TOWARDS DEVELOPING AN EVALUATION TOOL FOR BUSINESS MANAGEMENT INFORMATION SYSTEMS' SUCCESS AT PUBLIC FURTHER EDUCATION AND TRAINING (FET) COLLEGES IN SOUTH AFRICA

by

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JOINT SUPERVISOR: Prof. ME Herselman

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DEDICATION

To God all the glory

To my father and mother, John and Ruth Briers, whom I love dearly

My husband, Tony, and daughters, Rozanne and Daniela, who have supported and encouraged me every step of the way

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I am grateful to God for giving me the ability to complete this study.

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Title of thesis:

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ABSTRACT

The effective and efficient functioning of Further Education and Training (FET) colleges is pertinent to the development of critical, scarce and intermediate skills for the South African labour market. To this end, business management information systems are pivotal in the efficient and effective running of such institutions.

From a pragmatic, interpretive and post-positivist philosophical paradigm, a mixed-method framework was used to investigate what is necessary in designing an evaluation tool to assist in the evaluation of the success of business management information systems at public FET colleges in South Africa. The study produced a success evaluation model and tool that was empirically tested at one FET college. The findings linked the success of the business management information system to the quality of the information contained in the system and the level of service provided by the system's service provider. The results also revealed that the computer proficiency levels of users and the provisioning of quality training can greatly contribute to the success of a business management information system.

Key terms:

IS success evaluation; success evaluation model; evaluation tool; business management information system; FET college; computer satisfaction; end-user computing satisfaction; IS evaluation construct; DeLone and McLean; D&M Model, information systems.

Student number: 34747788

DECLARATION

I declare that, **TOWARDS DEVELOPING AN EVALUATION TOOL FOR BUSINESS MANAGEMENT INFORMATION SYSTEMS' SUCCESS AT PUBLIC FURTHER EDUCATION AND TRAINING (FET) COLLEGES IN SOUTH AFRICA,** is my own work and that all the sources that I have used or quoted have been indicated and acknowledged by means of complete references.

November 2011

SIGNATURE

DATE

(Mrs MM Visser)

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LIST OF ACRONYMS

ABET	Adult basic Education and Training
ACM	Association for Computing Machinery
ADP	Automatic Data Processing
BAUD	Public Finance Management System
BIS	Business information system
BMS	Business management system
CATI	Computer assisted telephonic interviewing
CINOP	Independent, international research and consultancy agency
COLTECH	Management information system for FET colleges
CUS	Computer user satisfaction
D&M	DeLone and McLean
DBE	Department of Basic Education
DHET	Department of Higher Education and Training
DoE	Department of Education
ECD	Early childhood development
EDP	Electronic data processing
ERP	Enterprise resource planning
EUCS	End-user computing satisfaction
FET	Further education and training
FETMIS	Further education and training management information system
FTE	Full-time equivalent
HSRC	Human Sciences Research Council
ICIS	Integrated compliance information system
ICT	Information and communication technology
IS	Information systems
IT	Information technology

ITS	Integrated tertiary system
LSEN	Learners with special educational needs
MIS	Management information system
NEET	Youth not in education, employment or training
NQF	National Qualifications Framework
NSA	National Skills Authority
NSDS	National Skills Development Strategy
Pastel	Accounting software
PCA	Principal component analysis
REC	Research ethical clearance
SAQA	South African Qualifications Authority
SEM	Structural equation modelling
SERVQUAL	Tool to measure service quality
SETA	Sector Education and Training Authority
SoC	School of Computing
SPSS	Statistical Software Package for Social Sciences
TAM	Technology acceptance model
TRATEC	Management Information System for FET colleges
TTF	Task-Technology Fit Model
UMALUSI	Council for Quality Assurance in General and Further Education and Training
UNISA	University of South Africa
US	User satisfaction
USQAS	User satisfaction with question answering system
UTAUT	Unified Theory of Acceptance and Use of Technology
WAI	Weighted average index

LIST OF VARIABLES

acc	Accuracy variable
bmseval	Overall business management system (BMS) evaluation variable
con	Content variable
dataq	Data quality variable
eoa	Ease of access variable
eof	Ease of functioning variable
eou	Ease of use variable
eucs	End-user computing satisfaction variable
for	Format variable
indi	Individual Impact variable
infq	Information quality variable
orgi	Organisational impact variable
outpq	Output quality variable
serq	Service quality variable
sysq	Systems quality variable
tim	Timeliness variable

CHAPTER 1

INTRODUCTION

1.1 BACKGROUND TO THE RESEARCH

The landscape of public FET colleges in South Africa is constantly changing. Accordingly, this necessitates the continuous change and adaptation of the business management information system(s) (MIS) employed at these institutions. Management information systems are pivotal to the efficient and effective running of any modern business, organisation or institution, including FET colleges (Irani and Love, 2008a). Apart from an extant MIS, it is also accepted that one of the key factors for successful IS planning and implementation is a close link between IS strategy and business strategy (Atkins, 1994, Baets, 1992, Paterson, 2005).

The following discussion illuminates the extensive changes that have taken place in the public FET sector in South Africa over the past two decades (and which it is still experiencing today) and the importance of IS evaluation in this metamorphosis. The developments in the FET sector are discussed in detail in Chapter 3, Section 3.3.

Figure 1.1 depicts the main historical highlights of the FET college sector. Initially, the FET sector consisted of 152 “technical colleges” which is what the colleges were referred to as prior to the commencement of restructuring in 1995. The 152 technical colleges were merged into 50 multi-campus FET colleges. Since the advent of democracy in 1994, many comprehensive changes have occurred in this sector. Transformation started in 1995 with the establishment of the National Qualifications Framework (NQF), which was aimed at promoting the integration of the Education and Training sector under the auspices of the South African Qualifications Authority (SAQA) (Department of Education, 2008a). Further highlights included the promulgation of the Skills Development Act in 1998; the development of the National Skills Development Strategies (NSDS) Phase I, Phase II and Phase III in 2001, 2005 and 2011, respectively; the consolidation of the merger process from 2002 to 2006; the recapitalisation programme implemented from 2006 to 2009; the publication of the National Plan in 2008; and the National Audit in 2011.

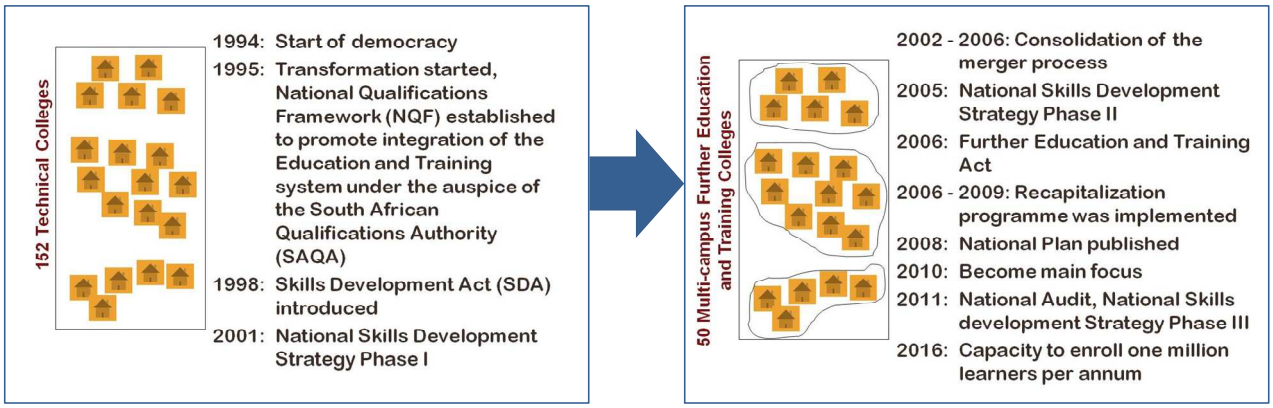


Figure 1.1: Historical highlights in the life of the FET college sector

Concurrent with the changing landscape and the critical need for skills development in South Africa, an urgent need arose for the monitoring and evaluation of systemic and institutional performance and the fostering of public accountability. For the FET system to function optimally it is necessary to reflect on and take stock of its successes and failures in order to consolidate its strengths and improve on its weaknesses. It is for this reason that performance in terms of the objectives set in the National Plan should be monitored and evaluated at both systemic and institutional levels (Department of Education, 2008a).

One of the focus areas of the FET colleges Act (2006) is quality assurance systems; these include the evaluation of the performance of information systems as a key performance indicator of organisational success. One of the strategies proposed to accomplish this is to identify inadequacies in business management information systems at FET colleges, in order to monitor, evaluate and strengthen them (Government, 2006, Department of Education, 2008a, Department of Education, 2008b, Republic of South Africa, 2006, Lund, 2010). After the implementation of the mergers, the substantive integration of college business information systems and processes followed, which reinforced the need for management information systems evaluation.

Evaluation is needed whenever some kind of change occurs to an information system (Tartu Ülikool, 2011). Accordingly, evaluation should address several issues. Some of those which need to be considered in general are the following:

- Does the IS work?

- How does the IS work?
- Why does the IS work?
- Who makes the IS work?
- With whom does the IS work?
- Can the IS be replicated?
- Can the IS be transferred?
- Can the IS be adapted?
- Can the IS be scaled?

This list of questions was adapted from a webpage of the Institute of Computer Science University of Tartu (Tartu Ülikool, 2011) and served as a source of investigative questions for, firstly, the case study considered in this research, which focuses on the public FET college's MIS, and secondly, informing questionnaire development for the survey of MIS users, which was fed into the appropriate evaluation tool.

1.2 PROBLEM STATEMENT AND PURPOSE

The previous section explained the extent of the changes that have taken place in the public FET college sector and the implications these changes have for the MISs employed at these institutions; the section also emphasised the importance of efficient and effective MISs at public FET colleges for monitoring and evaluating key success indicators. The monitoring and evaluation of key success indicators is not only essential for the management of a specific FET college but is also of critical importance for the Department of Higher Education and Training to evaluate its own successes. Thus, it is crucial to be able to evaluate the success of the business MIS implemented at a public FET college. The problem is that no MIS evaluation model specific to South African FET colleges could be found. Therefore there is a need to design and develop such an evaluation model and tool.

In section 1.2.1 the research goal is explicated and, in section 1.2.2, this is decomposed into research questions. In section 1.2.3, the objectives of the study are presented and the fields of investigation are delineated in section 1.2.4. Finally, the rationale for the study is explained in section 1.2.5.

1.2.1 Research goal

The purpose of the study is to investigate the components that are needed to assist in the development of a measuring tool to evaluate the success of the MISs implemented at public FET colleges. In order to reach this goal it was necessary to investigate three knowledge domains, that is, information systems evaluation, public FET colleges and business information systems (BISs).

1.2.2 Research questions

Based on the background and problem statement provided, this study addressed the following main research question:

What is necessary in designing an evaluation tool to assist in the evaluation of MIS success at public FET colleges in South Africa?

The following sub-questions need to be investigated to facilitate the investigation of the main research question:

1.2.2.1 What types of evaluation models and tools exist for MISs?

1.2.2.2 What types of information systems exist at public FET colleges?

1.2.2.3 Which variables need to be included in an evaluation tool to enable effective measurement of success of the MIS at public FET colleges?

1.2.3 Objectives of the study

The objectives of the study, based on the main research question and the sub-questions presented in section 1.2.2, can be articulated as follows:

- To review and interrogate the usefulness of existing tools and models for evaluating MIS success at public FET colleges. This includes the evaluation of the proposed or selected tool in terms of its applicability to public FET colleges in SA.
- To review literature on FET colleges' documentation including business plans, strategies on the implementation of the MIS, user manuals and user requirement statements, as

well as semi-structured interviews with information technology (IT) and MIS managers in order to understand the type of MIS and establish the relevant stakeholders involved in the operation of the MIS.

- To evaluate existing variables for inclusion in the survey instrument(s) that will eventually be fed into the selected model.
- To make recommendations if necessary for improving the MIS at public FET colleges in South Africa.

1.2.4 Fields of investigation

As mentioned above, there are three main knowledge domains that need to be investigated in order to address the main research question and the sub-research questions effectively:

- Information systems evaluation theory and models
- Public FET colleges in SA – history and MISs implemented
- BISs

1.2.5 Rationale

The government of South Africa, through the Department of Higher Education and Training (in the light of the enormous shortage of intermediate and artisanal skills in SA), is prioritising the development and growth of the FET sector (Department of Education, 2008a, Department of Higher Education and Training, 2011). Consequently, the constantly changing landscape of public FET colleges necessitates the on-going change, adaptation and merging of the MISs employed at these institutions. Furthermore, management information systems (MISs) and the ability to evaluate the success of these systems are pivotal to the efficient and effective running of any modern business, organisation or institution, including FET colleges (Irani and Love, 2008a). This study concentrated on investigating the subject of MIS success evaluation in one public FET college in depth, rather that covering many FET colleges (in width) with little information on the subject. This research is innovative in the sense that no evidence could be

found where an IS success evaluation model has been applied to a public FET college in South Africa.

1.3 LITERATURE REVIEW

The literature review conducted for this study covered the knowledge domains as specified in Figure 1.2. This figure presents the three main knowledge domains as well as the main keywords for the literature searches. The third knowledge domain (Business Information Systems) was included to enhance the understanding of the context of MIS within business management systems (BMS). Therefore reporting on the literature review of the second and third knowledge domains were combined and presented in chapter 2. The focus of the review was to understand different extant models of IS success evaluation in order to select or develop a suitable model for application to a selected public FET college in South Africa.

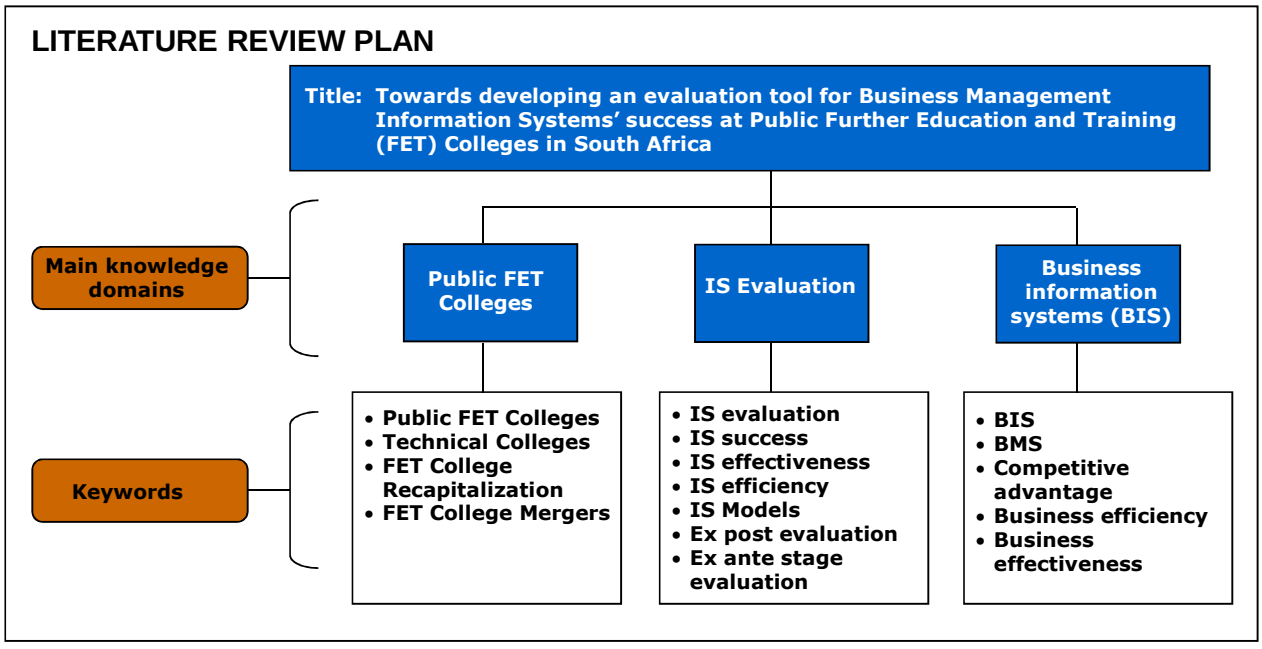


Figure 1.2: Literature review structure as derived from the research questions

Literature on the history of Information Systems as a discipline and the development of models for evaluating information systems success, as well as studies on the empirical testing of these models were investigated. Similarly, the history and development of public FET colleges in general was also investigated. One public FET college was selected as a case study in which all aspects of the MIS were investigated, including the scrutiny of strategic documentation, user

manuals and user requirement statements. Authors who are known for having done or are doing research or are being extensively cited in various publications on the evaluation of information systems success are the following:

- WH DeLone and ER McLean – known for the DeLone and McLean (D&M) Success Model described in the seminal 'Information systems success: The quest for the dependent variable' (DeLone and McLean, 1992) and 'The DeLone and McLean Model of Information Systems Success: A ten-year update' (DeLone and McLean, 2003)
- PB Seddon – carried out a re-specification and extension of the DeLone and McLean Model of IS Success. A context matrix for the selection of success measures that consists of different combinations of stakeholders and types of information systems was also proposed (Seddon, Staples, Patnayakuni & Bowtell, 1999). Seddon together with a different group of researchers did research on the measuring of organisational IS effectiveness with the focus on perspectives of senior management (Seddon, 1997, Seddon, Graeser & Willcocks, 2002, Seddon et al., 1999).
- J Palmius – explicated criteria for measuring and comparing information systems (Palmius, 2007).
- BL Myers – proposed a comprehensive model for assessing the quality and productivity of information systems function (Myers, Kappelman & Prybutok, 1997). The topic of his PhD thesis is 'Information systems assessment: Development of a comprehensive framework and contingency theory to assess the effectiveness of the information system function' (Myers, 2003).
- GG Gable, D Sedera and T Chan – contributed with a re-conceptualisation of IS success as a formative, multidimensional index. Such a validated and widely accepted index would facilitate cumulative research on the impact of information systems, while at the same time providing a benchmark for organisations to track their own performance (Gable et al., 2008).
- G Torkzadeh and WJ Doll – conducted research on the development of a tool for measuring the perceived impact of information technology on work (Torkzadeh and Doll,

1999). Their research contributed to the measurement of end-user computing satisfaction (Doll and Torkzadeh, 1988, Torkzadeh and Doll, 1999).

