewee 1, for example; CII.

University C was established as a result of the merger between three former technikons. It was promulgated in January 2004. Its merger created a mega technikon university with a student enrolment of about sixty thousand, six operating sites in the same province as well as three distant sites in other South African province. Given the size and the complexity of their new university one of the immediate challenges was to ensure that the core business of the institution was running effectively and efficiently. University C is one of the smaller universities in South Africa but unique in the fact that it remains a Technikon. The interview with university C was held at one of its campuses in the Gauteng province.

4.3.1.9.1 Interviewee 5 - Responses to interview questions from group 1 and 2: General questions; BPR and organisational strategy

Interviewee 5 works as a system developer for university C, a position which he has held for approximately two years now. He has been involved in system development for the duration of his current position at university C which is 2 years, since 2009. Interviewee 5 is involved with the development of university C's systems. On a daily basis he is responsible for programming with high level languages and developing databases using SQL. Interviewee 5 has been involved with BPR and merger initiatives at implementation level since 2009.

4.3.1.9.2 Responses to interview questions from group 3: SDMs

Interviewee 5 explained that in their organisation the use of SDMs is not mandatory but is encouraged. Normally they work with a series of steps based on reviewed past experiences and extractions from known existing SDMs including the SDLC. They then come up with a

set of activities that seem most appropriate for their development environment at that particular time. Interviewee 5 said that they tackle their BPR tasks as projects and the use of specific SDMs for each project team is considered marginal. He explained that SDMs adapted for any project have specific applications as the driving force behind them. Interviewee 5 indicated that SDMs remain a general framework which includes a series of steps or phases as well as various tools and techniques. It is up to a project team which tools and which techniques they would want to make use of. He explained that based on SDMs background that he has, he is certain that some of the phases, tools and techniques are also derived from latest versions of SDMs such as ITIL, PRINCE and SCRUM.

4.3.1.9.3 Responses to interview questions from group 3: SDMs

The major problem they experience with their system development approaches is that they capture what works at that particular time and ignore the bigger picture. Most of the time SDMs are not understood by developers and they are used “in spirit” and not as an effective tool to system development. Projects meant to address the same goal are approached differently and this causes confusion when trying to collaborate processes. The major benefit however is that their particular approach to SDMs is flexible to suit each particular project. Interviewee 5 also explained that the projects which they have made use of SDMs have been much easier to develop in terms of time, order and cost than the ones without.

4.3.1.9.4 Responses to interview questions from group 4: Willingness to adopt SDMs and support to strategy

Interviewee 5 explained that organisational strategic issues concern top management in their organisation. At their level they solve IT problems as they are reported per division or per process. He explained that ICT decisions for the university lie with the ICT department. He is not sure whether strategy is captured within the SDMs they employ or how it is incorporated. He however added that he believes organisational strategy is important and should be part of system development. He believes this is important because the systems they develop capture the universities strategic functions.

4.3.1.9.5 Responses to interview questions from group 4: Willingness to adopt SDMs and support to strategy

Interviewee 5 explained that they are always willing to take up new ways of developing as long as they make their work easier. He however explained that change in organisations mostly works if the top management hold the reigns and takes everyone else on board. He explained that it should not only be viewed as an ICT issue only or top management initiative only. If approached this way then the change may totally fail to address the organisation as a whole and acceptance from other users becomes difficult. Most of the time ICT develop systems for the university and they also have to run these systems for the different users. The interviewee emphasised that they are willing to adopt specific SDMs that will allow uniformity of their processes and that will allow important goals and objectives of the whole university to be captured.

4.3.1.10 Propositions for interviewee 5

In this section propositions about what is currently being done in university C with regards to SDMs, BPR and strategy are formulated. These propositions are formulated as a way of generating theory about what is happening regarding SDMs in universities by using only the information gained from the interviewee 5.

4.3.1.10.1 Proposition 1

The use of SDMs is not mandatory but is encouraged. They use a series of steps based on reviewed past experiences and extractions from known existing SDMs including the SDLC to come up with a set of activities that seem most appropriate development. [CII]

4.3.1.10.2 Proposition 2

SDMs are a general framework with a series of phases and various tools and techniques where they choose which tools and which techniques they would want to make use of. Some of the phases, tools and techniques are also derived from latest types of SDMs such as ITIL, PRINCE and SCRUM. [CII]

4.3.1.10.3 Proposition 3

Major problems with their SDMs framework have been that it captures what works at that particular time and ignore the bigger picture. Most of the time SDMs are not understood by developers and they are used “in spirit” and not as an effective tool to system development.

Projects meant to address the same goal are approached differently and this causes confusion when trying to collaborate processes. [CII]

4.3.1.10.4 Proposition 4

Developers view organisational strategic issues as a concern of top management. They are not sure whether strategy is captured within the SDMs they employ or how it is incorporated, but they believe organisational strategy is important and should be part of system development. [CII]

4.3.1.10.5 Proposition 5

There is willingness to adopt specific SDMs that will allow uniformity of their processes and capture important goals and objectives and make their work easier. Change in organisations mostly work if the top management hold the reigns and takes everyone else on board. [CII]

4.3.1.11 University D - Background Information

University D forms Case D of this study and it consists of three interviewees who will be referred to as interviewee 6, 7 and 8. The propositions for the interviews shall be formulated as of Case D for interviewees 1, 2 and 3, for example; DI1, DI2 and DI3.

University D came into being on 1 January 2004 through the merger of two universities with extremely diverse histories, personalities and cultures. The staff and students of another university were also incorporated, adding further to the richness of the university's heritage. The university is a multi-campus institution with campuses spread across two provinces. Unlike the decentralising approach that other universities have undertaken the IT department for university D is situated at a different site away from all of its campuses. Interviews with this university were held at this IT centre.

4.3.1.11.1 Interviewee 6 - Responses to interview questions from group 1 and 2: General questions; BPR and organisational strategy

Interviewee 6 currently works as the manager of business systems at university D a position which she has held about a month since 1 Nov 2011. She has worked with university D's IT department for approximately 15 years since around the year 1996 before the merger initiative which gave the university its current status. The interviewee has about 15 years experience in system development of which for the past 14 years she was mainly involved

with programming and business analysis. Interviewee 6 is responsible for overseeing all the business systems for university D. The business systems include all of the universities payroll, finance, human resources as well as all support systems. She is responsible for overseeing the development of new systems including implementing and maintaining them. She also oversees the upgrade of business systems, system management and collaboration of all business processes of university's campuses. She explained that all their initiatives lead to the reengineering of business processes as well as creation of new business processes. Currently she is involved in planning BPR initiatives for workflows. The interviewee has about 5 years involvement with BPR/merger since 2006 but at a higher level which involves more planning than implementation. With the coming of the merger, the universities BPR initiatives have mostly been the aligning of business processes among the campuses.

4.3.1.11.2 Responses to interview questions from group 3: SDMs

Interviewee 6 said that their university had always been involved with SDMs such as RUP and had been following the waterfall model even before the merger. She explained that the waterfall model has since fallen out of use with the changing technological demands. Since the merger, they have taken on new development approaches involving other international development groups. This has allowed them to move towards the more agile RUP and SCRUM though they still basically follow the traditional SDLC steps. Interviewee 6 also explained that they follow the structured approach and other SDMs such as ITIL for problem identification and management. They also use PRINCE since most of their development tasks are approached as projects. Currently they have also introduced the use of CRM for customer relations management.

4.3.1.11.3 Responses to interview questions from group 3: SDMs

The biggest success that interviewee 6 mentioned from the use of SDMs is that they have managed to implement systems that work. SDMs have helped them to organise their work and trace accountability. The weaknesses they have encountered in applying the use of SDMs include the fact they try to follow each step of the SDMs they use. In trying to do so they normally run out of time and the development team ends up doing what works first disregarding their usual structured approach.

4.3.1.11.4 Responses to interview questions from group 4: Willingness to adopt SDMs and support to strategy

Interviewee 6 said that some of the SDMs they prefer to use are good at capturing workable technological features, but they mostly miss addressing the aspect of organisational strategy. In most cases this means top management involvement maybe left out as well. She believes that top management involvement in any organisational task usually means influence on the attitudes of the people, therefore change is easily accepted. The other challenge that she mentioned was the fact that with the merger, a lot of business processes were affected, therefore if organisational strategy is not captured BPR becomes an overwhelming procedure without good direction.

4.3.1.11.5 Responses to interview questions from group 4: Willingness to adopt SDMs and support to strategy

Interviewee 6 explained that University D has always been willing to adapt to changes, be it technological or otherwise. This she said is an initiative that luckily with their university is derived from their top management. She also explained that in ICT change is inevitable and they are always willing and try to keep abreast with it. Willingness to take up new SDMs is a welcome initiative for them. Currently they are in need of SDMs that will assist them to capture the human element that addresses change management, cultural mindset, attitudes as well as customer relations management.

4.3.1.12 Propositions for interviewee 6

In this section propositions about what is currently being done in university C with regards to SDMs, BPR and strategy are formulated. These propositions are formulated as a way of generating theory about what is happening regarding SDMs in universities by using only the information gained from the interviewee 6

4.3.1.12.1 Proposition 1

They have always been involved with SDMs such as RUP and had been following the waterfall model. They have recently moved towards the more agile RUP and SCRUM though still basically following the traditional SDLC steps and other SDMs such as ITIL and PRINCE and currently they have introduced CRM. [DII]

4.3.1.12.2 Proposition 2

Through the use of SDMs they have managed to implement systems that work as well organise their work and trace accountability. [DII]

4.3.1.12.3 Proposition 3

In trying to follow each step of the SDMs time normally runs out and the development team ends up doing what works first disregarding the SDM's normal steps. [DII]

4.3.1.12.4 Proposition 4

SDMs are good at capturing workable technological features, but miss addressing the aspect of organisational strategy. [DII]

4.3.1.12.5 Proposition 5

If organisational strategy is not captured, it is difficult to influence people's attitudes and to get good direction in tackling diverse and a large number of business processes. [DII]

4.3.1.12.6 Proposition 6

There is willingness to adopt new SDMs that will assist to capture the human element that addresses change management, cultural mindset, attitudes as well as customer relations management. [DII]

4.3.1.13 Interviewee 7 - Responses to interview questions from group 1 and 2: General questions; BPR and organisational strategy

Interviewee 7 works as a senior system analyst for university D. Besides being an analyst he is also involved in hands on website and system development for university D. He mainly oversees the proper running of business processes for the university, follows up any defects and picks up new requirements and identifies areas of improvement. Interviewee 7 has been working with university D for almost 4 years now. For the purposes of the merger, he has been overseeing BPR activities involving the human resources, the student system and finance.