1.4 IMPORTANCE OF THE STUDY

This study constructs a conceptual framework that informs the design of an information systems success evaluation model (graphical representation of success evaluation constructs) and develops a success evaluation tool (questionnaire) by using knowledge and trends in the field of Information Systems Evaluation and taking into account the requirements of South African policy with regard to the administration and functioning of public FET colleges.

The implementation of the college mergers, as already described, were accompanied by challenges related to the substantive integration of college business systems and processes. In a recent institutional audit of public FET colleges, it was found that very few had taken steps to integrate their administrative, management, IT and communication systems (Cosser, Kraak & Winnaar, 2011). The challenge is, therefore, to establish administration systems, information technology infrastructure and MIS to ensure the full merger of all functions at the various sites (campuses) and align their delivery towards the new FET college mission and mandate (Department of Education, 2008a).

The National Department of Education has committed to the establishment of a MIS in all public FET colleges that will enable colleges to monitor and account for all their administrative business processes. Such processes include student administration, academic administration, financial administration, human resource management and development, and asset management (Department of Education, 2008a, Department of Higher Education and Training, 2011).

1.5 RESEARCH METHODOLOGY

This study applied a mixed-method framework with a concurrent triangulation design strategy, as defined by Creswell (2009:228), that implemented qualitative and quantitative approaches. Quantitative and qualitative data were gathered concurrently and were then compared to

determine whether there was convergence, differences or some combinations (convergent parallel design).

The underlying philosophical paradigm of this research is pragmatism (Creswell, 2009, Creswell and Clark, 2011). The research is problem-centred, consequence-oriented and pluralistic in method. Two strategies, namely a case study (qualitative framework in an interpretive philosophical paradigm) and a survey (quantitative framework in a postpositive philosophical paradigm), were applied. Accordingly, one public FET college was purposefully selected as a case study. In addition, the sampling of participants for interviewing was purposive, as the participants included Department of Higher Education and Training (DHET) officials, MIS developers, the MIS and the IT managers at the selected public FET college, as well as a sample of MIS users at the college (qualitative data). Furthermore, the entire population of MIS users at the selected public FET college was surveyed (quantitative data).

The literature review informed the development of a conceptual information systems success evaluation model and an evaluation tool (questionnaire) which was subsequently applied to the selected public FET college in the form of a survey.

Finally, the following data gathering methods were used in the research: literature review, document analysis, survey questionnaire, and unstructured and semi-structured interviews.

The matrix in Table 1.1 relates the sub-research questions to the strategy, the data gathering methods and the data analysis methods that were used to collect and analyse the data and information that support the probing of the main research question. More detailed information on the methodology is provided in chapter 4.

Table 1.1: Sub-research questions categorised by strategy, type of data collection instrument and data analysis method used

Research question		Research strategy	Data gathering methods					Data analysis methodology
Main question	What is necessary in designing an evaluation tool to assist in the evaluation of MIS success at public FET colleges in South Africa?		Literature review, documents	Structured questionnaires	Semi-structured interviews and audiotapes	Observations and photographs	Anecdotal records	
Sub-question 1	1.2.2.1 What types of evaluation models and tools exist for MISs?	Case study	√					Qualitative
Sub-question 2	1.2.2.2 What types of information systems exist at public FET colleges?	Case study	√		√	√	√	Qualitative
Sub-question 3	1.2.2.3 Which variables need to be included in an evaluation tool to enable effective measurement of success of the MIS at public FET colleges?	Survey	√	√	√		√	Quantitative

1.6. PROPOSED CONTRIBUTION

The study contributed to an improved understanding of the

- types of existing information systems evaluation models and tools
- types and characteristics of the users involved in MIS at public FET colleges
- types of information systems that exist at public FET colleges in SA
- variables needed by an evaluation tool to enable effective evaluation of MIS success at public FET colleges
- most importantly, an information systems success evaluation model and tool for public FET colleges.

1.7 DELINEATIONS, LIMITATIONS, ASSUMPTIONS AND FUTURE RESEARCH

The delineation of the scope of this study was such that only one public FET college was purposefully selected. The MIS implemented at this college served as the object for success evaluation. Accordingly, the information systems success evaluation model and tool developed in this research were applied to the FET college selected. In view of the fact that only one FET college was selected, the generalisability of the findings across FET colleges is limited; however, it is not limited internally within the selected college.

The assumptions of this study are that concepts such as *ease of use*, *effectiveness*, *efficiency*, and so on, as defined in Chapter 2, Section 2.5, are used from a MIS evaluation perspective and not from a human computer interaction (HCI) perspective.

This study could be extended in future research to include all public FET colleges in South Africa, which could eventually lead to an index of IS success in public FET colleges.

1.8 ETHICAL CONSIDERATIONS

The study proposal, the consent form and the tools developed (survey instruments: questionnaire, interview schedules as presented in Appendices 2, 3 and 4 respectively) have been presented to the University of South Africa's (UNISA) and the Human Sciences Research Council's (HSRC) ethics committees for ethical clearance. This was done after the research proposal and the survey instruments had been finalised. More detailed information on ethical clearance is given in Chapter 4, Section 4.9. The approval of the UNISA and the HSRC ethics committees is attached as Appendices 6 and 5 respectively.

1.9 RESEARCH PLANNING

The proposed research framework and data collection schedules (phases, instruments and time lines) are presented as Appendix 1.

1.10 CHAPTER MAP

Figure 1.3 depicts a chapter map for this study. Chapter 1 provided an introduction to the study; while Chapters 2 and 3 contain literature reviews on IS success evaluation models and tools and

the public FET sector respectively. Chapter 4 explains the research methodology applied in this research; Chapter 5 contains empirical evidence for the study and Chapter 6 concludes with the syntheses, findings, discussions, limitations and recommendations of the study.

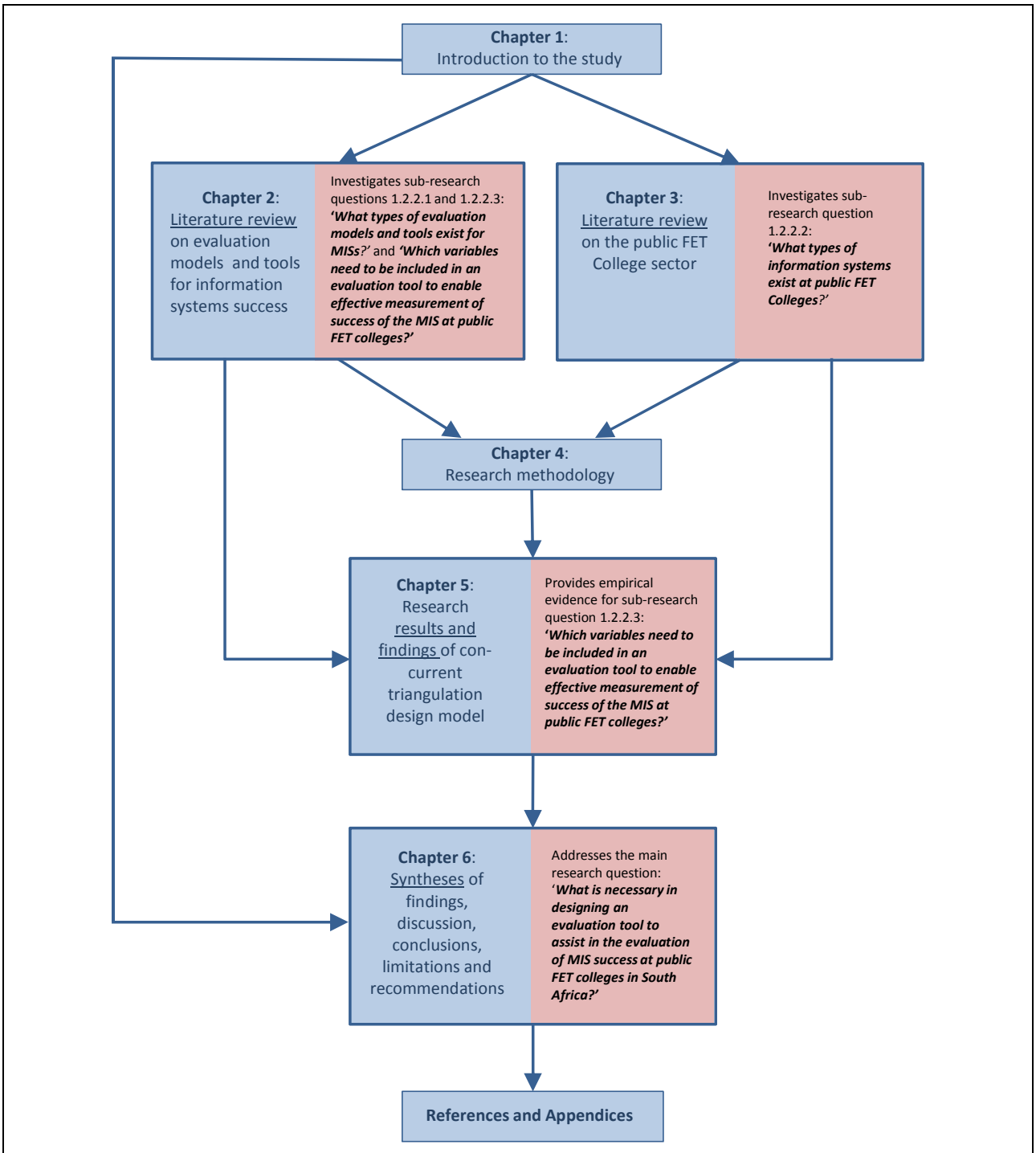


Figure 1.3: Chapter map for this study

1.11 SUMMARY

Chapter 1 provided an introduction to the study with particular emphasis on the background, research problem, aim and objectives of the study, the theoretical framework and the significance, assumptions, limitations and proposed contribution of the study.

The intention of this study is to constructs a conceptual framework that informs the design of an information systems success evaluation model (graphical representation of success evaluation constructs) and develops a success evaluation tool (questionnaire) by using existing knowledge and trends in the field of Information Systems Evaluation and taking into account the requirements of South African policy with regard to the administration and functioning of public FET colleges. It then applies the success evaluation tool to one purposively selected public FET college and analyses the results.

Although the research design and methodology were discussed briefly in this chapter, they are described again in more detail in Chapter 4.

The study contributes to an improved understanding of extant IS success evaluation models in the literature and the requirements and functioning of MIS employed at public FET colleges. The main contribution is an IS success evaluation model and tool for public FET colleges in South Africa.

CHAPTER 2

LITERATURE REVIEW

EVALUATION MODELS FOR INFORMATION SYSTEMS SUCCESS

2.1 INTRODUCTION

In this chapter a literature review on the evaluation of information systems success will be presented following the topical outline depicted in Figure 2.1.

Section 2.2 describes the literature review approach, section 2.3 identifies the sources of the literature review and section 2.4 discusses the purpose of the literature review. Key concepts of the IS success evaluation knowledge field are presented in section 2.5 and a brief overview of the history of IS success evaluation is presented in section 2.6. A description of the development of extant models for IS success evaluation that was found in the literature is given in section 2.7. These existing models have been compared and reviewed for suitability and applicability to public FET colleges in South Africa and a motivation for the selected base model is given in section 2.8. In section 2.9, the various constructs and effectiveness measures identified for the study model are explicated. Thereafter, a discussion on the process that led to the construction of the MIS evaluation tool for this study is provided in section 2.10. The proposed theoretical model for the evaluation of MISs at public FET colleges in South Africa is presented in section 2.11 and this model provides the framework for the development of the survey instrument (tool) that was used in this study.

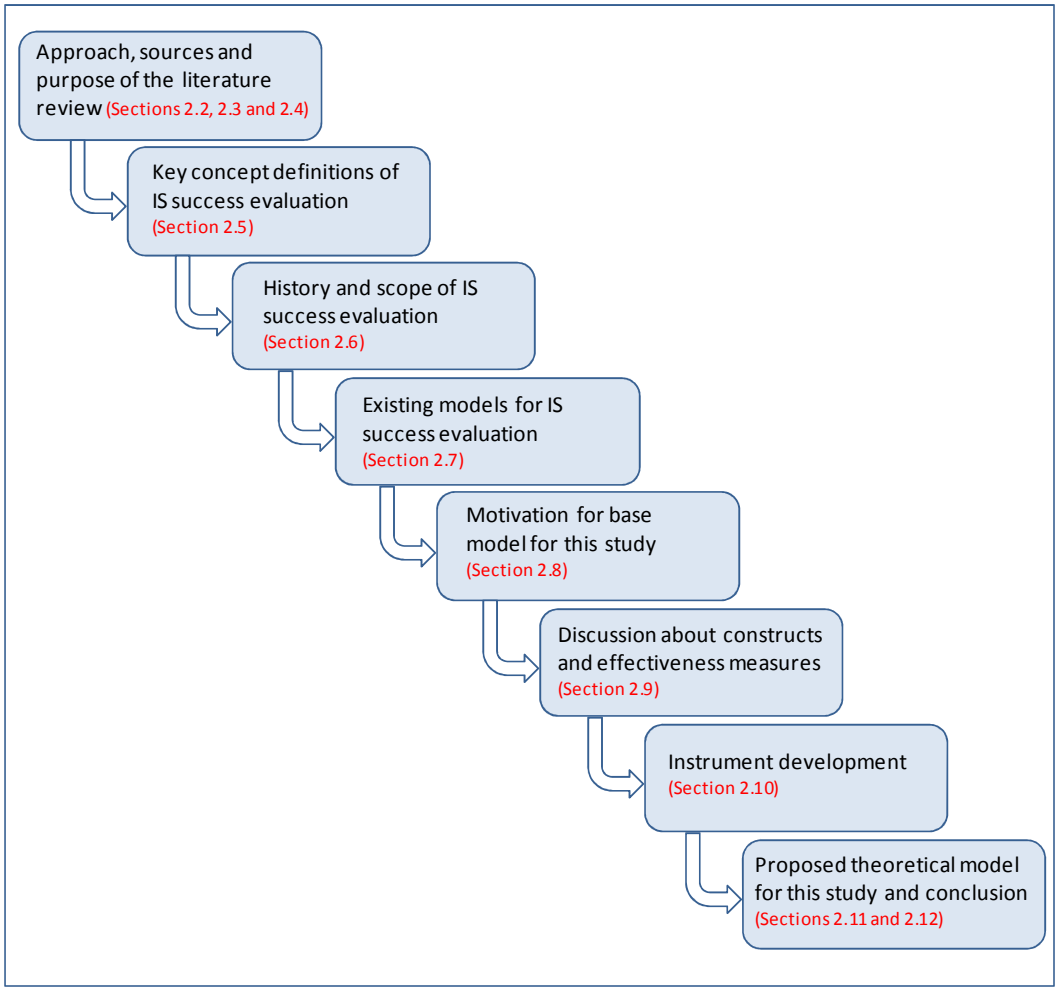


Figure 2.1: Topical outline of Chapter 2

2.2 A SYSTEMATIC LITERATURE REVIEW

Okoli and Schabram (2011:7) discuss the need for, and value of certain methodology when conducting a systematic literature review and present an eight-step guide for doing so. According to these authors, the proposed steps are essential for scientifically rigorous research. The eight steps recommended in the guideline are presented in Table 2.1. These guidelines have been developed from rigorous, standardised methodologies applied in the health sciences and other fields and are virtually unknown in information systems research (Okoli and Schabram, 2011). The authors claim that their guidelines are particular to the needs of information systems researchers because they respond to the field's balance of quantitative and qualitative methodologies. This literature review was account of the proposed guidelines.

Table 2.1: An eight-step guide to conducting a systematic literature review (Okoli and Schabram, 2011)

Step	Guideline	Description
1.	Purpose of the literature review	The first step in any review requires the reviewer to clearly identify the purpose and intended goals of the review. This is necessary for the review to be explicit to its readers.
2.	Protocol and training	For any review that employs more than one reviewer, it is critical that the reviewers be completely clear and in agreement about the detailed procedure to be followed. This requires both a written, detailed protocol document, and training for all reviewers to ensure consistency in the execution of the review.
3.	Searching for the literature	The reviewer needs to be explicit in describing the details of the literature search, and needs to explain and justify how the comprehensiveness of the search was assured.
4.	Practical screen	Also known as screening for inclusion, this step requires that the reviewer be explicit about what studies were considered for review, and which ones were eliminated without further examination (a very necessary part of any literature review). For excluded studies, the reviewer must state what the practical reasons were for their non-consideration, and justify how the resulting review can still be comprehensive given the practical exclusion criteria.
5.	Quality appraisal	Also known as screening for exclusion, the reviewer needs to explicitly spell out the criteria for judging which articles are of insufficient quality to be included in the review synthesis. All included articles need be scored for quality, depending on the research methodologies employed by the articles.
6.	Data extraction	After all the studies that should be included in the review have been identified, the reviewers need to systematically extract the applicable information from each study.
7.	Synthesis of studies	Also known as analysis, this step involves combining the facts extracted from the studies using appropriate techniques, whether quantitative, qualitative, or both.
8.	Writing the review	In addition to the standard principles to be followed in writing research articles, the process of a systematic literature review needs to be reported in sufficient detail so that the results of the review can be independently reproduced.

2.3 SOURCES FOR A LITERATURE REVIEW

Apart from being aware of and following a systematic methodology in conducting a literature review, it is also important to know which sources one can consult in conducting such a review. In a presentation on research methodologies at the University of Fort Hare, Herselman (2011) identifies the main categories of literature review sources and gives examples of each category. The author identifies three categories of literature sources: primary, secondary and tertiary – refer to Figure 2.2 for lists of these categories of sources. The author also notes that the use of primary sources allows for reporting on detail, while the time to prepare a document for publication increases with the increased use of tertiary sources. The author further provides a comprehensive list of types of secondary source (see Figure 2.3).

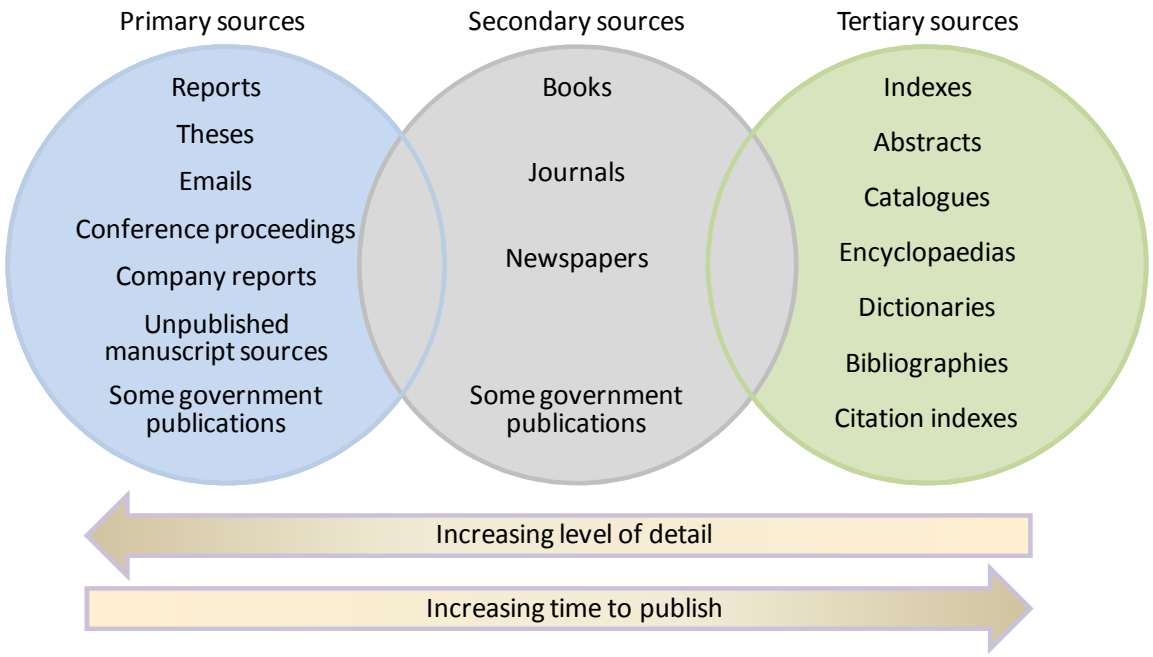


Figure 2.2: Literature review sources (Herselman, 2011)

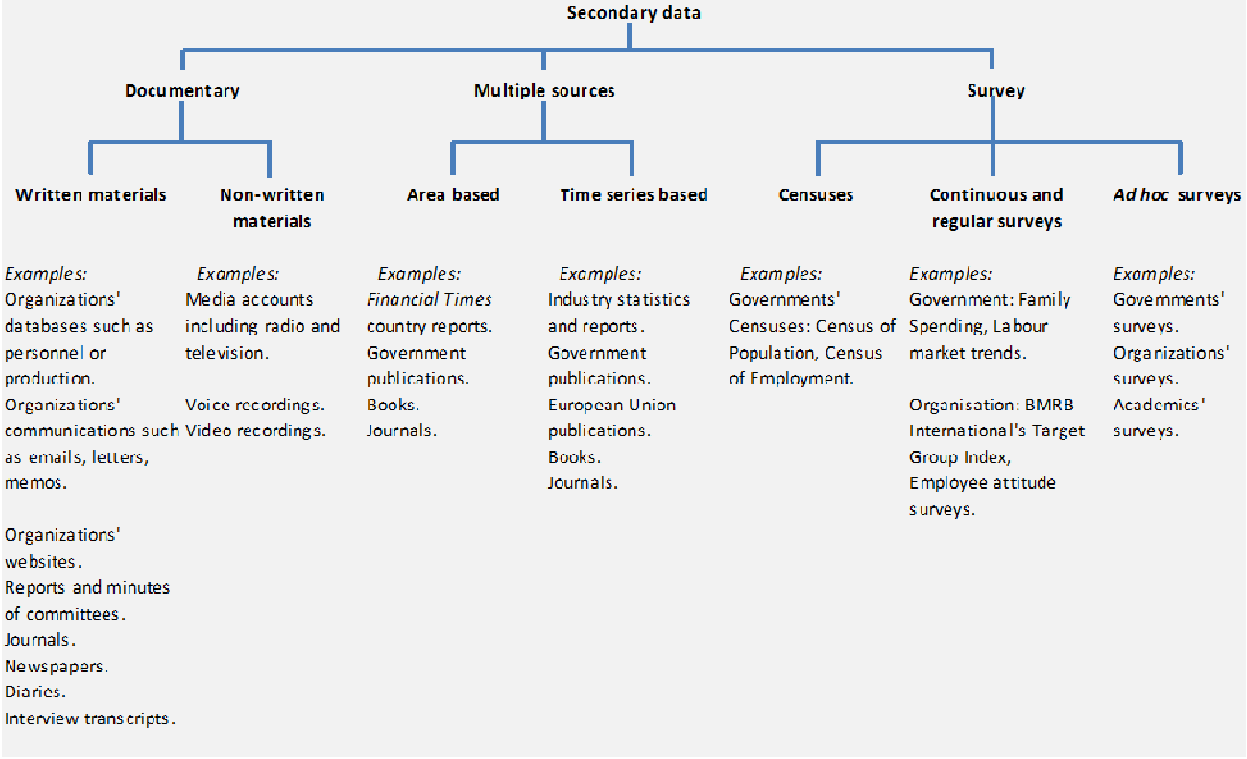


Figure 2.3: Classification of secondary literature review sources (Herselman, 2011)

2.4 PURPOSE OF THE LITERATURE REVIEW

A literature review accomplishes several purposes. In order to contextualise a research problem, researchers need to familiarise themselves with existing knowledge. Existing knowledge can be obtained from a critical review of the literature on the relevant topic, through discussions with experts in the same field of work or by communicating with researchers who have concerned themselves with similar problems. This review also shares with its readers the results of other studies that are closely related to this study, and relates this study to the larger ongoing dialogue in the literature, filling in gaps and extending prior studies (Creswell, 2009:25). A literature review involves the following actions: searching, obtaining, assessing, reading, critically evaluating (understanding, forming conclusions), recording and writing critical summaries about information that was published on a particular topic, as well as relevant information on the methodologies and instruments used in previous studies (Oates, 2006:80).

In this research , the objective of the literature review was to learn more about the history and development of information systems (IS) success evaluation in order to contextualise the key objective of the review, namely to investigate existing models and tools for the evaluation of information systems success (cf. Chapter 1, section 1.2.3). The conclusive aim of the review was to utilise the existing knowledge on the evaluation of IS success to determine the key variables needed in the design and development of an extended and/or amended and refined tool to apply to a selected public FET college in South Africa (cf. Chapter 1, section 1.2.2.3). In order to understand the domain of IS evaluation it is necessary to explain a few keywords and definitions.

2.5 KEY CONCEPT DEFINITIONS

Extensive literature searches were conducted by initially searching using the following key words: IS success, IS effectiveness, IS models, IS evaluation, IS efficiency, business management information system, MIS, competitive advantage, business efficiency, business effectiveness (cf. Chapter 1, Figure 1.2). Subsequent literature searches were based on and led by what was found in the literature obtained by the initial searches.

In this section, the key concepts in the study field of Information Systems applicable to this study are given to assist in understanding the discussions in the following sections. Descriptions of the following concepts are given: IS discipline/IS knowledge domain, information systems, business management information systems, model, success evaluation, effectiveness, efficiency, system quality, information quality, service quality, system use, user satisfaction, net benefits, individual and organisational impact.

2.5.1 IS discipline (IS knowledge domain)

The discipline of IS is 'a branch of instruction or learning' that has an agreed general area for teaching, research and practice (Avison and Elliot, 2006). The information systems field is a 'pluralistic field founded on knowledge from other more established source disciplines and frequently borrowing from these disciplines' (Avison and Elliot, 2006:3). Information systems emerged as a discipline in the 1950 and 60s. It has struggled to define itself, its scope and its relationship with its neighbouring disciplines in the computing and management arenas. Nevertheless, it has grown into a diverse and busy community (Clarke, 2008:47). Hamilton and Ives (1983:3) note the need for 'interdisciplinary communication with the established fields of computer science, management science, behavioural science, management and accounting' with which the IS field intersects, to encourage unification of the IS field. Baskerville and Myers (2002:8) advance the vision of the information systems (IS) field as a reference discipline, because this knowledge field was increasingly better placed to contribute to research in related fields. Satish Nambisan (2003:13) further extends this discourse through research conducted with the specific objective of demonstrating how the information systems field can serve as a reference discipline for the field of new product development.

2.5.2 Information systems

The *Encyclopedia of Information Systems*, *Volume 4* (Kim, Garrity and Sanders, 2004:299), defines an information system (IS) as follows:

> A purposeful entity composed of interdependent computer-based technology and human components that are unified by design to accomplish one or more objectives. Thus, by

> definition, an information system (IS) is a tool. When evaluating the success of a tool, it is imperative to assess the tool's effectiveness in a particular context and relative to its intended purpose. Therefore, IS success factors should be used to pinpoint how effective an IS tool is in a particular context toward achieving organizational and individual goals.

The *Encyclopedia of Computer Science* provides a similar uncomplicated definition – 'a collection of people, procedures, and equipment designed, constructed, operated, and maintained to collect, record, process, store, retrieve, and display information' (Teichroew, 2003:865).

The literature review furthermore revealed that different types of information systems exist: ESS (executive support systems), MIS (management information systems), DSS (decision support systems), KMS (knowledge management systems), TPS (transaction processing systems) and OAS (office automation systems). These ISs are associated with different groups of people within an organisation (Euromed Marseille School of Management, 2010a). The most common types of information systems in an organisation are illustrated in Figure 2.4. Although there are several different versions of the pyramid model depicted in this figure, the most common version according to the Euromed Marseille School of Management is probably a four-level model based on the people who use the systems. Basing the classification on the people who use the information system means that many of the other characteristics, such as the nature of the task and informational requirements, are taken into account more or less automatically (Euromed Marseille School of Management, 2010b).

Based on Figure 2.4, management information systems (MISs) are management-level systems that are used by middle managers and supported by workers to help ensure the smooth running of the organisation (in this study the FET college) in the short to medium term. The highly structured information provided by these systems allows managers to evaluate an organisation's performance by comparing current with previous outputs (Euromed Marseille School of Management, 2010b).

King (2003:115) defines MIS as a 'field of practice, study and research that focuses on the way computer and communications technology can be more efficiently and effectively employed by organisations and individuals to achieve their organisational, group and personal goals'.

Furthermore, MIS and the information it generates are generally considered essential components of 'prudent and reasonable business decisions' (USA Department of Treasury, 1995:1). In addition, research in the MIS field is defined as the 'systematic investigation of the development, operations, use and/or impact of an information system in an organisational environment' (Ives et al., 1980:910).

In this study reference to a MIS refers to a management information system mainly concerned with internal sources of information where the MIS take data from the transaction processing systems of the FET college and summarizes it into a series of management reports.

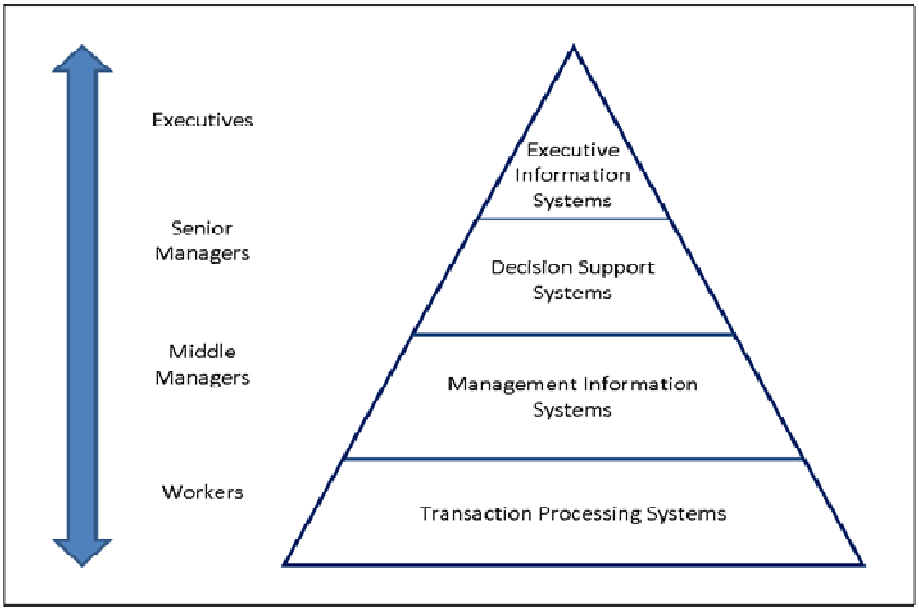


Figure 2.4: A four-level pyramid model of the different types of information systems based on the different hierarchical levels (staff levels) in an organisation (Euromed Marseille School of Management, 2010a)

2.5.3 Business Information System (BIS)

A business information system includes all types of information system, computers and computer technology, application software in a business environment. A BIS integrates data from all the departments and systems it serves and provides operations and management with the information they require. Components of BIS are illustrated in Figure 2.5 as adapted from the *Computer Desktop Encyclopedia* (1998). This study focuses on one component of a BIS in the context of an educational environment namely the MIS deployed at a public FET college.

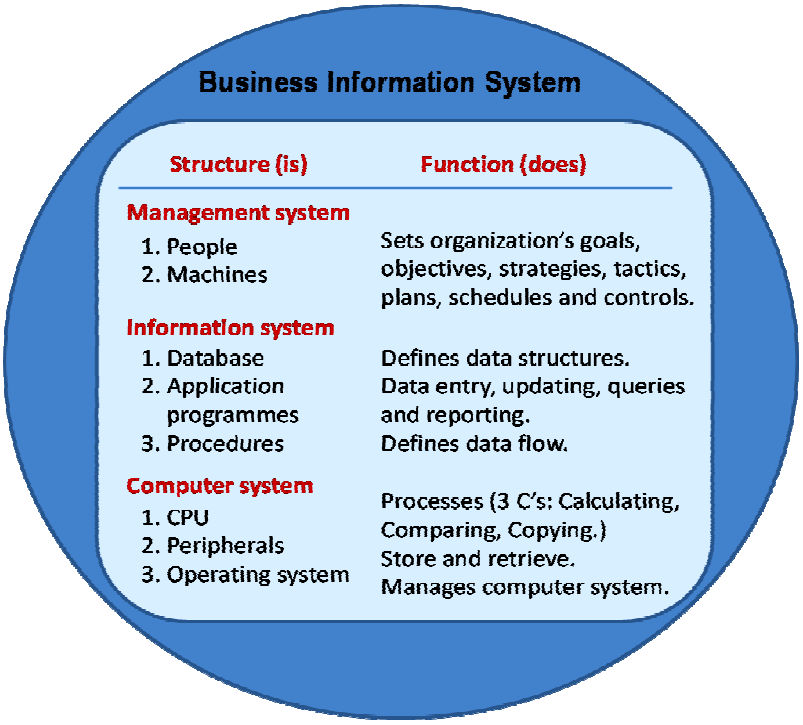


Figure 2.5: Components of a BIS (adapted from *Computer Desktop Encyclopedia,* 1998)

2.5.4 Model

According to Dictionary.com's (Dictionary.com, 2011) definition, a model is usually a three-dimensional representation of a person or thing or of a proposed structure, typically on a smaller scale than the original. The most suitable description of a model for this study was given by Benjamin Tomhave. He defines a model as 'an abstract, conceptual construct that represents processes, variables, and relationships without providing specific guidance on or practices for implementation' (Tomhave, 2005:8). In this study a model thus refers to a conceptual model of concepts/constructs (evaluation model for assessing MIS success) specifically used to evaluate the success of the MIS at the selected public FET college. According to Gregory (1993:333), a conceptual model is not intended to represent what exists but to represent a view of what could exist.

2.5.5 Success evaluation

According to Kim, Garrity and Saunders (2003:299), information systems success is a 'measure of the degree to which the person evaluating the system believes that the stakeholder is better

off after implementing and using the system'. This study investigates the beliefs and perceptions of MIS users about the success of the IS implemented at the public FET college selected. There are various internal and external interest groups in organisations such as public FET colleges that have varying expectations of IS performance. These include stakeholders, employees, students, managers, lectures, firms and government. The focus when measuring IS success is on investigating the effect of a system on individual performance, business process performance and organisational performance (Kim et al., 2003:299).

2.5.6 Effectiveness and efficiency

According to Hevner, March, Park and Ram (2004:75), information systems are implemented within an organisation (including public FET colleges) for the purpose of improving the effectiveness and efficiency of that organisation. The capabilities of the information system and the characteristics of the organisation, its work systems, its people, and its development and implementation methodologies, together determine the extent to which that purpose is achieved (Silver, Markus & Beath, 1995).

The term *effectiveness* is defined as the 'degree to which the level of performance conforms to a pre-established goal' (King, 2003:115). Thus, to be effective a system has to allow people to do the right things.

The term *efficiency* refers to performing or functioning in the best possible manner with the least waste of time and effort. Efficiency can be measured by the 'unit output per unit of input' from an activity or process (King, 2003:115).

2.5.7 System quality

System quality is the desirable characteristics of an information system. It includes attributes such as ease of use, system flexibility, system reliability and ease of learning, as well as system features of intuitiveness, sophistication, flexibility and response times (Petter, Delone & McLean, 2008:239).