4.3.1.13.1 Responses to interview questions from group 3: SDMs

Interviewee 7 was not well versed with the issue of SDMs from the theoretical point of view. He explained that they however follow an organised and well laid out approach to system development. This he understands is a system development approach although he may not know the exact names these approaches are identified with. He explained that all staff

members involved with system development in their organisation have recently and are currently undergoing training with regards to system development approaches. They have been involved with training for ITIL, and attended workshops on implementation of other SDMs such as agile RUP, SCRUM and CRM.

4.3.1.13.2 Responses to interview questions from group 3: SDMs

Interviewee 7 explained that the use of SDMs has been beneficial for them especially because they are currently faced with staff shortages. The orderly nature of SDMs makes it easier for them to approach their development tasks in an organised way to the extent they less burdened with random tasks.

4.3.1.13.3 Responses to interview questions from group 4: Willingness to adopt SDMs and support to strategy

Interviewee 7 explained that he believes that the organisational strategy should be part of any development endeavour. According to interviewee 7 in their organisation strategy always takes precedence over personal or campus preferences. He also explained that in their university issues of strategy remain a top management task. However the development of strategy in their organisation is an undertaking that involves other functions of the organisation and which all the stakeholders are kept posted. He explained that if strategy can be captured in SDMs this would mean that for their organisations their needs as a whole are captured. He also said that so far none of the SDMs he has encountered have clearly emphasised the use of organisational strategy. He further suggested that if such SDMs can be identified it would make development phases easier and especially requirements analysis.

4.3.1.13.4 Responses to interview questions from group 4: Willingness to adopt SDMs and support to strategy

Interview 7 said that as already explained in the previous question they look forward to SDMs that emphasise more strategy. He explained that their organisation is always looking forward to innovative solutions to system development. He also emphasised one of the elements that drive their university is innovativeness, this may only be fulfilled through taking up new approaches to system development.

4.3.1.14 Propositions for interviewee 7

In this section propositions about what is currently being done in university D with regards to SDMs, BPR and strategy are formulated. These propositions are formulated as a way of generating theory about what is happening regarding SDMs in universities by using only the information gained from the interviewee 7.

4.3.1.14.1 Proposition 1

Developers are not well versed with the issue of SDMs from the theoretical point of view. They know how to follow an organised and well laid out approach to system development.

[DI2]

4.3.1.14.2 Proposition 2

Developers have undergone through a lot of training for ITIL, and attended workshops on implementation of other SDMs such as agile RUP, SCRUM and CRM. [DI2]

4.3.1.14.3 Proposition 3

SDMs make it easier to approach development tasks in an organised way. [DI2]

4.3.1.14.4 Proposition 4

Strategy always takes precedence over personal or campus preferences and issues of strategy remain a top management task. If strategy is captured in SDMs it would mean that all organisations' needs are captured. So far none of the SDMs clearly emphasise on the use of organisational strategy. [DI2]

4.3.1.14.5 Proposition 5

There is willingness to adopt new SDMs [DI2]

4.3.1.15 Interviewee 8 - Responses to interview questions from group 1 and 2: General questions; BPR and organisational strategy

Interviewee 8 works as a system integrator for university D a position which he has held for 3 years now. Interviewee 8 is responsible for overseeing the proper functioning of introduced systems and alignment of business processes across campuses. So far his team has successfully managed to integrate the university's human resources and financial business processes. He is currently involved in integrating the student registration processes across all their campuses. Interviewee 8 has been involved with BPR and system development for 3 years.

4.3.1.15.1 Responses to interview questions from group 3: SDMs

Interviewee 8 explained that their university tries to keep abreast with the latest when it comes to information technology. He said that the university is currently working with the latest possible SDMs which include the use of agile SDMs. Their university has received a lot of assistance from outside consultancy and international system development groups. They have recently undergone training and are currently employing SDMs such as agile RUP, SCRUM and ITIL. They are also looking at employing other SDMs such as CRM and TOGAF.

4.3.1.15.2 Responses to interview questions from group 3: SDMs

Interviewee 8 explained that they have enjoyed successful system development through the use of SDMs. SDMs have assisted them to organise and formalise their development tasks as well as to create a clear traceable record. He said that the use of SDMs gives them a correct formula of solving development problems. He also raised concern that sometimes the use of SDMs makes the development process cumbersome because of all the steps that need to be followed. He explained that he believes that some of the steps that they follow can be done without.

4.3.1.15.3 Responses to interview questions from group 4: Willingness to adopt SDMs and support to strategy

Interviewee 8 explained he understands that their departmental strategy emanates from the university's strategy. Their departmental strategy is always a priority in their development tasks therefore the organisational strategy is also captured in their system. He explained that their organisation has introduced several new SDMs and from his observation none of these SDMs directly address issues of strategy. He said that he believes that organisational strategy is a crucial issue for any existent organisation. He said that it should therefore be seriously considered a requirement in SDMs so that organisations will have proper direction on how to incorporate it in system development. Currently several organisations including theirs incorporate strategy, but it is common that using the SDM they all apply strategy from different angles because the exact formula is not specified in the SDM.

4.3.1.15.4 Responses to interview questions from group 4: Willingness to adopt SDMs and support to strategy

As explained earlier interviewee 8 said that in their organisation the introduction of new SDMs has become a tradition to them. The main reason for this is because their organisation tries to find new approaches of addressing new technological developments and solving new problems. He said that they are yet to identify SDMs that are directly related to solving BPR problem because the existent ones address new developments.

4.3.1.16 Propositions for interviewee 8

In this section propositions about what is currently being done in university D with regards to SDMs, BPR and strategy are formulated. These propositions are formulated as a way of generating theory about what is happening regarding SDMs in universities by using only the information gained from the interviewee 8.

4.3.1.16.1 Proposition 1

The university is working with the latest possible SDMs which include agile SDMs.

4.3.1.16.2 Proposition 2

There is a lot of assistance from outside consultancy and international system development groups. There has been training and employing of SDMs such as agile RUP, SCRUM, ITIL, CRM and TOGAF. [DI3]

4.3.1.16.3 Proposition 3

University has enjoyed successful system development through the use of SDMs. SDMs have assisted to organise and formalise development tasks and create clear traceable records. SDMs make it easier to approach development tasks in an organised way. [DI3]

4.3.1.16.4 Proposition 4

The several SDMs do not directly address issues of strategy. [DI3]

4.3.1.16.5 Proposition 5

The university is yet to identify SDMs that directly solve BPR problem because the existent ones address new developments. [DI3]

4.3.1.17 Revised Interview Propositions

In this section the interview propositions are combined to formulate similar patterns among the responses from the different MHEIs interviewed. These propositions are formulated as a

way of generating theory about SDMs being applied in MHEIs for BPR by using only the information gained from the interviews.

4.3.1.17.1 Revised Proposition 1

Universities' IT personnel in top management are generally more positive and knowledgeable and experienced in systems development methodologies and they are more involved with BPR than developers. [A11, B11, D11]

4.3.1.17.2 Revised Proposition 2

Universities still basically follow the traditional waterfall model approach where systems are developed according to the phases of the formalised systems development methodology called the Information Systems Development lifecycle (SDLC). [A11, B11, B12, D11, D12]

4.3.1.17.3 Revised Proposition 3

Universities have developed a framework of tools and an organised collection of techniques from different types of SDMs where developers can pick and choose from for different development projects and some still require a workable framework. [A11, B11, B12, C11]

4.3.1.17.4 Revised Proposition 4

Universities IT departments took up the use of newer SDMs to try and address the changed and more complicated IT environments and businesses processes brought through the merger. SDMs being used include:

agile RUP - [A11, B11, B12, D11, D12, D13]

agile SRUM - [A11, B12, D11, D12, D13]

PRINCE - [A11, C11, D11]

ITIL - [A11, A12, C11, D11, D12, D13]

TOGAF - [A11, A12, D13]

CRM - [D11, D12, D13]

XP - [B11, B12]

JAD - [B11, B12]

RAD - [B11, B12]

4.3.1.17.5 Revised Proposition 5

Developers do not have a strong theoretical background with regards to SDMs – [A12, C11, D12, and D13]

4.3.1.17.6 Revised Proposition 6

Choice of the development language is mainly dependant on the SDM that is being used. [A12, C11]

4.3.1.17.7 Revised Propositions 7

Universities perceive SDMs as beneficial in the following ways

- formalising development [BI2, DI2]
- trace accountability [AII, BI2, and DII]
- provide evidence through documentation, eliminate duplication, avoid fragmentation and develop systems that work [AII, BI2, and DI2]

4.3.1.17.8 Revised Propositions 8

Developers are happy with the way that the systems are being developed and believe that SDMs are effective and develop systems that work [AII, AI2, CII, DII, DI2, and DI3]

4.3.1.17.9 Revised Propositions 9

Universities still face a challenge that available SDMs still do not bridge the gap between developers and users or stakeholders as well as capture change management. [AII, AI2, BII, CII, DII, DI2, DI3]

4.3.1.17.10 Revised Propositions 10

Existent SDMs carry very little or no emphasis on the implementation of strategy, they should capture the vision and the mission at all levels [BII, BI2, CII, DII, DI2, DI3]

4.3.1.17.11 Revised Propositions 11

IT managers perceive SDMs support for organisational strategy to be significantly more important than system developers [AII, BII, and DII]

4.3.1.17.12 Revised Propositions 12

Developers believe in the consideration of organisational strategy although they are not directly involved in strategic issues [AI2, BI2, CII, DI2, and DI3]

4.3.1.17.13 Revised Proposition 13

No specific SDMs were identified for BPR. [AII, BI2, DII, DI2, DI3]

4.3.1.17.14 Revised Proposition 14

IT personnel perceive that the majority of the stakeholders do not understand the link between the new business processes and the organisational strategy therefore they are not ready to accept change [AII, AI2, CII, DI2, and DI3]

4.3.1.17.15 Revised Proposition 15

Universities are willing to adopt new SDMs [AII, AI2, BII, BI2, CII, DII, DI2, and DI3]

4.3.1.17.16 Proposition 16

There is willingness to adopt new SDMs that can assist them to capture important aspects like organisational strategy as well as cultural and personality diversity [AII, AI2, BII, BI2, CII, DII, DI2, and DI3]

4.3.1.17.17 Proposition 17

SDMs should capture the softer side of development that involves change management [AII, DII, DI2, and DI3]

4.3.1.17.18 Proposition 18

The best SDM would be the one that captures and puts more emphasis on organisational strategy in all its phases [AII, AI2, BII, BI2, CII, DII, DI2, and DI3]

4.3.2 Documents

A second data collection method was used in this study to supplement the interviews in highlighting SDMs, strategy and BPR issues surrounding South African MHEIs. This included a review of secondary data in the form of acquired documents that include research reports and journal articles in education. With regards to this method the researcher was not very successful in obtaining specific documents that address ICT departmental issues in light of SDMs for BPR or effects on strategy. The researcher however managed to obtain documentation on ICT developments in MHEIs that are relevant to this study especially at addressing universities' BPR initiatives.