2.5.8 Information quality

This refers to the desirable characteristics of systems' outputs, which are used in management reports and Web pages. For example, relevance, understandability, accuracy, conciseness, completeness, currency, timeliness and usability (Petter et al., 2008:239).

2.5.9 Service quality

Service quality refers to the quality of the support that system users receive from the IS department and the IT support personnel, including aspects such as the responsiveness, accuracy, reliability, technical competence and empathy of the personnel staff. SERVQUAL is a tool in the form of a questionnaire that was adapted from the field of marketing and is a popular instrument for measuring the service quality of IS (Jiang et al., 2002:146, Pitt et al., 1995:173). Landrum, Prybutok, Zhang and Peak (2009:18) note that service quality can be measured as the gap between the service that customers expect and the performance they perceive they have received.

2.5.10 System use

System use is the degree and manner in which staff and customers utilise the capabilities of an information system. This includes characteristics such as amount of use, frequency of use, nature of use, appropriateness of use, extent of use and purpose of use (Petter et al., 2008:238).

2.5.11 User satisfaction

User satisfaction refers to users' level of satisfaction with reports, websites and support services. The most widely used multi-attribute instrument for measuring user information satisfaction can be found in Ives, Olson and Baroudi (1983). According to Freeze (2010:174) user satisfaction is a measure of the 'successful interaction' between an information system and its users. It is also defined as the extent to which users believe that the information system meets their needs (Ives et al., 1983). If a system meets the requirements of the users, their satisfaction with that information system will be enhanced (Bharati, 2003).

2.5.12 Net benefits

The term *net benefits* refers to the extent to which IS are contributing to the success of individuals, groups, organisations, industries and nations; for example, improved decision making, improved productivity, increased sales, reduced costs, improved profits and market efficiency, as well as increased consumer welfare, job creation and economic development. Hence, production economics has been used to measure the positive impact of IT investments on firm-level productivity (Petter et al., 2008, Brynjolfsson et al., 2002).

In this study the term *net benefits* include the terms ***organisational impact*** and ***individual impact***. *Organisational impact* represents the firm-level benefits received by an organisation because of IS applications (Gorla , N., Somers, T. M. & Wong, B, 2010:211), while *individual impact* is a measure of the extent to which the information system has influenced the capabilities and effectiveness, on behalf of the organisation, of key users (Gable et al., 2008:389).

Section 2.5 explains the most commonly and frequently used keywords in the subject field of IS success evaluation. In order to be able to understand the context and background of this subject, it is now important to consider the development path of the subject of IS success evaluation. Accordingly, the history in the development of IS success evaluation is considered in section 2.6.

2.6 BRIEF HISTORY AND SCOPE OF THE DEVELOPMENT OF IS SUCCESS EVALUATION

The discipline of information systems emerged in the 1950s/60s and grew rapidly, especially as a result of the increasing use of digital computers in business (Irani and Love, 2008b). The first business application was rolled out in 1953 (Hally, 2005). At that time, what practitioners were doing under the headings of electronic data processing (EDP) and automatic data processing (ADP) were starting to be formalised by specialist consultants like Isaac Auerbach (Auerbach Associates was founded in 1957). By mid 1960, universities had begun to establish courses, do research and start developing a theoretical base for scholars and practitioners (Irani & Love, 2008b). Subsequently, the IS discipline developed from its initial 'techno-centric' focus to a

more integrated technology, management, organisational and social focus (Avison and Elliot, 2006:5).

From the earliest days, the problem of justifying and auditing investments in the development and operation of these EDP systems was recognised and addressed by the 'mushrooming' IS community (Irani and Love, 2008a). Textbooks covering the auditing of systems, and symposia and conferences on the economics of EDP were published as early as 1961 (Frielink, 1961). In the United Kingdom, a working party comprising practitioners from commerce and administration and consultants and academia was set up by the National Computing Council to report on the state of practice with regard to both the justification for investment and the measurement of the impact of the implementation of IS in the UK (Irani and Love, 2008b). Morris et al (1971) reported that the business community expressed its concern about the problem of assessing the value of its innovative IS and especially about the failure to measure the value of the impact compared to expectations.

By the 1980s, it was becoming clear that the growing investment in information technology (IT) systems was not having the expected benefit either at the level of the economy or the level of the company (Irani and Love, 2008b). Further research showed the contrary, and problems with econometric measurement techniques and lags in achieving the expected benefits from ICT contributed to this impression and paradox (Irani and Love, 2008b).

In the decades that followed surveys of computer managers, conducted by academics and consultants, listed the evaluation of IS success as one of the top issues of concern (Al-adaileh, 2009, Grindley, 1991). The academic community, hardware and software vendors and consultants responded by publishing prescriptions on how to solve the problem of IS success evaluation (Ahituv, 1980, Bailey and Pearson, 1983, Bresnick and Schaeffer, 1999, Chang and King, 2000, DeLone and McLean, 1992, Gallagher, 1974, Myers et al., 1997, Seddon and Kiew, 1996).

At the same time, a plethora of literature grew up which included reviews of practices, reviews of the methods formulated, theoretical and pragmatic insights into the problem, and case studies for students and practitioners (Irani and Love, 2008b).

The discussion above lays emphasis on the importance of IS success evaluation and raises the question of how IS are currently being or have been evaluated in the past. The following section will explore the different ways or models found in the literature on IS evaluation. The underlying theory(ies) for each model is(are) also presented. Section 2.7 specifically addresses the sub-research question stated in Chapter 1, section 1.2.2.1, namely, *What types of evaluation models and tools exist for MISs?*.

2.7 MODELS FOR IS SUCCESS

Researchers in the IS field make use of many different theories (paradigms) in their research – the website, *Theories used in IS research* (York University, 2010) notes more than eighty different theories that have been used in IS research. The five most frequently used and most popular theories, according to the authors of this website, are the following:

- Delone and McLean IS success model
- organisational culture theory
- critical realism theory
- diffusion of innovations theory
- contingency theory

Since the focus of this study is on IS success evaluation models and tools, some of the most frequently used and cited of these models found in the literature are briefly explained in the following sections. Section 2.7.1 commences with a brief introduction to the models and their underlying theories. Then, in the subsequent section, a more comprehensive description and graphical illustration of the models are provided. Consequently, consideration of the different models provides a basis for the development of an appropriate model for evaluating the success of the MIS utilised by the selected public FET college. A suitable evaluation tool (questionnaire) is then developed based on the proposed conceptual model for this study.

2.7.1 Introduction to information systems success models

It was clear from the literature and as illustrated in Table 2.2 that IS success models are based on either one or a combination of theories. Examples of the most frequently used and well-known models with their original underlying theory or theories are listed in Table 2.2.

The most commonly used theories on which IS success models are based are: (1) the theory of reasoned action; (2) the theory of planned behaviour; (3) the theory of beliefs and attitudes; (4) the behavioural theory of the firm; and (5) the mathematical theory of communications, while the most frequently used models to evaluate IS success are: (1) the DeLone and McLean IS success model (D&M IS Success Model); (2) the Technology Acceptance Model (TAM); (3) the Task-Technology Fit model (TTF); and (4) the End User Computing Satisfaction model (EUCS). Many researchers in the field of IS success evaluation have conducted empirical studies based on portions, combinations or extensions of these models.

The synthesis of models and their underlying theories in Table 2.2 is presented to show that various models for evaluating IS success exist. The question now remains: which model, extension, or combination will be suitable for this study (cf. Chapter 1, section 1.2.2.1)? In order to make a decision in this regard, it will be necessary to investigate the models in more detail. Hence the following section, section 2.7.2, describes each of the IS success evaluation models in more depth to establish the suitability of each model for use at the selected public FET college in South Africa.

Table 2.2: Most commonly utilised information systems success evaluation models and their underlying theoretical frameworks

Year (theory developed)	Theory developed by	Theory	Name of the model based on theory	Model abbreviation	Model developed by:	Year (Model developed)
1934	LaPiere, R.T. – Evidence in the literature of the link between attitudes and behaviours (LaPiere, 1934)	Led to the formulation of the theories of reasoned action and planned behaviour				
1975	Fishbein and Ajzen (Fishbein and Ajzen, 1975)	Theory of Reasoned Action, Theory of Planned Behaviour	Technology Acceptance Model (Davis et al., 1989)	TAM	Davis F.D., Bagozzi R.P., Warshaw P.R.	1989
			Technology Acceptance Model 2 (Venkatesh and Davis, 2000)	TAM2	Venkatesh, V., Davis, F.D.	2000
			Unified Theory of Acceptance and Use of Technology (Venkatesh et al., 2003)	UTAUT	Venkatesh, V., Morris, M.G., Davis, F.D., Davis, G.B.	2003
			Technology Acceptance Model 3 (Venkatesh and Bala, 2008)	TAM3	Venkatesh, V., Bala, H.	2008
			Task Technology Fit Model (Goodhue and Thompson, 1995)	TTF Model	Goodhue, D.L. Thompson, R.L.	1995
			TAM/TTF Model with Computer Self-Efficacy (Dishaw et al., 2002)	Combined TAM/TTF Model	Dishaw, Mark T. Strong, Diane M. Bandy, D. Brent.	2002
1963	Cyert and March	Behavioural Theory of the Firm	Development of a Tool for Measuring and Analyzing Computer User Satisfaction (Bailey and Pearson, 1983)	CUS	Bailey, James E. Pearson, Sammy W.	1983
			The Measurement of End-User Computing Satisfaction (Doll and Torkzadeh, 1988)	EUCS	Doll, William J. Torkzadeh, Gholamreza.	1988

Table 2.2: Most commonly utilised information systems success evaluation models and their underlying theoretical frameworks

Year (theory developed)	Theory developed by	Theory	Name of the model based on theory	Model abbreviation	Model developed by:	Year (Model developed)
		Integration of the two concept theories 'Beliefs and attitudes about the system' and 'Beliefs and attitudes about using the system'	Integration of the User satisfaction literature and the Technology Acceptance Model (Wixom and Todd, 2005)	Integration of User Satisfaction (US) and TAM	Wixom, Barbara H. Todd, Peter A.	2005
1949	Shannon and Weaver (Shannon and Weaver, 1949)	Mathematical Theory of Communications	Expanded Shannon & Weaver's theory by extending the 'effectiveness level' into three categories	Expanded Mathematical Theory of Communications	Mason, R.O.	1978
1978	Mason (Mason, 1978)	Expanded Mathematical Theory of Communications	Delone and McLean IS Success Model (DeLone and McLean, 1992)	D&M IS Success Model	Delone, W.H., McLean, E.R	1992
			Extension of the Delone and McLean IS Success Model combined with the Technology Acceptance Model (Seddon and Kiew, 1996)	Extended D&M IS Success Model combined with TAM	Seddon, P.B., Kiew, M. Y	1996
			Respecification and extension of the DeLone and McLean Model of IS Success (Seddon, 1997:245)	Partial behaviour model of IS Use	Seddon, P. B.	1997
			Updated Delone and McLean IS Success Model (DeLone and McLean, 2003)	Updated D&M IS Success Model	Delone, W.H., McLean, E.R	2003

2.7.2 Description of IS success evaluation models

This section serves to provide a brief description of the most frequently used and cited IS success evaluation models and their underlying philosophical paradigms/theories for the purpose of selecting an appropriate model for the study (cf. Chapter 1, section 1.2.2.1).

2.7.2.1 Technology Acceptance Model (TAM)

TAM was developed by Davis, Bagozzi and Warshaw (Davis, 1989, Davis et al., 1989) and is one of the most influential extensions of Fishbein and Ajzen's (1975) theory of reasoned action in the literature. TAM replaces many of the theory of reasoned action's attitude measures with the two technology acceptance measures, namely *ease of use* and *usefulness*. The theory of reasoned action and TAM, both of which have strong behavioural elements, assume that when a person forms an intention to act, that he/she will be free to act without limitation. In the real world, however, there are many constraints that will limit the freedom to act (Bagozzi and Warshaw, 1992). The conceptual model of the TAM is given in Figure 2.6.

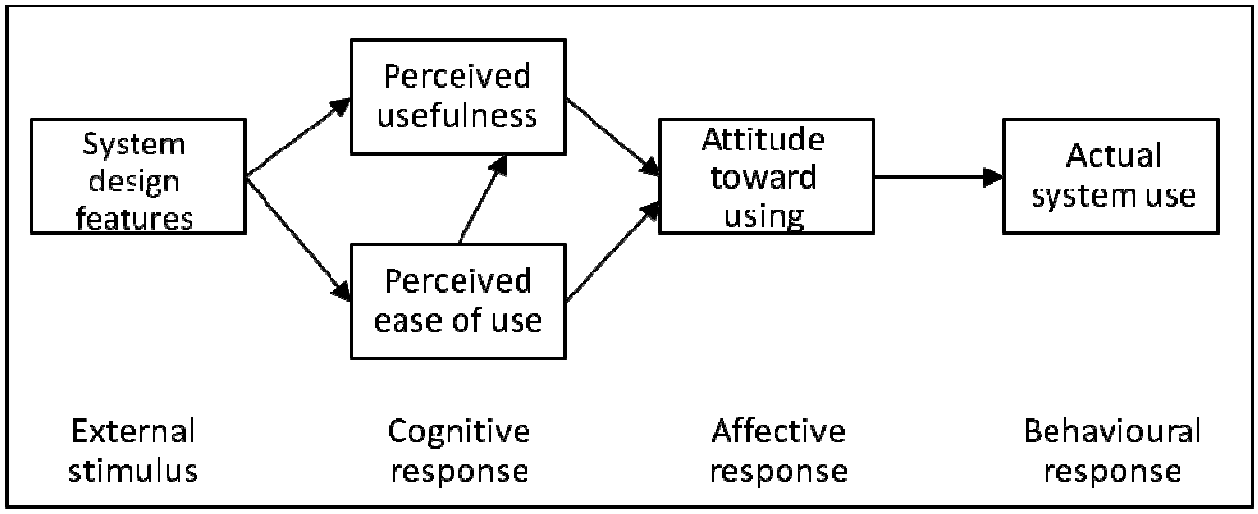


Figure 2.6: The TAM conceptual model (Davis, 1993:476)

TAM is an information systems model that represents the way in which users come to accept and use a technology (Davis, 1989:320). The model suggests that when users are presented with a new technology, a number of factors influence their decision about how and when they will use it, in particular:

- Perceived usefulness – this was defined by Davis as 'the degree to which a person believes that using a particular system would enhance his or her job performance'.
- Perceived ease-of-use – this was defined by Davis as 'the degree to which a person believes that using a particular system would be free from effort' (Davis, 1989:320).

Apart from evaluating IS success, TAM is a well-respected model (within the context of information technology diffusion literature) of IT adoption and operation that has been tailored to explain computer usage (Al-adaileh, 2009:229). Although the terms IT/IS *adoption, acceptance* and *diffusion* are often used interchangeably by IT/IS researchers, Williams, Dwivedi, Lal and Schwarz (2009:9) found that *adoption* is preferred over the other two terms. TAM is mainly used to explain the impact of system characteristics and end user behaviour on the actual system use (Davis, 1993). According to Petter et al. (2008:237), acceptance is not equivalent to success, although acceptance of an information system is a necessary precondition to success. TAM has been continuously studied and expanded. The first major theoretical extension TAM2 was developed by Venkatesh and Davis (2000) and is illustrated in Figure 2.7.

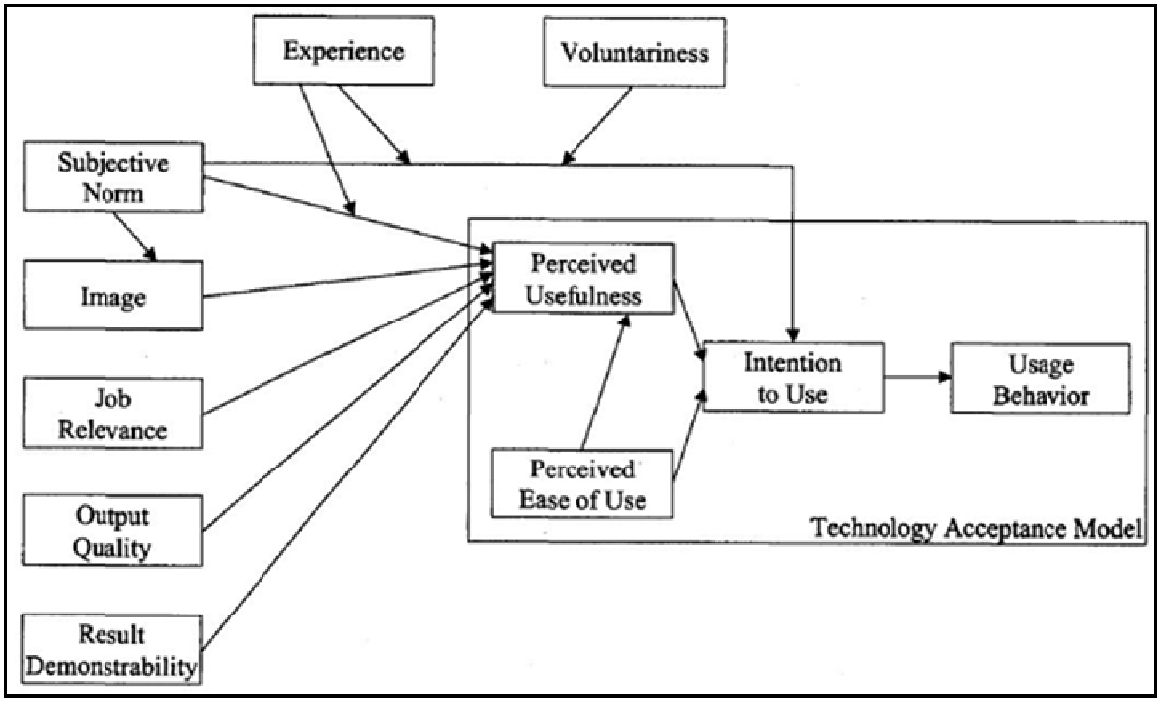


Figure 2.7: The TAM2 conceptual model (Venkatesh and Davis, 2000)

The difference between TAM and TAM2 lies in the factors that influence the user's perception of the usefulness of the technology. In TAM it is proposed that system design features influence perceived usefulness, while in TAM2 perceived usefulness and usage intentions are explained in terms of social influence and cognitive instrumental processes. It was found that both social influence processes (subjective norm, voluntariness and image) and cognitive instrumental processes (job relevance, output quality, result demonstrability and perceived ease of use) significantly influenced user acceptance (Venkatesh and Davis, 2000).