4.3.2.1 Document 1

4.3.2.1.1 Overview of the document

Background - Document 1 is an article by a former employee from an MHEI's ICT department obtained from the library. Document 1 shall also be referred to as Case A and the propositions for this document shall be formulated as of Case A for document 1, for example; AD1.

Purpose – Document 1 sought to highlight the challenges and issues that faced MHEIs and also to outline some of the challenges in integrating ICTs during the pre-, interim and post-merger phases in MHEIs.

Approach – In compiling Document 1, a case study of the employee's former MHEI was critiqued against his current MHEIs to compare the similarities and differences on issues

discussed in the paragraph above. A range of issues experienced by the two MHEIs ICT departments was explored.

Findings – The mergers are still a thorny issue that will take a long time to resolve. The MHEIs ICT departments have up to now experienced a whole host of challenges and extreme complexities which this document has attempted to report.

Value – Document 1 contributes to the current pool of information already found during the interviews and in earlier chapters of this study on MHEIs, BPR, strategy and vaguely on SDMs.

4.3.2.1.2 MHEIs, BPR, Strategy and SDMs

The general belief in South African MHEIs is that the previously elite universities have totally taken over the previously disadvantaged universities instead of them reaping the benefits of the MHEIs. This has affected the ICT side in the sense that the acceptance of new systems and resultant new business processes has not been easy as they are believed to be an imposing act. Using these new ICT systems has diminished morale to a level of being non-existent. This has also affected the entire teaching and learning process and service delivery in MHEIs. This highlights one of the major complexities that ICT department in MHEIs have and are still facing; the issue of change management.

ICT service delivery like any other services has become a matter of concern in MHEIs as infrastructure has become much larger. This also meant that communication through the levels of hierarchy became difficult. The reporting and management structures have changed placing stress and strain to staff who are failing to identify their appropriate bosses or subordinates thus demoralizing them. MHEI's ICT departments are therefore under severe pressure from other functions and management within their universities as they are believed to be the bearers of most of the solutions to problems being faced. All the other functions expect quality improvements in their areas through the ICT department. This is yet another complexity within ICT departments; the fact that changes are being identified as the ICTs responsibility and not the whole organisation's issue. There is also concern that top management involvement in the change endeavours is not very clear, there are a lot of bosses and a lot of unplanned requests for change.

Based on the discussions above, an obvious need for BPR in MHEIs was then recognized especially by the ICT departments. There was need for conversion of business processes to suit the mergers and this invoked a wide scope of BPR projects. With this new improvement a corresponding increase in implementation problems and in the extent to which organisational strategy is included in the BPR plans was expected. One of the problems observed by the writer was the absence of a relationship between BPR plans and the actual BPR projects implemented. One may then suggest that the lack of this relationship indicates that on average, MHEIs are not thoroughly planning their BPR suggesting a lack of an appropriate approach to development or SDMs.

An appropriate approach is a major factor that should be considered for BPR projects. Approaches such as SDMs help to organise BPR plans such that the extent of changes to business processes is related to the extent BPR implementation problems are encountered. One would also expect that the more thorough the BPR project plans are the lower the extent to which implementation problems will occur. On the other hand the extent of changes to business processes should be related to the extent to which the organisational strategy is included in the BPR plans. Any successful organisation would agree that it is important to consider the impact of BPR on organisational strategy. This would then lead to a greater likelihood that project goals and objectives will be accomplished. If BPR projects include organisational strategy it will also lead to project benefits being derived and a favourable impact on organisation performance.

In most of the MHEIs strategic functions such as student registration, admissions human resources and finance were the most affected business processes. This then supports the notion that in any BPR project plans organisational strategy should be included. Document 1 revealed that by prioritising the organisational strategy in their BPR projects, one of the MHEIs considered as his case has greatly accomplished most of their important project goals and objectives.

4.3.2.2 Propositions for Document 1

In this section propositions about possible relationships among BPR, SDMs and strategy in MHEIs are formulated. The propositions are formulated from similar patterns of responses from the different authors who wrote on these concepts. These propositions are formulated as

a way of generating theory about the SDMs, BPR, strategy and MHEIs by using only the information gained from document 1.

4.3.2.2.1 Proposition 1

There is general belief that previously elite universities have totally taken over the previously disadvantaged universities instead of them reaping the benefits of the MHEIs. This has affected the ICT in that the new systems and resultant new business processes have not been easily accepted. [ADI]

4.3.2.2.2 Proposition 2

The difficulties being faced in acceptance and usage of new systems confirms that MHEIs are failing when it comes to change management. [ADI]

4.3.2.2.3 Proposition 3

New systems introduced as a result of the merger have diminished morale among stakeholders, affecting the entire teaching and learning process and service delivery in most of these merged universities. [ADI]

4.3.2.2.4 Proposition 4

All other functions expect quality improvements in their areas through the IT department. [ADI]

4.3.2.2.5 Proposition 5

Another complexity within ICT departments is that changes are being identified as the ICTs responsibility and not the whole organisation's issue. [ADI]

4.3.2.2.6 Proposition 6

There is concern that top management involvement in the change endeavours is not very clear, there are a lot of bosses and a lot of unplanned requests for change. [ADI]

4.3.2.2.7 Proposition 7

The need for conversion of business processes to suit the mergers invoked a wide scope of BPR projects. [ADI]

4.3.2.2.8 Proposition 8

The complexity of business processes caused a lot of implementation problems [ADI]

4.3.2.2.9 Proposition 9

The new systems caused complications on the extent to which organisational strategy was included in the BPR plan. [ADI]

4.3.2.2.10 Proposition 10

There is no relationship between BPR plans and the actual BPR projects implemented. [ADI]

4.3.2.2.11 Proposition 11

An appropriate approach such as an SDM is a major factor that should be considered for BPR projects. [AD1]

4.3.2.2.12 Proposition 12

Approaches such as SDMs help to organise BPR plans such that the extent of changes to business processes is related to the extent BPR implementation problems are encountered. [AD1]

4.3.2.2.13 Proposition 13

The extent of changes to business processes should be related to the extent to which the organisational strategy is included in the BPR plans. [AD1]

4.3.2.2.14 Proposition 14

If BPR projects include organisational strategy it will lead to project benefits being derived and a favourable impact on organisation performance. [AD1]

4.3.2.2.15 Proposition 15

One would also expect that the more thorough the BPR project plans are the lower the extent to which implementation problems will occur. [AD1]

4.3.2.2.16 Proposition 16

On the other hand the extent of changes to business processes should be related to the extent to which the organisational strategy is included in the BPR plans. [AD1]

4.3.2.2.17 Proposition 17

Any successful organisation would agree that it is important to consider the impact of BPR on organisational strategy. This would then lead to a greater likelihood that project goals and objectives will be accomplished. [AD1]

4.3.2.2.18 Proposition 18

If BPR projects include organisational strategy it will also lead to project benefits being derived and a favourable impact on organisation performance. [AD1]

4.3.2.3 Document 2

4.3.2.3.1 Overview of the document

Background - Document 2 is a report on MHEIs in relation to BPR and SDMs that was obtained from the internet. Document 1 was a report that was not originally targeted for South African MHEIs but suitable information from was extracted to suit the requirements of

this study. Document 2 shall also be referred to as Case B and the propositions for this document shall be formulated as of Case B for document 2, for example; BD2.

Purpose – Document 2 also targeted to give an insight on the challenges that are facing MHEIs and in relation to BPR and SDMs.

Approach – In compiling Document 2, the Department of Education was the case study and a range of issues experienced by MHEIs ICT departments in general were explored.

Findings – The mergers were never embraced especially in the Higher Education community. Other common issues remained the issues of the use of SDMs for BPR tasks undertaken as a result of the mergers.

Value – Document 2 also adds crucial information on the relationship between MHEIs, BPR and SDMs.

4.3.2.3.2 MHEIs, BPR and SDMs

The reconfiguration of HEIs which involved the forming of MHEIs was mostly met with messages of doom and fear and little optimism in all cases worldwide. Accompanying that fear and doom were concerns over the change of business processes. It was envisaged that this change would not simply be a technical exercise of repackaging institutions into new entities. The fundamental change was meant to be a formation of new organisation forms and structures as well as establishing new visions and missions.

In MHEIs, ICT departments needed to understand that they profoundly play a major role in any change attempts especially by changing the way business is conducted. BPR is one common method for managing this change in ICT while at the same time making it possible to achieve dramatic gains in business performance. The compelled demand for business process improvements for mergers resulted in a proliferation of consultants and the introduction of various *approaches*, SDMs in the context of this study, to help manage these crucial *changes* which will be regarded as BPR projects for this study.

The overflow of SDMs in general has often left BPR planners confused about which SDMs are best suited to their needs. The lack of stipulated BPR SDMs has resulted in many unsuccessful BPR projects. There have been a number of previous investigations on the principles of BPR and how MHEIs approached this process. Existent SDMs elaborate on mostly general principles that apply to any organisation and this makes no distinction among

BPR projects in different organisational (MHEI) contexts. The characteristics of BPR projects in one MHEI differ from those of another because the business processes are different so the application of general principles makes the BPR process difficult. BPR is a world-wide applicable technique of business restructuring focusing on business processes and providing vast improvements in a short period of time. The technique implements organisational change based on the close coordination of a SDM for rapid change, employee empowerment and training and support by information technology.

4.3.2.4 Propositions for Document 2

In this section propositions about possible relationships among BPR, SDMs strategy in MHEIs are formulated. The propositions are formulated from similar patterns of responses from the different authors who wrote on these concepts. These propositions are formulated as a way of generating theory about the SDMs, BPR, strategy and MHEIs by using only the information gained from document 2.

4.3.2.4.1 Proposition 1

Stakeholders met mergers of universities with messages of doom and fear, little optimism, and concerns over the change of business processes. [BD2]

4.3.2.4.2 Proposition 2

The mergers were meant to be a formation of new organisation forms and structures as well as establishing new visions and missions. [BD2]

4.3.2.4.3 Proposition 3

BPR is one method for managing change while at the same time making it possible to achieve dramatic gains in business performance. [BD2]

4.3.2.4.4 Proposition 4

The compelled demand for business process improvements for mergers resulted in a proliferation of consultants and the introduction of various SDMs to help manage BPR projects [BD2]

4.3.2.4.5 Proposition 5

The lack of stipulated BPR SDMs has resulted in many unsuccessful BPR projects. [BD2]

4.3.2.4.6 Proposition 6

In MHEIs, ICT departments needed to understand that they profoundly play a major role in any change attempts especially by changing the way business is conducted. [BD2]

4.3.2.4.7 Proposition 7

BPR is one common method for managing this change in ICT while at the same time making it possible to achieve dramatic gains in business performance. [BD2]

4.3.2.4.8 Proposition 8

Existent SDMs elaborate on mostly general principles that apply to any organisation and this makes no distinction among BPR projects in different MHEIs. [BD2]

4.3.2.4.9 Proposition 9

The characteristics of BPR projects in one institution differ from those of another because the business processes are different. [BD2]

4.3.2.4.10 Proposition 10

BPR implements organisational change based on the close coordination of a SDM for rapid change, employee empowerment and training and support by information technology. [BD2]

4.3.2.4.11 Proposition 11

The overflow of SDMs in general has often left BPR planners confused about which SDMs are best suited to their needs. [BD2]

4.3.2.4.12 Proposition 12

The lack of stipulated BPR SDMs has resulted in many unsuccessful BPR projects. [BD2]

4.3.2.5 Document 3

4.3.2.3.1 Overview of the document

Background - Document 3 is an ICT report compiled by the ICT department from a South African MHEI. While the report was compiled by one particular MHEI, it turns out that most of these changes have been common to most South African MHEIs. Document 3 was obtained from one of the MHEIs during the time of the interviews. Document 3 shall also be referred to as Case C and the propositions for this document shall be formulated as of Case C for document 3, for example; CD3.

Purpose – Document 3 is a report targeted at presenting BPR projects that have been taking place ever since the merger.

Approach – In compiling Document 3, a South African MHEI was the case study and a range of issues from this MHEI's ICT department were highlighted.

Findings – The report revealed that MHEIs have truly undertaken quite a number of BPR projects and more projects are still being planned to take place.

Value – Document 3 adds to the existent findings in earlier sections of this study in providing an insight of the actual projects that have taken place in South African MHEIs. Document 4 also reveal the possibility of new BPR projects that are upcoming and gives hope for future research to contribute towards the proper planning of these projects in future.

4.3.2.3.2 BPR in MHEIs

One of the major BPR initiatives for the MHEIs was to embark on fibre connections tasks among their disparate campuses. The MHEI in partnership with network providing companies managed to undergo these connections and construction of new systems at half the construction costs involved. The MHEI, just like many other MHEIs in South Africa have installed 5 Gb/s speed capabilities on more than 60% of their campuses. This new development completed the delivery of gigabit per second primary links to the MHEIs' disparate campuses.

One of the benefits the of mergers to ICT has been the establishment of state of the art green ICT compliant infrastructures moving away from the old detached ICTs. The development has gone a long way towards addressing the continual failures experienced with the out dated and disparate equipment that was proving impossible to maintain.

BPR projects were tackled through the use of ICT task teams that were assigned the responsibility of developing aligned business processes to the ICT and organisational strategy. Previously the ICT strategy was set by the ICT departments within their different campuses with very low levels of institutional participation. The establishment of an ICT Task Teams was driven by the institutional stakeholders and focussed on achieving alignment among the different campuses. These new developments have been evaluated to be in full alignment with the fundamental requirements of the King III code of practise. The new development gave the opportunity for MHEIs to be critically assessed in terms of their ICT capabilities as well as the requirements to deliver on and support the strategic goals. For the purposes of the merger, every MHEI's ICT department had their own strategic plan but the main idea behind all of these plans was business processes collaboration through technology.

For the MHEI in this case, there was also the implementation of 100 Mb/s free space optics links to breach the distances to remote campuses. This laid the groundwork for growing connectivity among the campuses to support the teaching, learning and research efforts. Other

major developments have been the delivery of anywhere and always available networking to allow students access to e-learning. The need to cater for the student side of ICT has resulted in several pilot projects which include revamping of the core infrastructure and bandwidth provision. In most of the MHEIs, high capacity backbones were established in student's residences as well as wireless connectivity. The greatest achievement thus far among the MHEI's BPR projects has been the Inter-campus connectivity and the integration and equalisation of ICT infrastructure. Among many other BPR project planned for the future, the next step is the roll out of student-owned devices to enable access for the students through the appropriate technology.

4.3.2.6 Propositions for Document 3

In this section propositions the effects of the mergers on ICT formulated. The propositions are formulated from similar patterns of responses from different authors who wrote on these concepts. These propositions are formulated as a way of generating theory about the BPR endeavours in MHEIs and how they affected strategy.

4.3.2.6.1 Proposition 1

The report gave enough proof that there have been a number of BPR projects conducted as a result of the mergers. [CD3]

4.3.2.6.2 Proposition 2

Mergers brought complicated systems. [CD3]

4.3.2.6.3 Proposition 3

The development has gone a long way towards addressing the continual failures experienced with the outdated and disparate equipment that was proving impossible to maintain. [CD3]

4.3.2.6.4 Proposition 4

For the purposes of the merger, every university's ICT department had their own strategic plan but the main idea behind all of these plans was business processes collaboration through technology. [CD3]

4.3.2.6.5 Proposition 5

BPR projects were tackled through the use of ICT task teams that were assigned the responsibility of developing aligned business processes to the ICT and organisational strategy. [CD3]

4.3.2.6.6 Proposition 6

The greatest achievement thus far among the merged universities' BPR projects has been the inter-campus connectivity and the integration and equalisation of ICT infrastructure. [CD3]

4.3.2.6.7 Proposition 7

MHEIs have many other BPR projects planned for the future, which future research may need to contribute towards its planning. [CD3]

4.3.2.7 Revised document propositions

In this section combined propositions are formulated to come up with similar patterns among the documents propositions. The documents are combined to try and come up with possible theory on the concepts of BPR, SDMs, strategy and MHEIs concepts.

4.3.2.7.1 Proposition 1

ICT new systems and resultant new business processes brought as a result of the merger have not been easily accepted by stakeholders. [AD1, BD2]

4.3.2.7.2 Proposition 2

BPR implements organisational change based on the close coordination of a methodology for rapid change, employee empowerment and training and support by Information Technology. [AD1, BD2]

4.3.2.7.3 Proposition 3

The extent of changes to business processes should be related to the extent to which the organisational strategy is included in the BPR plans. [AD1, BD2]

4.3.2.7.4 Proposition 4

Mergers brought complicated systems. [AD1, CD3]

4.3.2.7.5 Proposition 6

BPR is one method for managing change while at the same time making it possible to achieve dramatic gains in business performance. [AD2, CD3]

4.3.2.7.6 Proposition 6

The difficulties being faced in acceptance and usage of new systems confirms that MHEIs are failing when it comes to change management. [AD1, BD2]

4.3.2.7.7 Proposition 7

The report gave enough proof that there have been a number of BPR projects conducted as a result of the mergers. [AD1, BD2, CD3]

4.3.2.7.8 Proposition 8

The need for conversion of business processes to suit the mergers invoked a wide scope of BPR projects. [AD1, BD2, CD3]

4.3.2.7.9 Proposition 9

The characteristics of BPR projects in one institution differ from those of another because the business processes are different. [AD1, BD2]

4.3.2.7.10 Proposition 10

BPR projects were tackled through the use of ICT task teams that were assigned the responsibility of developing aligned business processes to the ICT and organisational strategy. [AD1, CD3]

4.3.2.7.11 Proposition 11

An appropriate approach is a major factor that should be considered for BPR projects. [AD1, BD2]

4.3.2.7.12 Proposition 12

The compelled demand for business process improvements for mergers resulted in a proliferation of consultants and the introduction of various SDMs to help manage BPR projects [AD1, BD2]

4.3.2.7.13 Proposition 13

The lack of stipulated BPR SDMs has resulted in many unsuccessful BPR projects. [AD1, BD2]

4.3.2.7.14 Proposition 14

Approaches such as SDMs help to organise BPR plans such that the extent of changes to business processes is related to the extent BPR implementation problems are encountered. [AD1, BD2]

4.3.2.7.15 Proposition 15

BPR for mergers resulted in the introduction of various SDMs to help manage BPR projects [AD1, BD2]

4.3.2.7.16 Proposition 16

Existent SDMs elaborate on mostly general principles that apply to any organisation and this makes no distinction among BPR projects in different MHEIs. [AD1, BD2]

4.3.2.7.17 Proposition 17

The overflow of SDMs in general has often left BPR planners confused about which SDMs are best suited to their needs. [AD1, BD2]

4.3.2.7.18 Proposition 18

The lack of stipulated BPR SDMs has resulted in many unsuccessful BPR projects. [ADI, BD2]

4.3.2.7.19 Proposition 19

There is no relationship between BPR plans and the actual BPR projects implemented. [ADI, BD2]

4.3.3 Revised propositions for interviews and documents

This section presents the revised propositions that include findings from both the interviews and the documents. These propositions will represent the system development practices in MHEIs and the MHEIs sentiments with regards to the issues of SDMs, consideration of strategy and BPR. The revised propositions are presented according to the groupings formulated from the interview questions shown in Section 4.3.1. These propositions will assist the study to form a coherent story that will answer the research questions of this study and eventually satisfy the aim and objectives of the study.