The second major upgrade was the Unified Theory of Acceptance and Use of Technology (UTAUT) (Venkatesh et al., 2003), as illustrated in Figure 2.8.

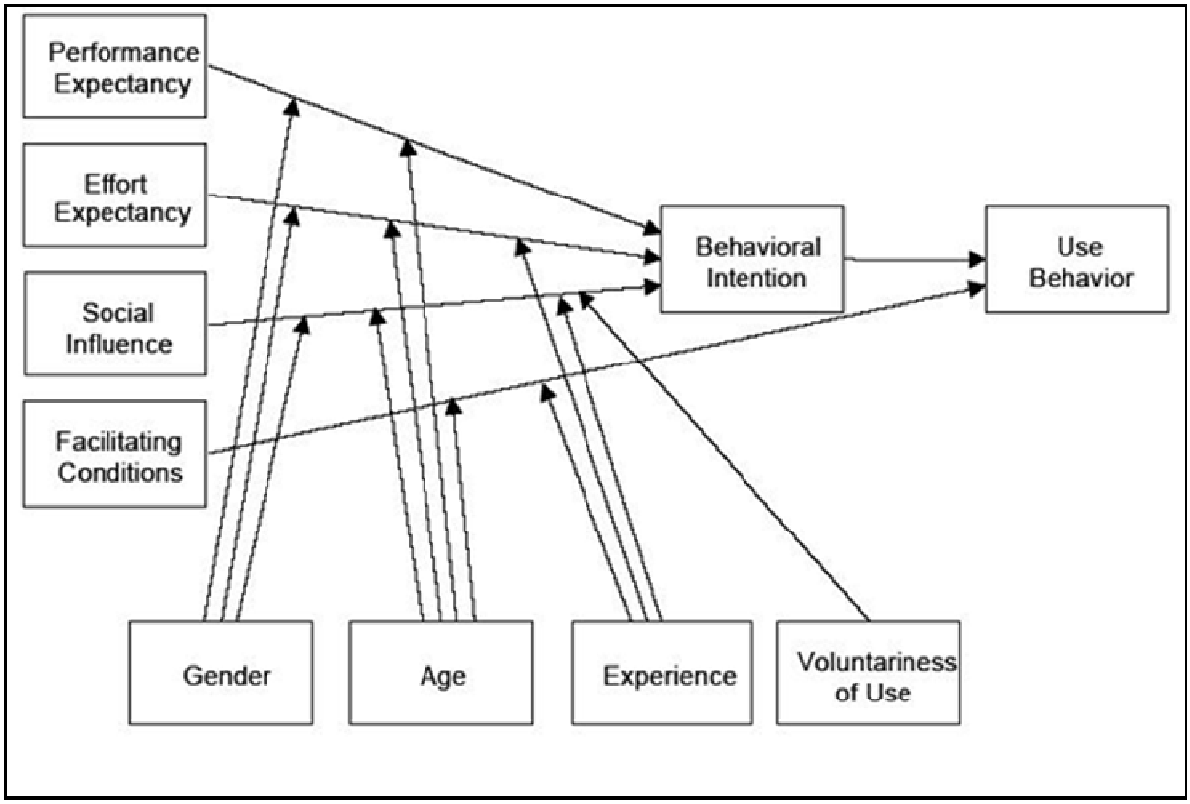


Figure 2.8: The UTAUT conceptual model (Venkatesh et al., 2003)

The UTAUT model was the outcome of the revision and integration of eight different competing technology acceptance models. As stated by the authors, the eight models reviewed were the theory of reasoned action, the technology acceptance model, a motivational model, the theory of planned behaviour, a model combining the technology acceptance model and the theory of planned behaviour, a model of PC utilisation, innovation diffusion theory, and social cognitive theory (Venkatesh et al., 2003). It has been claimed by the authors that the UTAUT

> … provides a useful tool for managers needing to assess the likelihood of success for new technology introductions and helps them understand the drivers of acceptance in order to proactively design interventions (including training, marketing, etc.) targeted at populations of users that may be less inclined to adopt and use new systems (Venkatesh et al., 2003).

In a study done by Lee, Rhee and Dunham (2009:641), that examined the roles that users' individual and organisational characteristics play in technology acceptance, results showed that

work group characteristics and attitude toward change influence the perceived ease of use of an IT system. This implies that organisations wishing to promote use of an IT system can benefit by providing supervisory support and enhancing extensive relations among colleagues to facilitate this perception. It also implies that people who like and enjoy organisational change are more likely to accept new technology.

Venkatesh and Bala (2008) proposed a further extension of the model by suggesting the TAM3 (Figure 2.9). TAM3 was developed from an organisational point of view by considering the issue of how managers make informed decisions about interventions that can lead to greater acceptance and effective utilisation of IT. The authors drew from the body of research on TAM, particularly the work on the determinants of perceived usefulness (TAM2) and perceived ease of use and developed an integrated model of the determinants of individual level IT adoption and use (Venkatesh and Bala, 2008). Figure 2.9 illustrates that TAM3 is a direct extension of TAM2 by proposing determinants for perceived ease of use.

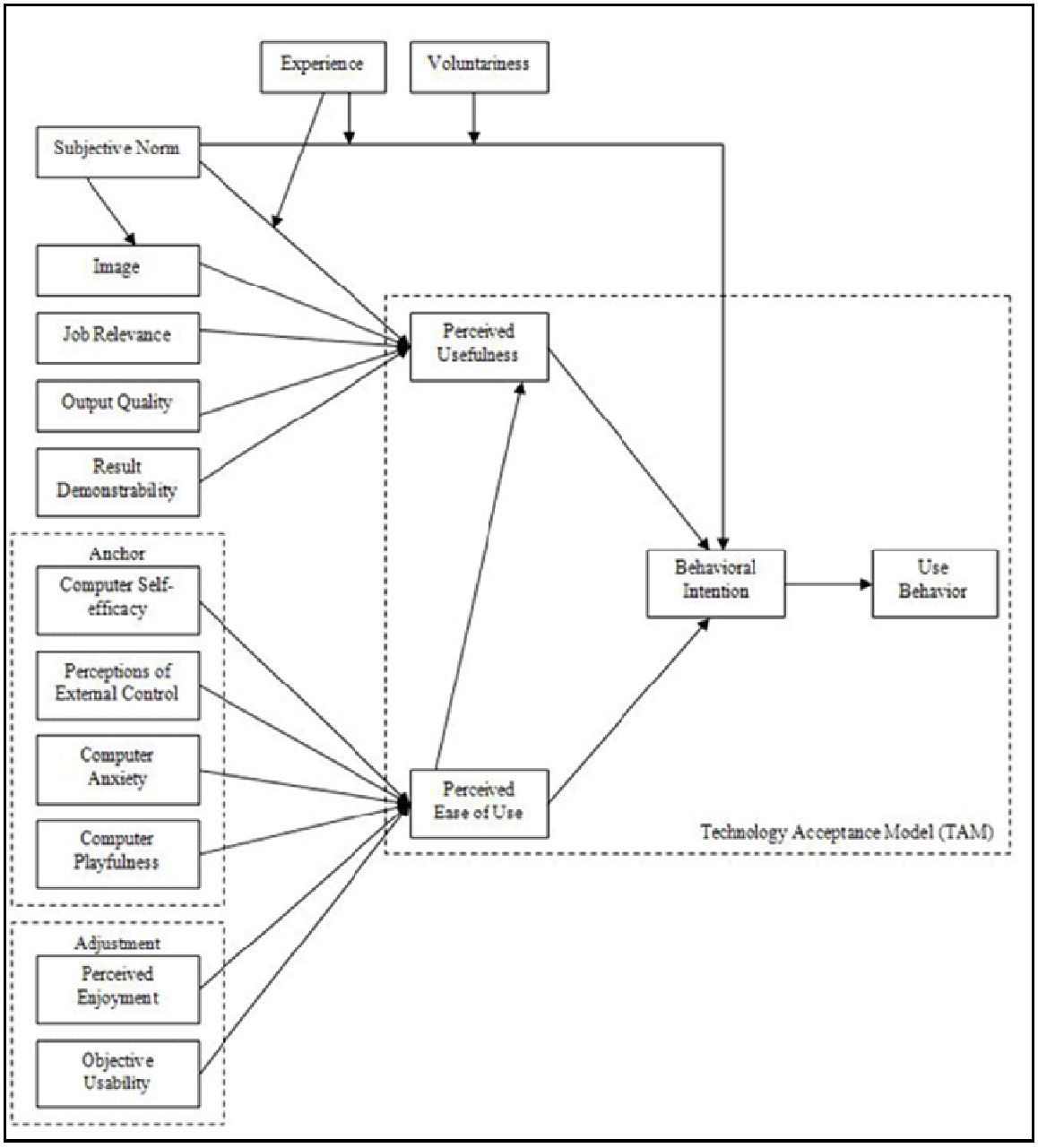


Figure 2.9: The TAM3 conceptual model (Venkatesh and Bala, 2008)

2.7.2.2 Wixom and Todd Model

Wixom and Todd (2005) developed an integrated research model that distinguishes beliefs and attitudes *about* the system (object-based beliefs and attitudes) from beliefs and attitudes about *using* the system (behavioural beliefs and attitude) to build a theoretical logic that links the user satisfaction (CUS) and technology acceptance (TAM) models. According to the authors, the

proposed model (Figure 2.10) provided preliminary evidence that the two perspectives can and should be integrated. They state further that the integrated model helps to bridge the gap between system characteristics (the core strength of the user satisfaction literature) and the prediction of usage (the core strength of technology acceptance literature).

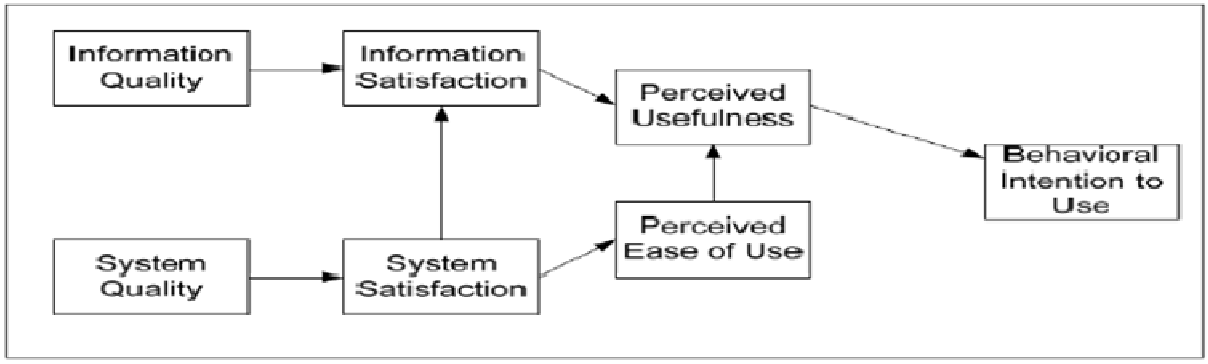


Figure 2.10: The Wixom & Todd conceptual model (Wixom and Todd, 2005)

2.7.2.3 Task-Technology Fit (TTF) model

Fundamentally, the Task-technology Fit (TTF) model states that IT is more likely to have a positive impact on individual performance (dependent variable) and is more likely to be used if the capabilities of the IT match the tasks that the user must perform (Goodhue and Thompson, 1995). Goodhue and Thompson developed a measure of task-technology fit that consists of eight factors: *quality*, *locatability*, *authorisation*, *compatibility*, *ease of use/training, production timeliness, systems reliability,* and *relationship with users (Goodhue and Thompson, 1995:234)*.

The TTF conceptual model as depicted in *Theories used in information systems research* (York University, 2010), is given in Figure 2.11, while a comprehensive version of the model as given by the authors is depicted in Figure 2.12 (Goodhue and Thompson, 1995:217).

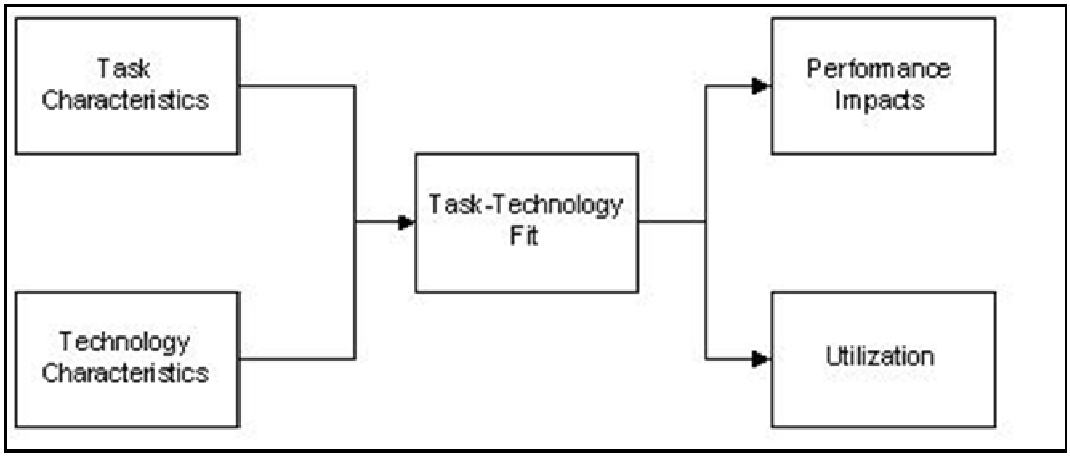


Figure 2.11: Task-technology fit model adapted from Goodhue and Thompson (1995)

Figure 2.12 shows that both the *theories of fit* and the *theories of attitudes and behaviour* underlie the TTF model. Apart from *task* and *technology* characteristics, the comprehensive model also includes *individual* characteristics as independent variables to establish a *task-technology fit* (dependent variable). The dependent variable, *performance impacts,* serves as the final success measure. Hence, the model proposes that if the characteristics of the task performed by the user, the characteristics of the technology used by the user and the individual characteristics of the user are a good fit then the user will demonstrate efficient performance and the utilisation of the system will increase (Goodhue and Thompson, 1995).

Goodhue and Thompson (1995:213) found the TTF measure, in conjunction with utilisation, to be a significant predictor of user reports of improved job performance and effectiveness that was attributable to their use of the system under investigation (Goodhue and Thompson, 1995:213). This also suggests that task-technology fit, when decomposed into its more detailed components, could be the basis for a strong diagnostic tool to evaluate whether information systems and services in a given organisation are meeting user needs (Goodhue and Thompson, 1995:230).

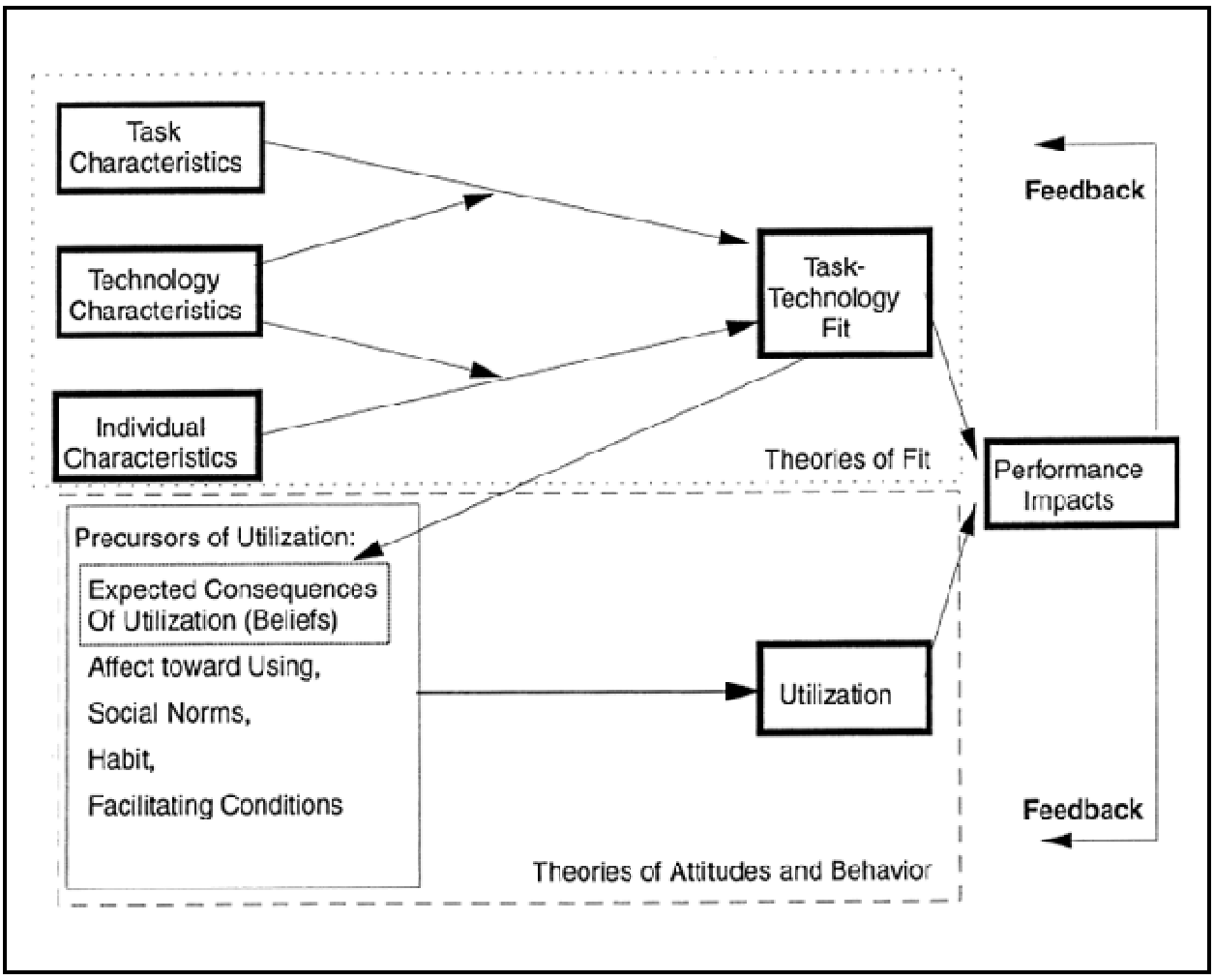


Figure 2.12: Task-Technology Fit model (Goodhue and Thompson, 1995:217)

2.7.2.4 The original DeLone and McLean (D&M) information systems success model

DeLone and McLean reviewed the literature published from 1981 to 1987 in seven publications to develop a taxonomy of IS success. Five of the seven publications reviewed (*Management Science, MIS Quarterly, Communications of the ACM, Decision Sciences* and *Information & Management*) were drawn from the top six journals cited by Hamilton and Ives (1983:5) in their study of the journals most respected by MIS researchers. To these five were added the *Journal of MIS* and the *ICIS Proceedings*, which is not a journal per se but represents the published output of the central academic conferences in the IS field. A total of 100 empirical studies were included from these seven sources (DeLone and McLean, 1992:63).