4.3.3.1 Revised propositions according to the grouping of interview questions: Group 1: General questions

Proposition 1

Universities' ICT personnel in top management are generally more positive, knowledgeable and experienced in SDMs and they are more involved with BPR decisions than developers. [A11, B11, D11]

The results from the interview data indicate that this proposition will remain unchanged since it is supported by the findings. It was found that generally all the ICT personnel in top management are better well versed with SDMs than the operational staff.

Proposition 2

Universities' ICT personnel interviewed are all knowledgeable and experienced in system development though at different levels. [A11, AI2, B11, BI2, C11, D11, DI2, DI3]

It was found that generally all the ICT personnel are experienced in one or more SDMs at different levels. The results from the interview data indicate this and therefore the proposition will remain unchanged since it is supported by the findings.

4.3.3.2 Revised propositions according to the grouping of interview questions: Group 2: BPR and organisational strategy

Proposition 1

Universities believe that organisational change through BPR is better implemented based on the close coordination of a SDM for rapid change, employee empowerment and training and support by Information Technology. [AI2, DI1, DI2, AD1, BD2]

The results from both the interviews and documents support the use of SDMs during BPR for reasons mentioned in the proposition. This proposition is supported by the findings and it therefore remains unchanged.

Proposition 2

Universities highlighted that the extent of changes to business processes should be related to the extent to which the organisational strategy is included in the BPR plans. [AI1, AI2, BII, BI2, CII, DI1, DI2, DI3, AD1, BD2]

The findings show that there is general belief that the degree of change planned should be at par with the organisational strategy in the BPR plans. This proposition is supported by the findings from both the interviews and the documents therefore it remains unchanged.

Proposition 3

Universities explained that the characteristics of BPR projects in one institution differ from those of another because the business processes are different. This is also true of organisational strategy in the sense that each organisation has its own unique strategy hence the close connection between BPR and strategy. [AI1, AI2, BII, BI2, CII, DI1, DI2, DI3, AD1, BD2]

It was found that BPR endeavours and organisational strategies are unique to every organisation. The results from the interview and documents data indicate this and therefore the proposition will remain unchanged since it is supported by the findings.

Proposition 4

Universities' developers are not directly involved with issues of strategy, but understand that the IT department strategy is part of the organisational strategy and should be prioritised in their development tasks. [A11, AI2, B11, BI2, C11, D11, DI2, DI3]

The findings showed that developers are more involved with the implementation of strategy at the lower level and are not involved in the actual development of the strategy although they understand its importance. Findings from the interviews confirm this proposition, therefore it remains unchanged.

Proposition 5

Universities' developers view organisational strategic issues as a concern of top management. They are not sure whether strategy is captured within the SDMs they employ or how it is incorporated. [AI2, BI2, C11, DI2, DI3]

Findings from the interviews show that developers are less knowledgeable on how their organisations come up with strategies and later incorporate them into their development processes. They only know how to implement what has already been done. This proposition therefore remains unchanged.

Proposition 6

Universities agree that if organisational strategy is not captured, it is difficult to influence people's attitudes and to get good direction in tackling diversity and a large number of business processes. [A11, AI2, B11, BI2, C11, D11, DI2, DI3, AD1, AD2, CD3]

Results from both interviews and documents support that the lack of strategy in development leads to the development of systems that lack at capturing important aspects of the organisation. This proposition is therefore remains unchanged.

Proposition 7

Universities are making use of ICT task teams who are assigned the responsibility of developing aligned business processes to the organisational strategy in tackling their BPR projects. [AI2, BI2, C11, DI2, DI3, AD1, CD3]

It was found that universities try by all means to ensure that their business processes are aligned with the organisational strategy. This proposition is supported by both interviews and documents, therefore it remains unchanged.

Proposition 8

Universities' ICT managers perceive SDMs support for organisational strategy to be significantly more important than system developers [A11, B11, D11, AD1, BD1]

The results have shown that top management are the implementers of strategy therefore whenever there is top management involvement then strategy is accommodated. Results from the interview data show that the interviewees at top management level were better versed with strategy than developers. This proposition therefore remains unchanged.

Proposition 9

Universities' developers believe in the consideration of organisational strategy during development although they are not directly involved in strategic issues [A12, B12, C11, D12, D13]

The results from the interviews show that developers believe in the implementation of strategy 'in spirit' but are not directly involved in strategic decisions or understand how exactly it is encompassed in development. This proposition is supported by the findings and it therefore remains unchanged.

Proposition 10

Universities BPR endeavours have not been easy mainly because the new systems or reengineered systems and resultant new business processes have not been easily accepted by stakeholders. [A11, B11, C11, AD1, BD2]

Results from both interviews and documents confirmed that there was strong resistance in the use and acceptance of the reengineered systems making the BPR process difficult for the ICT departments in trying to gain acceptance from the targeted users. This proposition remains unchanged.

4.3.3.3 Revised propositions according to the grouping of interview questions: Group 3: SDMs

Proposition 1

Universities still basically follow the traditional waterfall model approach where systems are developed according to the phases of the formalised systems development methodology called the Information Systems Development lifecycle (SDLC). [A11, B11, B12, D11, D12]

Results from the interview data indicate generally all the organisations interviewed still basically follow the SDLC steps during system development. This proposition therefore remains unchanged as it is supported by the findings.

Proposition 2

Universities have developed a framework of tools and an organized collection of techniques from different types of SDMs where developers can pick and choose from for different development projects and some still require a workable framework. [A11, B11, B12, C11]

The interview results have indicated that some of the MHEIs apply SDMs as a framework where they can choose tools and techniques from and can therefore tune the SDM to suit their different projects. However some still feel they need a more appropriate framework that can accommodate other elements like strategy and change management. This proposition therefore remains unchanged.

Proposition 3

Universities ICT departments took up the use of newer SDMs to try and address the changed and more complicated ICT environments and businesses processes brought through the merger. SDMs being used include:

agile RUP - [A11, B11, B12, D11, D12, D13]

agile SRUM - [A11, B12, D11, D12, D13]

PRINCE - [A11, C11, D11]

ITIL - [A11, A12, C11, D11, D12, D13]

TOGAF - [A11, A12, D13]

CRM - [D11, D12, D13]

XP - [BI1, BI2]

JAD - [BI1, BI2]

RAD - [BI1, BI2]

All universities interviewed revealed that they make use of at least one SDM during development. The findings have therefore shown that the use of SDMs is preferable for all in any kind of development including reengineering. This proposition therefore remains substantive.

Proposition 4

Universities' developers do not have a strong theoretical background with regards to SDMs. [AI2, CII, DI2, DI3]

The findings from the interviews done show that the developers interviewed had very little theoretical understanding of the SDMs they are implementing. This proposition remains unchanged because it is supported by the findings.

Proposition 5

Universities perceive SDMs as beneficial in the following ways: formalising development, trace accountability, provide evidence through documentation, eliminate duplication, avoid fragmentation and develop systems that work [AI1, BI2, DII, DI2, AD1, BD2]

Findings from both interviews and documents indicate that organisations perceive SDMs as a useful artefact that should be applied in system development for common benefits. SDMs should therefore be applied even during BPR. This proposition therefore remains unchanged.

Proposition 6

Universities' development teams are happy with the way that the systems are being developed and believe that SDMs are effective and develop systems that work [AI1, AI2, CII, DII, DI2, DI3, AD1, BD1]

The results from the interviews and documents support this proposition, therefore it remains unchanged.

Proposition 7

Universities confirmed that there are no specific SDMs that they have managed to identify which are specific for BPR. [A11, B12, D11, D12, D13, AD1, BD1, CD1]

Findings from both documents and interviews show that there is no proven SDM for BPR. This proposition remains unchanged as it is supported by findings.

Proposition 8

Universities mergers compelled demand for BPR and this resulted in a proliferation of consultants and the introduction of various SDMs to help manage BPR projects [A11, B12, D11, D12, D13, AD1, BD2]

It was found that generally universities attempted to come up with different types of approaches or SDMs to try and make their BPR endeavours easier. The findings from both the interviews and the documents support this propositions and it therefore remains unchanged.

Proposition 9

Universities confirmed that approaches such as SDMs help to organise BPR plans such that the extent of changes to business processes is related to the extent BPR implementation problems are encountered. They also agreed that the lack of stipulated SDMs for BPR has resulted in many unsuccessful BPR projects. [A11, AI2, B11, B12, C11, D11, D12, D13, AD1, BD2]

Findings show that universities agree that SDMs are a strong leverage to their development tasks, but they are worried that there is no specific SDM for BPR to make this process easier. The interviews and the documents support this proposition, therefore it remains unchanged.

Proposition 10

Universities are concerned that existent SDMs elaborate on mostly general principles that apply to any organisation and this makes no distinction among BPR projects in different MHEIs or the different BPR projects. [A11, AI2, B11, B12, C11, D11, D12, D13, AD1, BD2]

Although there has been general agreement and support for the use of SDMs, universities are concerned that the existent SDMs are too general and in most cases do not meet their

expectations when it comes to addressing specific BPR issues. This proposition is supported by both interviews and documents and it remains unchanged.

Proposition 11

Universities expressed concern over the overflow of SDMs in general. They are concerned that this overflow has often left them as BPR planners confused about which SDMs are best suited to their needs. [A11, B11, D11, AD1, BD2]

It was found that there is general confusion in making choices when it comes to choosing SDMs for BPR endeavours as they are so many and each one of them touches at least one element of BPR although not all. This proposition is supported by findings from the interviews and documents and it remains unchanged.

Proposition 12

Universities explained that from experience they have not yet used any SDMs that directly emphasise organisational strategy. Most SDMs are more enlightened towards developing systems that work and then organisations have to tune the SDMs to suit their strategy. [A11, AI2, B11, BI2, C11, D11, DI2, DI3, AD1, BD2]

Findings show that emphasis on strategy lack in most existent SDMs. This proposition remains unchanged as it is supported by findings from both the interviews and the documents.

Proposition 13

Universities agreed that SDMs that focus on organisational strategy will give development a more narrowed focus towards the actual need of the organisation. [A11, AI2, B11, BI2, C11, D11, DI2, DI3, AD1, BD2]

Universities would still like their reengineered systems to remain focused on the organisation's main purpose and therefore believe that accommodation of strategy in SDMs would assist them to remain focused. This proposition is supported by both interviews and documents and it remains unchanged.

Proposition 14

Universities have developed their own in-house SDMs which involve the use of phases derived from traditional SDMs techniques such as the waterfall and prototyping models. [B11, B12, C11, AD1, BD2]

Findings revealed that universities have re-arranged or developed their own SDMs with phases from existent SDMs in an attempt to come up with their own SDMs suitable for the development needs. This proposition remains unchanged as it is supported by the interviews and documents.

Proposition 15

Universities still face a challenge that available SDMs still do not bridge the gap between developers and users or stakeholders; they are more concerned with what developers should do to create systems that work. They suggested that SDMs should balance between the developers' tasks and the users' tasks in the eventual system. [A11, A12, B11, C11, D11, D12, DI3, AD1, BD1]

The results from both documents and interviews show that change management still remains a big challenge which is not well addressed in most of the SDMs. This proposition is supported by the findings therefore it remains unchanged.

4.3.3.4 Revised propositions according to the grouping of interview questions: Group 4: Willingness to adopt SDMs and support to strategy

Proposition 1

Universities agreed that they are willing to adopt new SDMs but suggested that the existent SDMs or future SDMs should carry enough emphasis on the implementation of strategy. They explained that SDMs should capture the vision and the mission at all levels [A11, A12, B11, B12, C11, D11, D12, DI3, AD1, BD1]

The results have proved that accommodation of strategy is more of an organisational task rather than a part of SDMs processes that must be followed. Findings from interviews and documents reveal that universities are willing to adopt newer SDMs provided they do not extra effort from them on deciding how to include the strategy. This proposition remains unchanged.

Proposition 2

Universities ICT departments emphasised that the nature of their work is driven by innovation, therefore willingness to adopt new SDMs is something inevitable and very acceptable to them. [A11, AI2, B11, BI2, C11, D11, DI2, DI3]

Results from interviews show that MHEIs are willing to adopt new SDMs and would embrace the idea of new SDMs created for BPR. This proposition therefore remains unchanged.

Proposition 3

Universities are willing to adopt new SDMs that can assist them to capture important aspects like organisational strategy as well as cultural and personality diversity. There is willingness to adopt new SDMs that will assist to capture the human element that addresses change management, cultural mindset, attitudes as well as customer relations management. [A11, AI2, B11, BI2, D11, DI2, DI3]

The results have highlighted that there are other very important aspects important to universities that should be captured in SDMs as mentioned in the proposition. Universities expressed that they are willing to accept newer SDMs provided they also include the aspects mentioned in the propositions. Findings from interviews strongly support this proposition, therefore it remains unchanged.

Proposition 4

Universities' ICT personnel perceive that the majority of the stakeholders do not understand the link between the new business processes and the organisational strategy therefore they are not ready to accept change [A11, AI2, C11, DI2, DI3, AD1, BD1]

The results from both the documents and interviews prove that there is very little acceptance of change from stakeholders mostly because they do not understand how their contributions are captured.

4.4 Summary of the research findings

4.4.1 Research aim, objectives and research questions

Section 4.2 highlighted the research aim as the need to evaluate whether SDMs accommodate organisational strategy in order to determine their utility as a change tool during BPR. The aim was broken down into specific objectives that satisfy the aim of the study. The objectives of the study are broken down as follows: to

- identify major categories of existing system development methodologies and create a list of criteria to use as evaluation dimensions for support to or accommodation of strategy;
- evaluate by presenting the strengths and shortcomings of different SDMs for BPR purposes and
- investigate whether or not SDMs play a role in BPR in MHEIs.

The first and second objectives were covered and partly reported in section 2.10 of this study. Based on the research aim and the third objective two main research questions were formulated and to give a deeper insight to these main research questions, five minor research questions were derived from them. A summary of the research findings will now be discussed based on the research questions as presented below.

4.4.2 Research findings according to research questions

Main research question 1: Are there any SDMs being applied in MHEIs for BPR purposes?

Minor research questions:

4.4.2.1 Which specific or other SDMs are currently being applied in the organisation for BPR purposes?

Interview findings show that SDMs are being applied during system development in MHEIs as a change tool. [AI1, AI2, BI1, BI2, CI1, DI1, DI2, DI3]

Interview and document findings show that there are no specific SDMs for BPR that either exist or have been introduced in MHEIs with the coming of the mergers. MHEIs are concerned that existent SDMs elaborate on mostly general principles that apply to any

organisation and this makes no distinction among BPR projects in different MHEIs or the different BPR projects. [AI1, BI1, CI1, DI1, DI2, DI3, AD1, BD2]

Interview and document findings confirmed that developers are happy with the way that the systems are being developed and believe that SDMs are effective and develop systems that work. [AI1, AI2, BI1, BI2, CI1, DI1, DI2, DI3, AD1, and BD2]

SDMs help to organise BPR plans such that the extent of changes to business processes is related to the extent BPR implementation problems are encountered. [AI1, BI2, DI1, DI2, DI3, AD1, BD1]

4.4.2.2 What success or failure factors are associated with the current SDMs

Interviews and document findings reveal that there is general appreciation for the use of SDMs, but a lot of confusion still lingers with regards to how they should be applied for BPR purposes as they have been originally developed for new developments rather than reengineering. [AI1, AI2, BI1, BI2, CI1, DI1, DI2, DI3, AD1, BD2]

Findings from section 2.3 to 2.10 confirmed that in theory BPR and strategy are partners but the partnership between strategy and SDMs or SDMs and BPR rarely exist. At the same time document and interview results show that in practice, BPR, strategy and SDMs are merely a belief that has rarely been put into practice. [AI1, AI2, BI1, BI2, CI1, DI1, DI2, DI3, AD1, BD2]

The lack of stipulated BPR SDMs has resulted in many unsuccessful BPR projects therefore appropriate SDMs is a major factor that should be considered for BPR projects. [AI1, BI2, DI1, DI2, DI3, AD1, BD1]

4.4.2.3 Is there readiness to adopt if there are none or to take up new SDMs to replace current ones?

Findings from interviews and documents reveal that universities are willing to adopt newer SDMs provided they do not extra effort from them on deciding how to include the strategy. [AI1, AI2, BI1, BI2, CI1, DI1, DI2, DI3, AD1, BD1]

Results from interviews show that MHEIs are willing to adopt new SDMs and would embrace the idea of new SDMs created for BPR. [AI1, AI2, BI1, BI2, CI1, DI1, DI2, DI3]

Main research question 2: Do SDMs accommodate strategy for use during BPR in MHEIs?

Minor research questions:

4.4.2.4 Are the current SDMs structured to in a way that allows strategy to be accommodated?

Evaluations of SDMs 2.4.3.2 of the study show that some SDMs mention organisational strategy in some parts of their stages but do not prioritise or emphasise it in all its phases. Interview results also confirmed that most of the SDMs being applied do not emphasise support to organisational strategy. [AI1, AI2, BI1, DI1, DI2, DI3]

Evaluations of SDMs presented in section 2.4.3.3 of the study based on BPR characteristics show that SDMs generally lack accommodation of one major characteristic which is organisational strategy. Interview and document results also confirmed that most of the SDMs being applied do not emphasise support to organisational strategy. [AI1, AI2, BI1, BI2, CI1, DI1, DI2, DI3, AD1, BD2]

Interview and document findings revealed that developers in MHEIs believe in the consideration of organisational strategy within SDMs although they are not directly involved in strategic issues. IT managers perceive SDMs support for organisational strategy to be significantly important. The extent of changes to business processes should be related to the extent to which the organisational strategy is included in the BPR plans. [AI1, AI2, BI1, BI2, CI1, DI1, DI2, DI3, AD1, BD2]

Interview and document findings confirmed that the new systems caused complications on the extent to which organisational strategy was included in the BPR plans. Findings in section 2.10 as well as interview and document findings reveal that the extent of changes to business processes should be related to the extent to which the organisational strategy is included in the BPR plans. If BPR projects include organisational strategy it will lead to project benefits

being derived and a favourable impact on organisation performance. [AI1, AI2, BI1, BI2, CI1, DI1, DI2, DI3, AD1, BD2]

4.4.2.4 Is there a need to develop specific SDMs that accommodate strategy to suit BPR purposes?

Interviews and document findings support that there is need for specific SDMs for BPR that accommodate organisational strategy instead of random application of general SDMs which is the current practice. [AI1, AI2, BI1, BI2, CI1, DI1, DI2, DI3, AD1, BD2]

New systems introduced as a result of the merger were not easily accepted by stakeholders. ICT personnel perceive that the majority of the stakeholders do not understand the link between the new business processes and the organisational strategy therefore they are not ready to accept change. Universities still face a challenge that available SDMs still do not bridge the gap between developers and users or stakeholders as well as capture change management and other important aspects such as cultural and personality diversity, cultural mindset, attitudes as well as customer relations management. [AI1, AI2, BI1, CI1, DI1, DI2, DI3, AD1, BD2, CD3]

4.5 Chapter Summary

Findings from interviews conducted with MHEIs and document analysis were reported in this chapter. A total of 8 interviews were held with four MHEIs and 3 documents were identified for literature analysis. The results for both interviews and documents were first presented separately and separate propositions were also formulated. Thereafter revised propositions were formulated that presented similar patterns in all the results found and generated theory about what is happening with the use of specific SDMs for BPR that accommodate strategy. Lastly the findings were also presented according to the research questions, to show proof that the interview questions were addressed as well as prove that that the aim and objectives of the study were satisfied. The chapter that follows presents concluding remarks and recommendations for the study.