This taxonomy was based on Richard Mason's modification of Shannon and Weaver's (1949:2) mathematical theory of communications which identified three levels of information:

- the technical level (accuracy and efficiency of the system that produces it)
- the semantic level (its ability to transfer the intended message)
- the effectiveness level (its impact on the receiver) (Shannon and Weaver, 1949:2).

Mason adapted this theory for IS and expanded the effectiveness level into three categories: receipt of information, influence on the recipient, and influence on the system (Mason, 1978).

DeLone and McLean identified categories for IS success by mapping an aspect of IS success (found in the literature review) to each of Mason's effectiveness levels (DeLone and McLean, 1992:62). This analysis yielded six variables of success:

- system quality
- information quality
- use
- user satisfaction
- individual impact
- organisational impact

System quality was equivalent to the technical level of communication, while *information quality* was equivalent to the semantic level of communication. The other four variables were mapped to Mason's sub-categories of the effectiveness level. *Use* related to Mason's *receipt of information*; *user satisfaction* and *individual impact* were associated with the *information's influence on the recipient* and *organisational impact* was the *influence of the information on the system*. A diagram illustrating the development of the original D&M IS success model from the theory of communication is given in Figure 2.13.

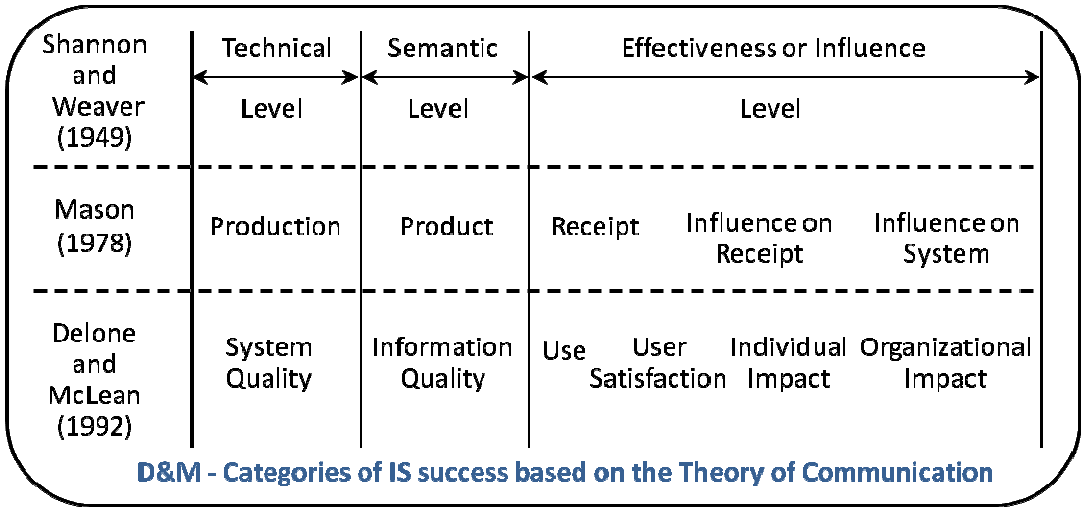


Figure 2.13: Categories of IS success adapted from DeLone and McLean (1992:62)

DeLone and McLean developed their initial taxonomy using established theories of communication adapted to IS. These theories suggested that the flow of information was linear; however, they proposed that, for IS, these different measures of success were independent, but that there was interdependency among them (DeLone and McLean, 1992:88). Figure 2.14 shows the original D&M model. DeLone and McLean suggest that researchers should use this model in a predictive manner, although they cautioned that one must measure and/or control each of the variables in the model to ensure a complete understanding of IS success. DeLone and McLean called upon others to validate their model (DeLone and McLean, 1992:88).

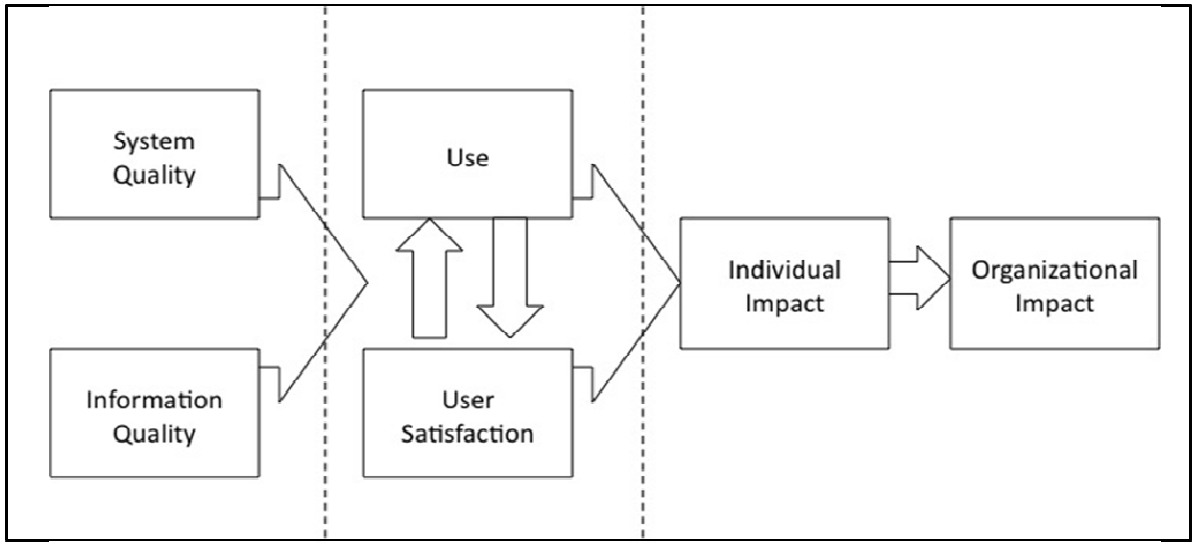


Figure 2.14: D&M Initial IS success Model (DeLone and McLean, 1992:87)

2.7.2.5 Updated DeLone and McLean (D&M) IS success model

In the years that followed after DeLone and McLean presented their original IS success model, several researchers altered or extended the model, while others adapted it for specific applications, such as knowledge management or e-commerce systems (Petter et al., 2008). Recognising these potential improvements over their original model, DeLone and McLean acknowledged these modifications and revised their model accordingly (DeLone and McLean, 2003:24). The updated model is shown in Figure 2.15. DeLone and McLean also modified their model to address some of the limitations of the original model. They acknowledged that *quality* should include *information*, *system* and *service* quality. Therefore a key addition in the updated model was the inclusion of *service quality* as an additional aspect of IS success (DeLone and McLean, 2003:18). This was added because the changing nature of IS required the need to assess service quality when evaluating IS success. DeLone and McLean also recommended assigning different weights to *system quality*, *information quality* and *service quality,* depending on the context and application of the model (DeLone and McLean, 2003:18).

DeLone and McLean (2003:19) also notes that since the impacts of IS have evolved beyond the immediate user, researchers have suggested additional IS impact measures, such as work group impacts, inter-organisational and industry impacts, consumer impacts and societal impacts.

Accordingly, they decided to group all the impact measures into a single impact or benefit category called *net benefits*. Although they acknowledged that for some studies such finer granularity may be appropriate, they resisted further refinements for the sake of parsimony.

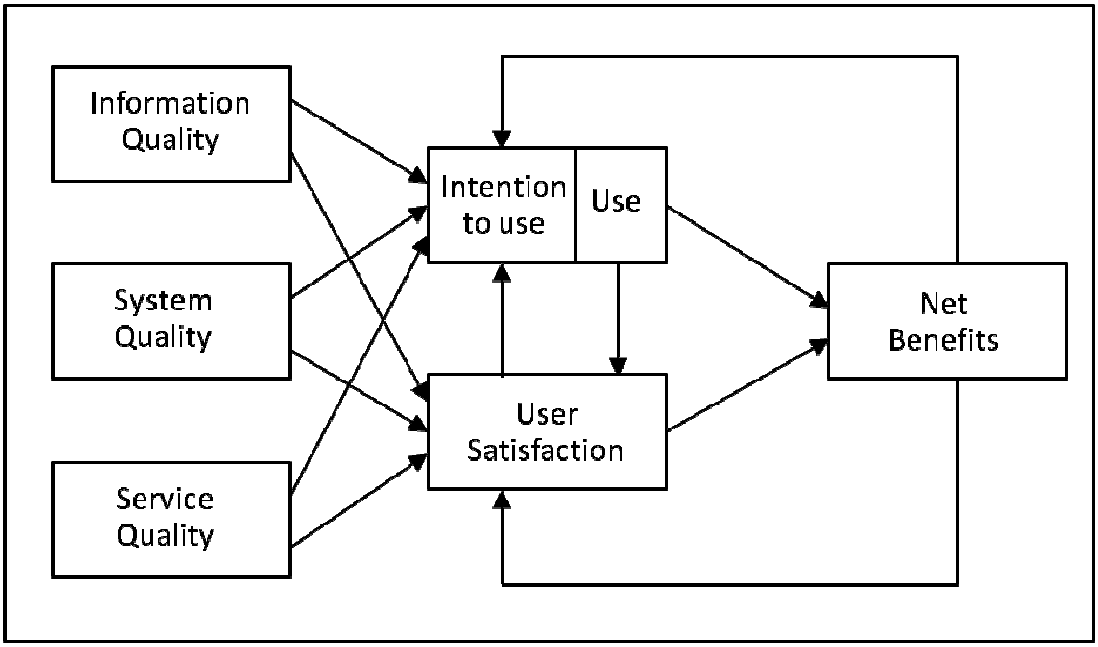


Figure 2.15: D&M updated IS success Model (DeLone and McLean, 2003:24)

2.7.2.6 Model of User Satisfaction (Seddon and Kiew, 1996:92)

In 1996, Seddon and Kiew undertook a partial test of D&M's initial model of IS success in small business, although with some changes to the underlying theoretical assumptions (Seddon and Kiew, 1996:90). Seddon and Kiew critically examined the meaning of four of D&M IS success model's constructs and the interrelationships between them (i.e. *system quality*, *information quality*, *use* and *user satisfaction*).

In their evaluation, they modified the construct, *use*, because they 'conjectured that the underlying success construct that researchers have been trying to tap is *usefulness*, not *use*' (Seddon and Kiew, 1996:93). Seddon and Kiew's concept of usefulness is equivalent to Davis's idea of perceived usefulness in TAM (Davis et al., 1989). Seddon and Kiew argued that, for voluntary systems, *use* is an appropriate measure; however, if *system use* is mandatory, *usefulness* is a better measure of IS success than *use*. DeLone and McLean (2003:16) responded

that, even in mandatory systems, there can still be considerable variability of *use* and therefore the variable *use* deserves to be retained. Seddon and Kiew's conceptual model is depicted in Figure 2.16.

Seddon and Kiew's study found good support for the D&M IS success model. They also found that *user satisfaction* is the most general individual-user perceptual measure of information system success. They noted further that researchers will need to control for *task importance* whenever they measure the *usefulness* of an information system, because systems that perform more important tasks are perceived as more useful (Seddon and Kiew, 1996:92).

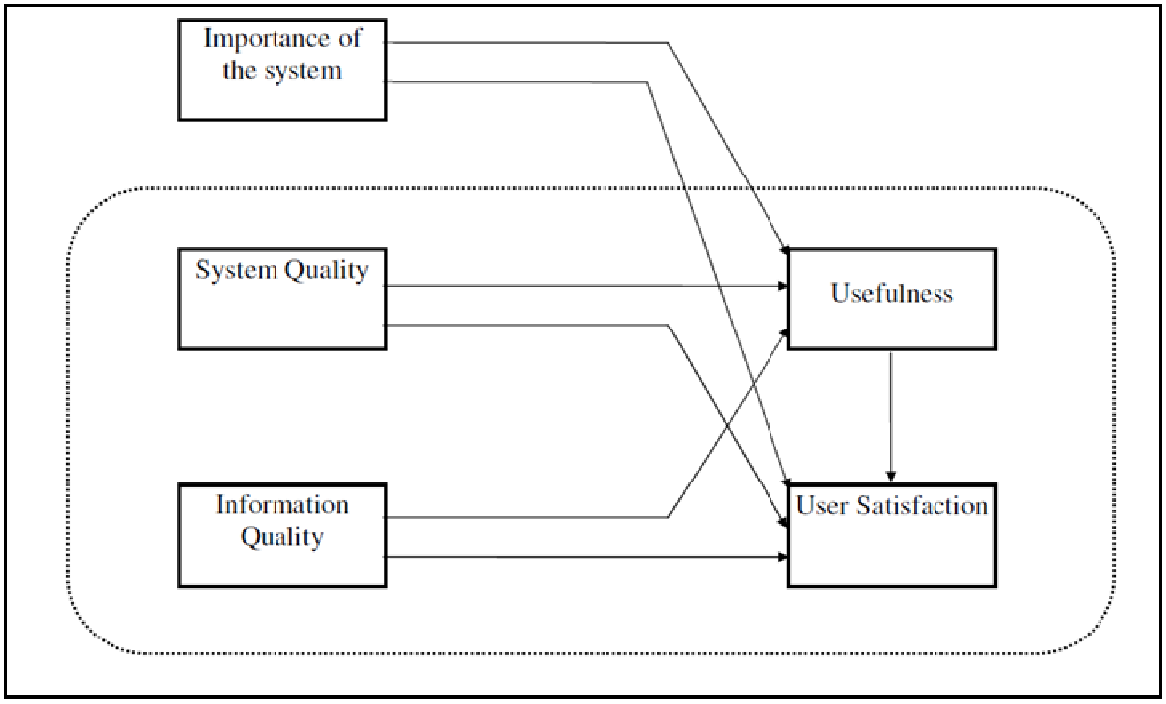


Figure 2.16: Seddon and Kiew's model of user satisfaction (Seddon and Kiew, 1996:92)

2.7.2.7 The Re-specified Model of IS Success (and Use) (Seddon, 1997)

Seddon (1997:240) stressed the fact that D&M in their comprehensive review of different IS success measures contributed firstly by providing a scheme for classifying the multitude of IS success measures into six categories and secondly by proposing a model of 'temporal and causal' interdependencies between these categories (DeLone and McLean, 1992:88). Seddon argues further that the problem with the D&M IS success model is that it combines variance and

process models which cause confusion in the meanings of the different relations and constructs. Seddon further states that the D&M IS success model is actually a combination of three models:

- a variance model of IS success, where the independent variables are *system quality* and *information quality*, and the dependent variables are *IS use* (for benefits of use) and *user satisfaction*
- a variance model of *IS use* (as the dependent variable of future IS use) as a behaviour
- a process model of IS success, where *IS use* is an event in a process leading to *individual* or *organisational impact* (Seddon, 1997:244).

The re-specified model of IS Success (and Use) by Seddon is depicted in Figure 2.17.

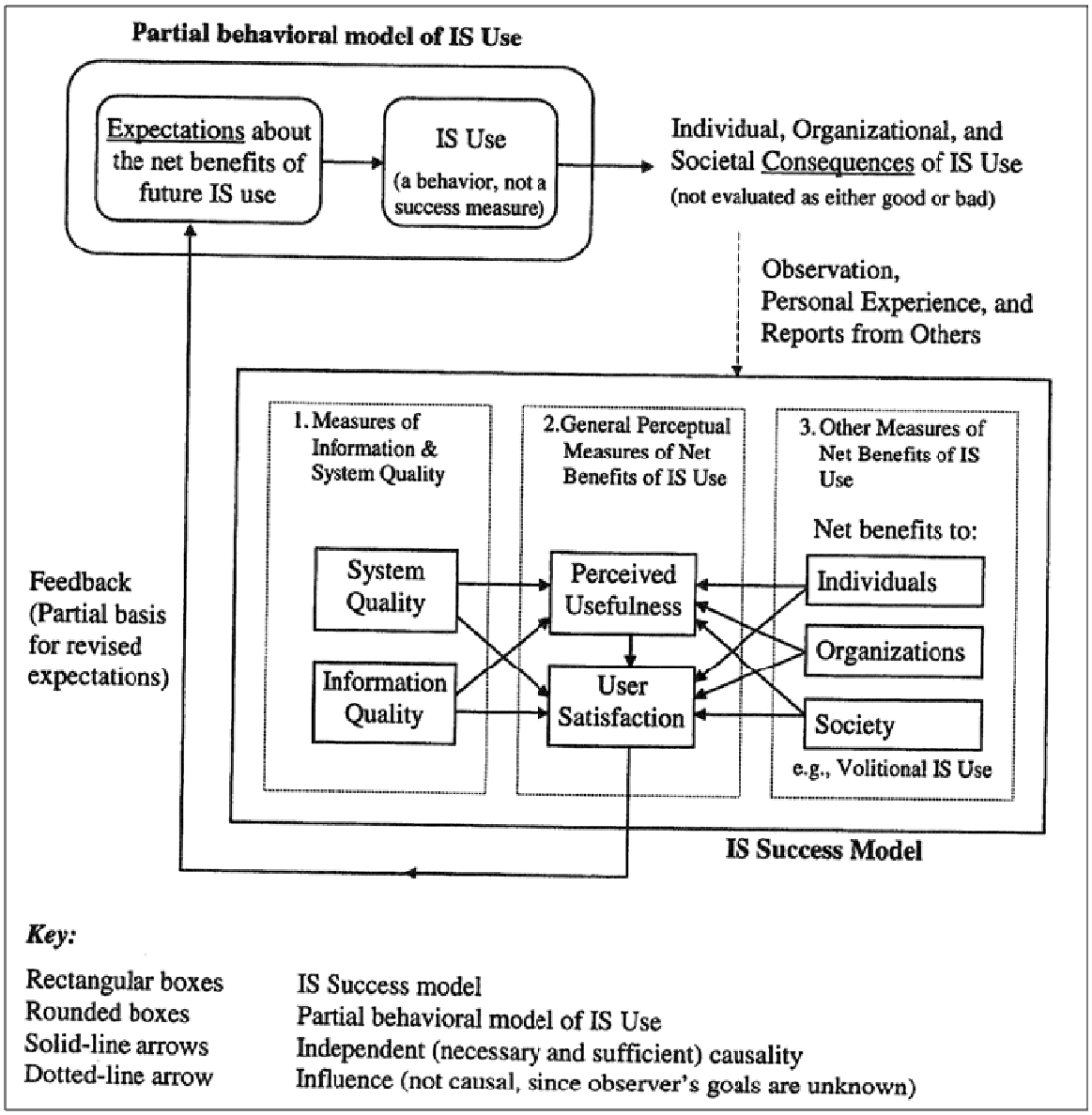


Figure 2.17: Respecified model of IS success (and Use) (Seddon, 1997:245)

Starting at the top left of Figure 2.17, the behavioural variance model asserts that higher levels of *expectations* about net benefits of future IS use will lead to higher levels of *IS use*. This model is intended to be consistent with the work of Davis et al. (Davis, 1989, Davis, 1993, Davis et al., 1989) related to the TAM. The consequences of *IS use* are represented by the block containing the *individual*, *organisational* and *societal* consequences of IS use. Inside the rectangle labelled *IS success model* a complex set of variance model relationships between seven IS success measures arranged in three columns is found which correlates with the D&M constructs. The

final relationship is the feedback path from *IS success* to *expectations* in the behavioural model. It is hypothesised that higher *net benefits* from past use will lead to higher *expectations* about future benefits (Seddon, 1997:250).

The focus of the re-specified model is still very much the same as D&M's IS success model. The six categories of IS success measures and two of the three meanings of *IS use* implicit in the D&M IS success model are present in the re-specified model.

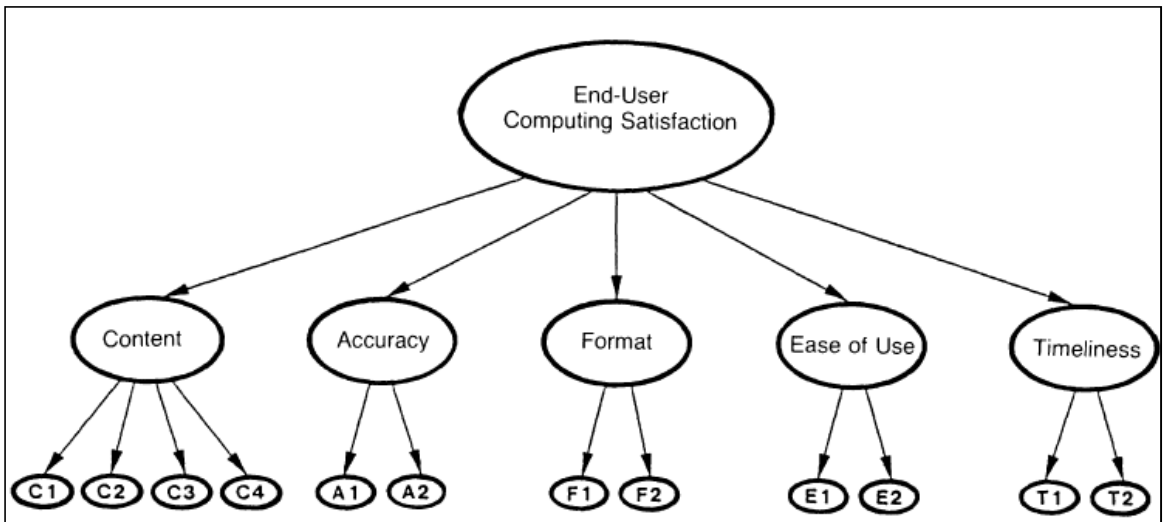
2.7.2.8 End-User Computing Satisfaction Model (Doll and Torkzadeh, 1988:268)

Doll and Torkzadeh (1988) carried out research on end-user computing satisfaction by contrasting traditional versus end-user computing environments and reported on the development of an instrument which merges ease of use and information product items to measure the satisfaction of users who directly interact with the computer for a specific application. The researchers started off with a 40-item instrument and conducted a survey of 618 end users. After doing a factor analysis they modified the instrument. The results suggested a 12-item instrument that measures five components of end-user satisfaction: *content*, *accuracy*, *format*, *ease of use* and *timeliness*. Evidence of the instrument's discriminant validity has been presented, while reliability and validity were assessed by nature and type of application.

According to the authors, the explicit goals of the research were to develop an instrument that

- focuses on satisfaction with the information product provided by a specific application
- includes items to evaluate the ease of use of a specific application
- provides Likert-type scales as an alternative to semantic differential scaling
- is short, easy to use, and appropriate for both academic research and practice
- can be used with confidence across a variety of applications (i.e. adequate reliability and validity)
- enables researchers to explore the relationships between end-user computing satisfaction and plausible independent variables (i.e. user computing skills, user involvement, EDP support policies and priorities, etc.) (Doll and Torkzadeh, 1988:260).

Figure 2.18 provides an illustration of the model, a list of the questions used and the identified underlying factors or components of end-user computing satisfaction obtained by factor analysis (Content, Accuracy, Format, Ease of use, and Timeliness).



CONTENT

C1: Does the system provide the precise information you need?
C2: Does the information content meet your needs?
C3: Does the system provide reports that seem to be just about exactly what you need?
C4: Does the system provide sufficient information?

ACCURACY

A1: Is the system accurate?
A2: Are you satisified with the accuracy of the system?

FORMAT

F1: Do you think the output is presented in a useful format?
F2: Is the information clear?

EASE OF USE

E1: Is the system user friendly?
E2: Is the system easy to use?

TIMELINESS

T1: Do you get the information you need in time?
T2: Does the system provide up-to-date information?

Figure 2.18: A Model for measuring End-user Computing Satisfaction (Doll and Torkzadeh, 1988:268)

In considering the models described in section 2.7, it was decided to select and integrate three of the models in designing an evaluation model for this study. The original D&M IS Success Model, the updated D&M IS Success Model, and the End User Computing Satisfaction Model were selected and integrated to develop the proposed conceptual model for this study as depicted in section 2.11. Section 2.8 provides the motivation for this decision.

2.8 MOTIVATION FOR THE SELECTED BASE MODEL FOR THIS STUDY

In an attempt to further the understanding of the D&M model, a number of studies have been conducted by attempting to validate some, or all, of the entire model in a single study. Seddon and Kiew (1996) examined the relationships among four of the constructs and found significant support. Rai, Lang and Welker (2002) compared the original D&M model (1992) to the re-specified D&M IS success model created by Seddon (1997) and found that the original model stood up reasonably well to the validation attempt and outperformed the Seddon model. Sedera et al. (2004) also tested several success models, including the D&M and Seddon models, against empirical data and determined that the D&M Model provided the best fit for measuring enterprise systems success (Petter et al., 2008). McGill, Hobbs and Klobas (2003:24) examined the full D&M IS success model, but found four paths in the original IS success model to be insignificant (the relationships between *system quality* and *use*, *information quality* and *use*, *intended use* and *individual impact*, and between *individual impact* and *organisational impact*).

The overwhelming evidence in the literature on the strength of the D&M IS success model leads to the decision to base the model for this study on D&M's IS success model.

The preceding two sections, 2.6 and 2.7, partially answered the first sub-research question, namely *What types of evaluation models and tools exist for MISs?* (cf. Chapter 1, section 1.2.2.1). The conceptual model for this study is provided in section 2.11. In order to answer the first research question in full, an appropriate tool for this study needs to be developed. Hence, the time is now appropriate to concentrate on the theoretical component of the third sub-research question, namely *Which variables need to be included in an evaluation tool to enable effective measurement of success of the MIS at public FET colleges?*, by seeking suitable variables to include in an evaluation tool to enable effective IS success evaluation at a selected public FET college (cf. Chapter 1, section 1.2.2.3).

In the search for appropriate effectiveness measures for measuring the IS success constructs, many different theoretical frameworks used by researchers were found. The details of the constructs and their effectiveness measures within the different models are dealt with in

section 2.9 and listed in Table 2.3. This is a necessary theoretical step in the development of a survey questionnaire for administration to the public FET college selected for the study.

2.9 CONSTRUCTS AND EFFECTIVENESS MEASURES

The literature review revealed that although different researchers propose models with different constructs and effectiveness measures to evaluate IS success, similarities can be identified, as illustrated in Table 2.3. In Table 2.3, a synthesis of the proposed effectiveness measures of five models for the evaluation of IS success based on the D&M IS success model is given. Some researchers used different terms for comparable constructs (e.g. the use of the term *system quality* versus *systemic,* and *information use* versus *use* versus *technology)*. It is thus evident from reviewing the models that the main dimensions identified by D&M in 1992 namely, *systems quality*, *information quality*, *information use*, *individual impact* and *organisational impact,* are still being considered relevant and are still being empirically tested and used by many IS researchers (Gable et al., 2008, Ifinedo et al., 2010, Palmius, 2007).

Table 2.3 was compiled to illustrate the different effectiveness measures that are being measured within each construct and model, and forms the basis for questionnaire design and development.

Table 2.3: A comparison of the criteria models proposed by some of the researchers with the effectiveness measures that needs to be taken into account when measuring and comparing information systems

1992 D&M Success Model Conceptual framework (DeLone and McLean, 1992)	2003 D&M Success Model: Updated E-commerce Success Metrics Conceptual framework (DeLone and McLean, 2003)	2007 Criteria for measuring and comparing information systems (Palmius, 2007)	2008 Re-conceptualising Information Success: The information systems-Impact Measurement Model (Gable et al., 2008)	2010 Relationships among ERP post-implementation success constructs: An analysis at the organisational level (Ifinedo, P.,Rapp, B., Ifinedo, A., Sundberg, K., 2010)
Systems quality	**Systems quality**	**Systemics**	**System quality**	**System quality**
Data accuracy	Adaptability	Cybernetics: Filters, Sensors,	Data accuracy	System has accurate data
Data currency	Availability	Amplifyers, Feedback,	Data currency	System is flexible
Database contents	Reliability	Viability, Req. variety	Database contents	System is easy to use
Ease of use	Response time	Model conf.: VSM, Living system,	Ease of use	System is easy to learn
Ease of learning	Usability	SSM, ITIL	Ease of learning	System is reliable
Convenience of access		Systems properties.: Efficacy, Cultural	Access	System allows data integration
Human factors		Feasibility, Systemic desire.	User requirements	System is efficient
Realization of user requirements			System features	System allows for customization
Usefulness of system features and functions			System accuracy	System allows for integration with other IT systems
System accuracy			Flexibility	System's content is good
System flexibility			Reliability	System meets users' requirements
System reliability			Efficiency	
System sophistication			Sophistication	
Integration of systems			Integration	
System efficiency			Customisation	
Resource utilization				
Response time				
Turnaround time				
Information quality	**Information quality**	**Information**	**Information quality**	**Information quality**
Importance	Completeness	Access: Accessibility,	Importance	System has timely information
Relevance	Ease of understanding	Searchability, Format	Availability	Information is understandable

Table 2.3: A comparison of the criteria models proposed by some of the researchers with the effectiveness measures that needs to be taken into account when measuring and comparing information systems

1992 D&M Success Model Conceptual framework (DeLone and McLean, 1992)	2003 D&M Success Model: Updated E-commerce Success Metrics Conceptual framework (DeLone and McLean, 2003)	2007 Criteria for measuring and comparing information systems (Palmius, 2007)	2008 Re-conceptualising Information Success: The information systems-Impact Measurement Model (Gable et al., 2008)	2010 Relationships among ERP post-implementation success constructs: An analysis at the organisational level (Ifinedo, P.,Rapp, B., Ifinedo, A., Sundberg, K., 2010)
Usefulness	Personalization	Quality: Accuracy, Relevance,	Usability	Information is important
Informativeness	Relevance	Importance, Reliability,	Understandability	Information is brief/concise
Usableness	Security	Uniqueness, Free from bias	Relevance	Information is relevant
Understandability		Durability: Archivability,	Format	Information is usable
Readability		Movability, Portability,	Content accuracy	Information is available
Clarity		Traceability, Original look,	Conciseness	
Format		Evidence	Timeliness	
Appearance			Uniqueness	
Content				
Accuracy				
Precision				
Conciseness				
Sufficiency				
Completeness				
Reliability				
Currency				
Timeliness				
Uniqueness				
Comparability				
Quantitativeness				
Freedom from bias				
	Service quality			**Service quality**
	Assurance			System provides prompt info to users
	Empathy			System has a good interface
	Responsiveness			System has visually appealing features

Table 2.3: A comparison of the criteria models proposed by some of the researchers with the effectiveness measures that needs to be taken into account when measuring and comparing information systems

1992 D&M Success Model Conceptual framework (DeLone and McLean, 1992)	2003 D&M Success Model: Updated E-commerce Success Metrics Conceptual framework (DeLone and McLean, 2003)	2007 Criteria for measuring and comparing information systems (Palmius, 2007)	2008 Re-conceptualising Information Success: The information systems-Impact Measurement Model (Gable et al., 2008)	2010 Relationships among ERP post-implementation success constructs: An analysis at the organisational level (Ifinedo, P.,Rapp, B., Ifinedo, A., Sundberg, K., 2010)
				System provides the right solution to requests
				System service provider is dependable
				System service provider has up-to-date facilities
				System service provider is experienced and provides quality training and services
Information Use	**Use**	**Technology**		
Amount of use/duration of use:	Nature of use	Usability: Learnability,		
Number of inquiries	Navigation patterns	Memorability, Efficiency		
Amount of connect time	Number of site visits	Effectiveness, Errorproneness		
Number of functions used	Number of transactions executed	Security: Stability, Validity,		
Number of records accessed		Secrecy		
Frequency of access		Software: Compatibility,		
Frequency of report requests		Saliency, Availability,		
Number of reports generated		Replicability, Licensing,		
Charges for system use		Administration		
Regularity of use		Hardware: Scalability,		
Use by whom?		Administration, Performance		
Direct vs. Chauffeured use				
Binary use: Use vs. non-use				
Actual vs. reported use				
Nature of use:				

Table 2.3: A comparison of the criteria models proposed by some of the researchers with the effectiveness measures that needs to be taken into account when measuring and comparing information systems

1992 D&M Success Model Conceptual framework (DeLone and McLean, 1992)	2003 D&M Success Model: Updated E-commerce Success Metrics Conceptual framework (DeLone and McLean, 2003)	2007 Criteria for measuring and comparing information systems (Palmius, 2007)	2008 Re-conceptualising Information Success: The information systems-Impact Measurement Model (Gable et al., 2008)	2010 Relationships among ERP post-implementation success constructs: An analysis at the organisational level (Ifinedo, P.,Rapp, B., Ifinedo, A., Sundberg, K., 2010)
Use for intended purpose				
Appropriate use				
Type of information used				
Purpose of use				
Levels of use: General vs. specific				
Recurring use				
Institutionalization/routinization of use				
Report acceptance				
Percentage used vs. opportunity for use				
Voluntariness of use				
Motivation to use				
User satisfaction	**User satisfaction**			
Satisfaction with specifics	Repeat purchases			
Overall satisfaction	Repeat visits			
Single-item measure	User surveys			
Multi-item measure				
Information satisfaction: Difference between information needed and received				
Enjoyment				
Software satisfaction				
Decision-making satisfaction				

Table 2.3: A comparison of the criteria models proposed by some of the researchers with the effectiveness measures that needs to be taken into account when measuring and comparing information systems

1992 D&M Success Model Conceptual framework (DeLone and McLean, 1992)	2003 D&M Success Model: Updated E-commerce Success Metrics Conceptual framework (DeLone and McLean, 2003)	2007 Criteria for measuring and comparing information systems (Palmius, 2007)	2008 Re-conceptualising Information Success: The information systems-Impact Measurement Model (Gable et al., 2008)	2010 Relationships among ERP post-implementation success constructs: An analysis at the organisational level (Ifinedo, P.,Rapp, B., Ifinedo, A., Sundberg, K., 2010)
Individual impact	**Net benefits**	**Individual**	**Individual-impact**	**Individual impact**
Information understanding	Cost savings	Emancipation: Satisfaction, Democracy,	Learning	System enhances individual creativity
Learning	Expanded markets	Influence, Learning	Awareness/Recall	System enhances organizational learning and recall for individual workers
Accurate interpretation	Incremental additional sales	Ergonomy: Stress, Overload, Underfeed,	Decision effectiveness	System improves individual productivity
Information awareness	Reduced search costs	Control	Individual productivity	System is beneficial for individual's tasks
Information recall	Time savings	Communication: Informedness, Social		System enhances high-quality decision making
Problem identification		Integration, Belonging		System saves time for individual tasks/duties
Decision effectiveness:				
Decision quality				**Work group impact**
Improved decision analysis				System improves workers' participation in the organization
Correctness of decision				System improves organizational-wide communication
Time to make decision				System improves inter-departmental coordination
Confidence in decision				System creates a sense of responsibility
Decision-making participation				System improves the efficiency of sub-units in the organisation
Improved individual productivity				System improves work-groups productivity