CHAPTER 5

CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

South African MHEIs have seen improvements in service delivery through the combining of resources between the previously poor institutions and the previously richer ones. The mergers have seen improvement in physical infrastructure as well as staff development. Most importantly the mergers saw the transformation or altering of organisational strategic goals of the different universities to suit the requirements of the merger. There was also the expansion of ICT infrastructures as well as modifications and adjustments to original business processes thereby invoking several BPR initiatives besides the fact that the whole merger endeavour was BPR itself.

It is with this in mind that the research was seen necessary. The researcher believes that ICT is one of the most important functions handling the most important asset of the business which is information. Major decisions in any organisation are based on the information at hand, especially strategic decisions. It is obvious that BPR initiatives such as mergers are bound to affect the way information was previously handled, therefore the BPR process should be well handled in such a way that will still allow valuable decisions to be based on existent information.

As with any other business concepts, BPR and SDMs have both stories of success and failure. Many organisations that have undertaken the use of SDMs and embarked on BPR projects reported significant benefits from their experiences (Hammer and Champy 2005). Their success rates have been reported in several areas such as efficiency and effectiveness in software development processes, customer satisfaction, as well as productivity and profitability (Huisman 2004).

The study introduced the concept of SDMs to assist with the handling of BPR on the ICT side of MHEIs. The research looked at evaluating the supportiveness of SDMs to strategic goals during BPR. This was done by firstly reviewing literature on the accommodation of strategy in existent SDMs, then evaluating SDMs against required BPR characteristics. Thereafter case studies were conducted at four merged universities in South Africa. The results of these

cases were used to establish the use of SDMs to support the merger initiatives and most importantly ascertain the degree of support to strategy. The results indicated that there was generally applicability SDMs to support system development and BPR initiatives but vagueness still remained as to the existence and use of particular SDMs for BPR that support strategy. Most of the universities interviewed reported major benefits and significant favourable impact of SDMs on development but their application to BPR and organisational strategy seem rather disappointing.

5.2 Research Contribution

Higher education still remains one of the most important sectors in South Africa, training and imparting necessary skills towards the development of qualified employees to service the nation. Organisational components or assets such as information still remain extremely important making possible strategic functions such as student enrolments, registration and results handled by ICT. In terms of this research ICT was viewed as important and business process reengineering initiatives such as mergers that have an impact on them were investigated. The research aimed to evaluate SDMs to find out whether they accommodate organisational strategy in order to be used as a change tool during BPR.

Evaluations of SDMs for accommodation of strategy and of SDMs against BPR characteristics were done in Sections 2.4.3.2 and 2.4.3.3 respectively. These evaluations met the requirements of the first and the second objective. Two main research questions were then formulated out of the third objective and also to address the research aim. The research questions were formulated as follows:

Main question 1: Are there any SDMs being applied in MHEIs for BPR purposes?

Minor questions:

- *Which specific or other SDMs are currently being applied in the organisation for BPR purposes?*
- *What success or failure factors are associated with the current SDMs*
- *Is there readiness to adopt if there are none or to take up new SDMs to replace current ones?*

Main question 2: Do SDMs accommodate strategy for use during BPR in MHEIs?

Minor questions:

- *Are the current SDMs structured to in a way that allows strategy to be accommodated?*
- *Is there need to develop specific SDMs that accommodate strategy to suit BPR purposes?*

The purpose of this group of questions was to establish applicability of specific SDMs or other SDMs that are being used for BPR purposes in MHEIs. According to Hammer and Champy (2005) BPR is a world-wide applicable technique of business restructuring focusing on business processes and providing vast improvements in a short period of time. The technique implements organisational change based on the close coordination of a SDM for rapid change, employee empowerment and training and support by information technology (Chapman 2007). The researcher therefore aimed to make a contribution to this field of thought by attempting to identify specific SDMs for BPR purposes.

5.3 Results of the Study

This section presents brief highlights of the findings of the study discussed according to the aim and objectives of the research. Propositions formulated from the MHEIs investigated, documents analysed as well as evaluations done are presented according to the objectives that answer the research questions. ICT staff members from South African MHEIs were asked to contribute their views with regards to the use of SDMs in universities. Staff at the level of top management in ICT departments and staff at the operations level were interviewed to try to distinguish formal development procedures (how things should be done) and actual development procedures (how things are really done).

This research is a first step in understanding the nature of SDMs in use for BPR in MHEIs and the extent to which they are used. The sample investigated may not be an adequate representative of MHEIs in general, nor may the experiences of the respondents. It is only through a database of such experiences that we will understand how SDMs are in use today in MHEIs and what their shortcomings might be.

- ***Objective 1** - identify major categories of existing SDMs and create a list of criteria to use as evaluation dimensions for support to or accommodation of strategy*

Proposition 1

Evaluations of SDMs for accommodation of strategy were done in Section 2.4.3.2 of the study. It was found that some SDMs mention organisational strategy in some parts of their stages but all SDMs evaluated do not prioritise or emphasise on strategy in all their phases. Interview results also confirmed that most of the SDMs being applied do not emphasise support to organisational strategy while some do not accommodate strategy at all. [**AI1, AI2, BI1, DI1, DI2, DI3**]

Proposition 2

Findings from Sections 2.3 to 2.10 confirmed that in theory BPR and strategy are partners but the partnership between strategy and SDMs or SDMs and BPR rarely exist. At the same time document and interview results show that in practice, BPR, strategy and SDMs are merely a belief that has rarely been put into practice. [**AI1, AI2, BI1, BI2, CI1, DI1, DI2, DI3, AD1, BD2**]

Proposition 3

Interviews and document support that there is need for specific SDMs for BPR that accommodate organisational strategy instead of random application of general SDMs which is the current practice. [**AI1, AI2, BI1, BI2, CI1, DI1, DI2, DI3, AD1, BD2**]

- ***Objective 2** - evaluate by presenting the strengths and shortcomings of different SDMs for BPR purposes*

Proposition 4

Evaluations of SDMs based on BPR characteristics were presented in section 2.4.3.3 of the study. These showed that SDMs generally lack accommodation of one BPR success factor or major BPR characteristic. Interview and document results also confirmed that most of the SDMs being applied do not emphasise support to one of the major BPR success factor which is organisational strategy. [**AI1, AI2, BI1, BI2, CI1, DI1, DI2, DI3, AD1, BD2**]

- *Objective 3 - investigate whether or not SDMs play a role in BPR in MHEIs.*

Proposition 5

Interview findings show that SDMs are being applied during system development in MHEIs as a change tool. [AI1, AI2, BI1, BI2, CI1, DI1, DI2, DI3]

Proposition 6

Interview and document findings show that there are no specific SDMs for BPR that either exist or have been introduced in MHEIs with the coming of the mergers. MHEIs are concerned that existent SDMs elaborate on mostly general principles that apply to any organisation and this makes no distinction among BPR projects in different MHEIs or the different BPR projects. [AI1, BI1, CI1, DI1, DI2, DI3, AD1, BD2]

Proposition 7

Interview and document findings confirmed that developers are happy with the way that the systems are being developed and believe that SDMs are effective and develop systems that work. [AI1, AI2, BI1, BI2, CI1, DI1, DI2, DI3, AD1, and BD2]

Proposition 8

SDMs help to organise BPR plans such that the extent of changes to business processes is related to the extent BPR implementation problems are encountered. [AI1, BI2, DI1, DI2, DI3, AD1, BD1]

5.4 Summary of the measured aspects

The adaptation of SDMs to fit particular BPR projects appears to be common in MHEIs. The results also indicate that SDMs being applied are not emphasizing on some of the most important elements recommended for BPR in merged universities such as organisational strategy. Based on these highlights and other earlier discussions, the study may therefore summarise that the failure to accommodate strategy in SDMs is one of the major reasons why many of the BPR project goals and objectives have been only modestly accomplished.

Other BPR implementation problems mentioned in the literature include:

- The difficulty in having the changes accepted by the stakeholders affected, SDMs have a general lack of the change management aspect. Universities still face a challenge that available SDMs still do not bridge the gap between developers and users or stakeholders as well as capture change management and other important aspects such as cultural and personality diversity, cultural mindset, attitudes as well as customer relations management.
- The mega ICT infrastructures formed as a result of the mergers speared more implementation problems for BPR which is other aspect that SDMs may need to address in future.
- There is general reluctance to commit resources to the BPR efforts from top management while at the same time they demand quick results. Lack of top management commitment always mean that issues of strategy are taken less seriously.

5.4.1 Summary of interview results in Tabular format

The results of the study discussed in previous sections will now be summarised in Table 5.1 below in an attempt to give a bird's eye view on the findings of the study. Table 5.1 is presented according to the major aspects that required answers to be found in the study and not in any order presented before like according to interview or research questions.

	Experience With		SDMs being used	Perceptions with regards to the use of SDMs	SDMs support to strategy	SDMs for BPR	Readiness to adopt new SDMs
	SDMs Years	BPR Years	SDM				
A1							
1	8	15	<ul style="list-style-type: none"> - Agile Rup - Prince, SDLC - ITIL, TOGAF -Agile Scrum 	<ul style="list-style-type: none"> - easy accountability - evidence in the form of documents - less people focused - need to address issues of new developments acceptance 	<ul style="list-style-type: none"> - very little emphasis on inclusion of strategy 	<ul style="list-style-type: none"> - not aware of any specific ones 	<ul style="list-style-type: none"> - need for ones that capture strategy, culture, are cost and time effective, capture the human aspect - some need replacement of phases
2	6	-	<ul style="list-style-type: none"> - ITIL - TOGAF 	<ul style="list-style-type: none"> - 85% success rates -happy - need to bridge gap between users and developers 	<ul style="list-style-type: none"> - not aware of any - suggest there should be more emphasis on strategy 	<ul style="list-style-type: none"> not aware of any specific ones 	<ul style="list-style-type: none"> - need for ones that address buy in issues from stakeholders - willing to adopt productive change - process maybe cumbersome
BI							
1	19	7	<ul style="list-style-type: none"> - In-house - agile RUP -XP, SDLC RAD, JAD 	<ul style="list-style-type: none"> - better understanding of development process - assist them to capture customer relations and change requests 	<ul style="list-style-type: none"> - having no strategy means no thorough planning 	<ul style="list-style-type: none"> - not aware of any 	<ul style="list-style-type: none"> - need for criteria to choose SDMs, SDMs that develop adaptive products, capture beliefs and culture
2	8	5	<ul style="list-style-type: none"> - In-house - agile RUP -XP, RAD - JAD 	<ul style="list-style-type: none"> - control development - formalise development - allows processes to be traceable - solve problems of duplication and fragmentation - cannot distinguish between new and BPR developments 	<ul style="list-style-type: none"> - emphasise more on development 	<ul style="list-style-type: none"> - not aware of any 	<ul style="list-style-type: none"> - willing to take up any recipe that will make their work easier

	Experience With		SDMs being used	Perceptions with regards to the use of SDMs	SDMs support to strategy	SDMs for BPR	Readiness to adopt new SDMs
	SDMs Years	BPR Years	SDM				
CI							
1	2	-	<ul style="list-style-type: none"> - not mandatory - encouraged - derive steps from ITIL, PRINCE, SCRUM 	<ul style="list-style-type: none"> - save time and cost - brings order to the development process - ignore the bigger picture 	<ul style="list-style-type: none"> - there is less emphasis on how strategy is incorporated 	<ul style="list-style-type: none"> - not aware on any 	<ul style="list-style-type: none"> - have the will to take up new ones - believes top management should everyone on board - need ones that allow uniformity
DI							
1	14	5	<ul style="list-style-type: none"> - agile RUP - agile SCRUM - ITIL - PRINCE -CRM, SDLC -Waterfall 	<ul style="list-style-type: none"> - implement systems that work - organise development - following steps is time consuming - too procedural 	<ul style="list-style-type: none"> - aware that most of the SDMs miss out on addressing strategy issues 	<ul style="list-style-type: none"> - not aware of any specific ones - make use of ones meant for new development 	<ul style="list-style-type: none"> - need ones that combine management and customer issues and address issues
2	4	-	<ul style="list-style-type: none"> - ITIL - agile RUP - agile SCRUM - CRM, SDLC 	<ul style="list-style-type: none"> - organise development 	<ul style="list-style-type: none"> - believe strategy should be part of SDMs 	<ul style="list-style-type: none"> - not aware on any 	<ul style="list-style-type: none"> - theirs is already a university driven by innovation - new SDMs will support their mission
3	3	-	<ul style="list-style-type: none"> - ITIL - agile RUP - agile SCRUM - CRM 	<ul style="list-style-type: none"> - allow traceability - give formula for development - cumbersome 	<ul style="list-style-type: none"> - there is very little or no emphasis on strategy 	<ul style="list-style-type: none"> - make use of existent SDMs for new developments 	<ul style="list-style-type: none"> - adapting to change is a tradition for them - need for new developments to address new problems

Table 5.1: Summary of Findings in Tabular Form

5.5 Recommendations

This section presents the recommendations to the study informed from the findings presented in Section 5.7. Muthu et al. (1999) point out that the difference between a methodologist and a terrorist is that you can negotiate with a terrorist, but not with a methodologist. This implies that once an SDM is recommended then system development becomes a straight forward task where simple adherence to the steps stipulated is required. Development is more comfortable where developers believe in following a prescribed way of doing things. This should be done for both new developments and for BPR. Recommendations for future studies in line with SDMs, BPR and strategy are as follow below.

5.5.1 Development of specific SDMs for BPR

Some MHEIs assumed that the written guidance for the steps they follow during development is equivalent to developing their SDM for BPR projects. Developing a SDM wisely means selecting processes to address known risks not only involved with new system development but also with reengineering.

BPR SDMs can share common elements, but it should be noted that simple differences can have a significant impact on the success or failure of a project or organisational performance. In order for an institution aiming to apply BPR to select the best SDM, there is need to sequence processes and implement an appropriate BPR plan. One of the major problems that the MHEIs faced was lake of experienced planners as discussed in Section 2.7.3.

BPR plans must be created with the organisation's effective and actionable mission and vision. Vision in this case refers to the complete articulation of the future state that is the organisational values, processes, structure, technology, job roles and environment. Mission meanwhile refer o the sole purpose of the organisation.

Some recommendations of ideas to be considered for developing SDMs for BPR include the following:

Stakeholder cooperation: the coming together and agreeing of the right combination of individuals form an optimistic and energised BPR team; a team that can stand in the future and look back rather than stand in the present and look forward.

Organisational strategy – should be well defined and understood by all stakeholders affected and should define the scope of the BPR project and achievable objectives should be derived.

Capture the softer side of development – should consider important aspects such as change management and other important aspects such as cultural and personality diversity, cultural mindset, attitudes as well as customer relations management.

BPR SDMs like any other should be divided into model stages as suggested:

Stage 1 - envision: the organisation reviews their existing strategy and businesses processes and identify areas for improvement as well ICT opportunities.

Stage 2 - Initiation: thorough project planning is done where performance goals are set; employees are notified and assigned to project

Stage 3 - Diagnosis: this stage involves the creation of appropriate documentation for processes and sub-processes in terms of process attributes like activities, resources, communication, roles, IT and costs.

Stage 4 - Redesign: the new processes are designed through process design alternatives devised from brainstorming and creativity techniques.

Stage 5 - Reconstruction: management is required apply their techniques to carry everyone on board to assist stakeholder with change management that ensures smooth migration to the new business processes, responsibilities and roles.

Stage 6 - Evaluation: the new processes are monitored to determine if both organisational and ICT strategies were met and establish whether quality requirements were met.

Retrain workers on what BPR actually is

5.5.2 Devising a BPR framework from several SDMs

Document 2 in Section 4.3.2.3 of the study mentioned that existent SDMs make no distinction among BPR projects yet the characteristics of BPR projects differ with each institution because the business processes are different. Instead of adapting or devising a single BPR SDM which will probably address specific situations only, different SDMs may be used on different BPR projects (Kettinger and Grover 2005). SDMs may be adapted on a project by project basis (Smolander et al. 2000). In other words an organisation may devise its own collection or framework that involves a variety of SDMs which they can choose from for each project. Alternatively organisations can develop the framework from a collection of various stages of SDMs that are relevant to their unique settings and then add other stages of

their own provided they strictly consider the BPR characteristics discussed in Section 2.3.3.3. The problem with this approach however is that there is no guidelines as to how adaptation decisions can be made or whether there are any controls over the changes and how well the adapted SDMs frameworks work.

5.6 Limitations and future work

While this study's major objectives were accomplished, it has some limitations which should be viewed as opportunities for future research. The absence of particular SDMs established for BPR capable of capturing strategy has led to a model based on newly suggested constructs.

While this new idea is considered valid by practitioners such as Hammer and Champy (1993) and Davenport (1995) further research should be undertaken to identify further constructs and assess their reliability. Despite these limitations, this study makes a significant contribution as a first attempt at empirically testing many of the scattered opinions and single-case evidence about the use of SDMs during BPR in South African MHEIs.

5.7 Conclusion to the study

In general, the results indicate that SDMs that exist do not put enough emphasis on some of the most important elements of BPR recommended in the BPR literature, such as ensuring the value-added element of every business activity termed strategy. Therefore, one may summarise that therein lies a major reason why many of the BPR project goals and objectives for MHEIs investigated have not accomplished to the fullest or had a lot of implementation problems. The problem of addressing organisational strategy in SDMs while implementing BPR, seem to be rather basic but quite difficult to address in practice.

Before embarking on a BPR adventure, executives should ensure that at least some of the success factors deemed important are operational as discussed in Section 2.4.3.3 of the study. Alternatively, one may summarise that expanding BPR SDMs to include a wider collection of important goals and objectives is a better project organisation thus reducing the intensity and variety of implementation problems anticipated. It is also interesting to note that the extent to which BPR goals and objectives are accomplished is strongly related to the impact BPR has on company performance. Based on the findings of the study as a whole, top managers

should now be aware that they should not to engage in BPR projects unless if it is absolutely necessary or it is a well planned endeavour to reposition the organisation strategically.

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APPENDIX A (INTERVIEW QUESTIONS)

1. General questions

What is your job title, your job description and your job responsibilities?

Are you involved with information systems development?

Are you involved in decisions concerning BPR and to what extend?

How many years of experience do you have in system development and or BPR?

2. The organisational strategy and Business Process Reengineering (BPR)

What major BPR steps have you undertaken in your organisation?

Is it obvious that the organisational strategy are a priority when considering BPR or otherwise?

What has been the impact of BPR decisions that you have made particularly on the organisational strategy?

What do think were the possible causes of this impact?

3. System Development Methodologies (SDMs)

Do you know about SDMs?

What SDMs have you or are you using?

What success factors are involved with this methodology and what are its failures?

What are the main causes of the successes and the failures?

4. If there are no SDMs is there willingness to adopt

Do you think if methodologies were to address the organisational strategy as a priority it would be ideal for the merged higher educational institutions?

Do you think if there were suggested SDMs to be considered for BPR processes that support the organisational strategy it would benefit the higher educational sector?

Do you think higher educational organisations will be willing switch from their current SDMs to try new ones?

LANGUAGE EDITOR'S LETTER



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TO WHOM IT MAY CONCERN

01 June 2012

Dear Sir/Madam

**LANGUAGE EDITORIAL CONFIRMATION FOR CHIPO GETRUDE
MAVETERA; STUDENT NO: 18022782**

The above refers.

I hereby confirm that I did language editing for a 180 pages *Master of Science* in Computer Science dissertation titled: An evaluation of the supportiveness of system development methodologies to strategic goals during business process reengineering

Yours sincerely

Dr Livingstone Makondo
Senior Academic Development Advisor/Senior Instructional Designer