Table 2.3: A comparison of the criteria models proposed by some of the researchers with the effectiveness measures that needs to be taken into account when measuring and comparing information systems

1992 D&M Success Model Conceptual framework (DeLone and McLean, 1992)	2003 D&M Success Model: Updated E-commerce Success Metrics Conceptual framework (DeLone and McLean, 2003)	2007 Criteria for measuring and comparing information systems (Palmius, 2007)	2008 Re-conceptualising Information Success: The information systems-Impact Measurement Model (Gable et al., 2008)	2010 Relationships among ERP post-implementation success constructs: An analysis at the organisational level (Ifinedo, P.,Rapp, B., Ifinedo, A., Sundberg, K., 2010)
Change in decision				System enhances solution effectiveness
Causes management action				
Task performance				
Quality of plans				
Individual power or influence				
Personal evaluation of information systems				
Willingness to pay for information				
Organisational impact		**Organisation**	**Organisational-impact**	**Organisational-impact**
Application portfolio:		Performance: Transmission, Fail rate,	Organisational cost	System reduces organisational costs
Range and scope of application		Congestion, Underfeed	Staff requirements	System improves overall productivity
Number of critical applications		Control: Knowledge management,	Cost reduction	System enables e-business/e-commerce
Operating cost reductions		Overview, Flexibility, Manageability,	Overall productivity	System provides competitive advantage
Staff reductions		Decision speed, Decision accuracy	Improved outcomes/outputs	System increases customer service satisfaction
Service effectiveness				
Overall productivity gains		Economy: ROI, Competitiveness,	Increased capacity	System facilitates business process change
Increased revenues		Customer satisfaction, Productivity	e-government	System supports decision making
Increased sales			Business Process Change	System allows for better use of

Table 2.3: A comparison of the criteria models proposed by some of the researchers with the effectiveness measures that needs to be taken into account when measuring and comparing information systems

1992 D&M Success Model Conceptual framework (DeLone and McLean, 1992)	2003 D&M Success Model: Updated E-commerce Success Metrics Conceptual framework (DeLone and McLean, 2003)	2007 Criteria for measuring and comparing information systems (Palmius, 2007)	2008 Re-conceptualising Information Success: The information systems-Impact Measurement Model (Gable et al., 2008)	2010 Relationships among ERP post-implementation success constructs: An analysis at the organisational level (Ifinedo, P.,Rapp, B., Ifinedo, A., Sundberg, K., 2010)
Increased work volume				organisational data resources
Increased market share				
Increased profits				
Return on investment				
Return on assets				
Ratio of net income to operating expenses				
Cost/benefit ratio				
Stock price				
Increased work volume				
Product quality				
Contribution to achieving goals				

In the search for appropriate items or questions for measuring the effectiveness measures within the IS success constructs, many different survey questionnaires used by researchers who conducted empirical studies were found (Doll and Torkzadeh, 1988, Gable et al., 2008, Ifinedo et al., 2010, Ong et al., 2009). The details of the items or specific questions to be included in the final questionnaire on the evaluation of the MIS are dealt with in section 2.10. The content of section 2.10 attends to the third sub-research question and the third research objective (cf. Chapter 1, sections 1.2.2.3 and 1.2.3).

2.10 INSTRUMENT DEVELOPMENT

A survey questionnaire was specially designed and developed, as no standardised questions applicable to this study could be found (cf. Appendix 2 for a copy of the questionnaire and Chapter 4, section 4.7 for more details on the questionnaire development for this study). One of the four sections of the final questionnaire relates to IS success evaluation and the development of these questions was informed by empirically tested survey instruments that were found in the literature. The use of empirically tested items is beneficial to the reliability and content validity of a questionnaire, as is evident from McKenzie, Wood, Clark, Kotecki and Brey's (1999) guidelines for content validity in questionnaire development. The authors state that the first of four steps in the guideline is to create the survey instrument by 'canvassing the wealth' of literature available in the IS Success domain (Gable et al., 2008:391).

Table 2.4 shows how the final IS success evaluation items for this study were developed. The first four columns contain reference to constructs with similar questions across four different survey instruments, while the last three columns in the table show how the IS success evaluation section (question 15) of the questionnaire for this study was developed based on the proposed conceptual model as provided in section 2.11. The final questionnaire is attached in Appendix 2.

Column five in Table 2.4 contains the variable names that were assigned to the questions and which are used in the MS Access and SPSS database (cf. Chapter 4, section 4.3.6). These variable names facilitate the link between the database and the questionnaire. The sixth column lists the actual questions addressed to respondents, while column seven shows the link between variables and constructs in the conceptual model (cf. Section 2.11).

The abbreviation, BMS, which is used in the questionnaire, should be noted here. During the pilot phase of the questionnaire it was discovered that users of the MIS at the selected public FET college refer to their system as the BMS and therefore the term MIS in the questionnaire was changed to the more familiar term *BMS* (Interview 2, 2011, Interview 3, 2011).

Table 2.4: Towards questionnaire development: A comparison of four different empirically tested survey instruments

(Doll and Torkzadeh, 1988:268)	(Gable et al., 2008:405)	(Ong et al., 2009:402)	(Ifinedo et al., 2010:1146)	Proposed survey instrument for this study based on the empirically tested questionnaires used in the four studies on the left:		
End-user Computing satisfaction (EUCS)	IS Measurement Model	User satisfaction with Question Answering Systems (USQAS)	ERP system success model (ERP)	Variable name	Question/Item	Constructs
	IS measurement model - Individual impact	USQAS - Usefulness	ERP - Individual impact	v15a1	I have learnt much through the presence of the BMS	Individual impact
	IS measurement model - Individual impact	USQAS - Usefulness	ERP - Individual impact	v15a2	The BMS enhances my awareness of job related information	Individual impact
	IS measurement model - Individual impact	USQAS - Usefulness	ERP - Individual impact	v15a3	The BMS enhances my recall of job related information	Individual impact
	IS measurement model - Individual impact	USQAS - Usefulness	ERP - Individual impact	v15a4	The BMS enhances my effectiveness in the job	Individual impact
	IS measurement model - Individual impact	USQAS - Usefulness	ERP - Individual impact	v15a5	The BMS increases my productivity	Individual impact
	IS measurement model - Information quality		ERP - Information quality	v15b1	Information available from the BMS is important	Information quality
EUCS - Content		USQAS - Information quality		v15b2	The BMS contains all the key data that is needed	Information quality, User Satisfaction
EUCS - Accuracy	IS measurement model - Information quality			v15b3	Information available from the BMS is always accurate (does not often need correction)	Information quality, User Satisfaction
EUCS - Timeliness		USQAS - Information quality	ERP - System quality	v15b4	Information from the BMS is always updated and current	Information quality, User Satisfaction
EUCS - Content	IS measurement model - Information quality			v15b5	The BMS provides output that seems to be exactly what is needed	Information quality, User Satisfaction
	IS measurement model - Information quality		ERP - Information quality	v15b6	Information needed from the BMS is always available	Information quality
EUCS - Format	IS measurement model - Information quality	USQAS - Information quality		v15b7	Information from the BMS is in a format that is readily usable	Information quality, User Satisfaction
EUCS - Format	IS measurement model - Information quality	USQAS - Information quality	ERP - Information quality	v15b8	Information from the BMS is easy to understand	Information quality, User Satisfaction
EUCS - Format	IS measurement model - Information quality	USQAS - Information quality		v15b9	Information from the BMS appears readable, clear and well formatted	Information quality, User Satisfaction
EUCS - Content	IS measurement model - Information quality		ERP - Information quality	v15b10	Information from the BMS is concise	Information quality, User Satisfaction

Table 2.4: Towards questionnaire development: A comparison of four different empirically tested survey instruments

(Doll and Torkzadeh, 1988:268)	(Gable et al., 2008:405)	(Ong et al., 2009:402)	(Ifinedo et al., 2010:1146)	Proposed survey instrument for this study based on the empirically tested questionnaires used in the four studies on the left:		
End-user Computing satisfaction (EUCS)	IS Measurement Model	User satisfaction with Question Answering Systems (USQAS)	ERP system success model (ERP)	Variable name	Question/Item	Constructs
EUCS - Timeliness	IS measurement model - Information quality		ERP - Information quality	v15b11	Information from the BMS is always timely	Information quality, User Satisfaction
	IS measurement model - Information quality			v15b12	Information from the BMS is unavailable elsewhere	Information quality
EUCS - Ease of use	IS measurement model - System quality	USQAS - Ease of use	ERP - System quality	v15c1	The BMS is easy to use	System quality, User Satisfaction
EUCS - Ease of use	IS measurement model - System quality	USQAS - Ease of use	ERP - System quality	v15c2	The BMS is easy to learn	System quality, User Satisfaction
	IS measurement model - System quality	USQAS - Ease of use		v15c3	It is not difficult to get access to information that is in the BMS	System quality
	IS measurement model - System quality		ERP - System quality	v15c4	All data within the BMS is fully integrated and consistent	System quality
EUCS - Content	IS measurement model - System quality		ERP - System quality	v15c5	The BMS meets (the FET college's) information requirements	System quality, User Satisfaction
	IS measurement model - System quality			v15c6	The BMS includes necessary features and functions	System quality
	IS measurement model - System quality	USQAS - Ease of use		v15c7	The BMS always does what it should	System quality
	IS measurement model - System quality	USQAS - Ease of use	ERP - Service quality	v15c8	The BMS user interface (screen) can be easily adapted to one's personal approach (customize)	System quality
	IS measurement model - System quality		ERP - System quality	v15c9	The BMS is always up-and-running as necessary (It has good connectivity, e.g. to network, server access, etc.)	System quality
EUCS - Timeliness	IS measurement model - System quality		ERP - Service quality	v15c10	The BMS programme speed is quickly enough (responds quickly)	System quality, User Satisfaction
	IS measurement model - System quality		ERP - Service quality	v15c11	The BMS requires only the minimum number of fields and screens to achieve a task	System quality
	IS measurement model - System quality		ERP - System quality	v15c12	Modifications to the functionality of the BMS can easily be done (modified, corrected and improved)	System quality
		USQAS - Service quality	ERP - Service quality	v15c13	The BMS's service provider is reliable	Service quality
		USQAS - Service quality	ERP - Service quality	v15c14	The BMS's service provider has up-to-date facilities	Service quality
		USQAS - Service	ERP - Service quality	v15c15	The BMS's service provider is experienced	Service quality

Table 2.4: Towards questionnaire development: A comparison of four different empirically tested survey instruments

(Doll and Torkzadeh, 1988:268)	(Gable et al., 2008:405)	(Ong et al., 2009:402)	(Ifinedo et al., 2010:1146)	Proposed survey instrument for this study based on the empirically tested questionnaires used in the four studies on the left:		
End-user Computing satisfaction (EUCS)	IS Measurement Model	User satisfaction with Question Answering Systems (USQAS)	ERP system success model (ERP)	Variable name	Question/Item	Constructs
		quality				
			ERP - Service quality	v15c16	The BMS's service provider provides quality training	Service quality
		USQAS - Service quality	ERP - Service quality	v15c17	The BMS's service provider provides quality services	Service quality
	IS measurement model - Organisational impact		ERP - Organisational impact	v15d1	The BMS has resulted in overall productivity improvement	Organisational impact
	IS measurement model - Organisational impact			v15d2	The BMS has resulted in improved outcomes or outputs	Organisational impact
	IS measurement model - Organisational impact			v15d3	The BMS has resulted in an increased capacity to manage a growing volume of activity (e.g. transactions, population growth, etc.)	Organisational impact
	IS measurement model - Organisational impact		ERP - Organisational impact	v15d4	The BMS has resulted in improved business processes	Organisational impact
	IS measurement model - Organisational impact		ERP - Organisational impact	v15d5	The BMS has helped to improve communication and relationships with partners such as DHET, SETAs, government, private companies, etc.	Organisational impact
	IS measurement model - Organisational impact			v15d6	The BMS is cost effective	Organisational impact
	IS measurement model - Organisational impact			v15d7	The BMS has resulted in reduced staff costs	Organisational impact
	IS measurement model - Organisational impact		ERP - Organisational impact	v15d8	The BMS has resulted in cost reductions (e.g. inventory holding costs, administration expenses, etc.)	Organisational impact

2.11 MODEL FOR THIS STUDY

The proposed theoretical model for this study comprises of a combination of three models: the original D&M IS Success Model, the updated D&M IS Success Model and the End-User Computing Satisfaction Model (cf. sections 2.7.2.4, 2.7.2.5 and 2.7.2.8). Figure 2.19 depicts the three models on which the proposed theoretical BMS Success Evaluation Model for this study is based. The proposed theoretical model was used to develop the evaluation tool for evaluating the BMS system at the selected public FET college.

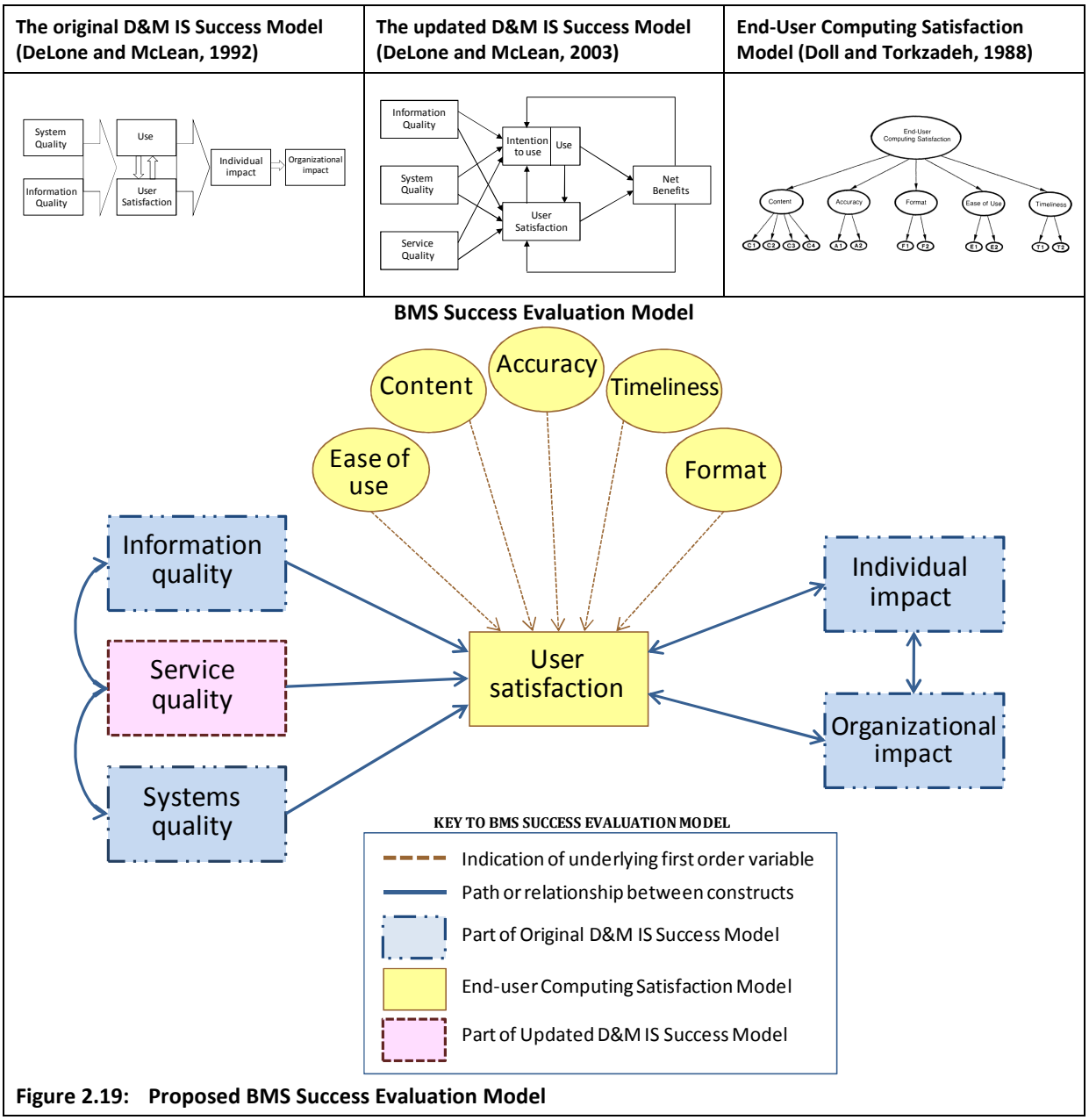


Figure 2.19: Proposed BMS Success Evaluation Model

The inter-relationships between the constructs (as presented in the models) will be retained and further verification of these inherent relationships is beyond the scope of this study.

The underlying variables of the BMS Success Evaluation Model are listed in the last three columns on the right-hand side of Table 2.4. The model should therefore be studied in conjunction with this table. The model as depicted in Figure 2.19 is the proposed theoretical model and will be further validated, developed, refined and, if necessary, extended after both quantitative and qualitative data analysis have been done as discussed in Chapter 5, section 5.5.

2.12 CONCLUSION

In Chapter 2, a literature review concerning extant IS success evaluation models and tools, underlying constructs, effectiveness measures and finally a proposed theoretical model for the study and items for inclusion in a survey questionnaire were presented.

In the IS success evaluation literature the terms ***model*** and ***tool*** are sometimes used interchangeably to refer to conceptual models. In this study the term ***model*** refers to the conceptual model as presented textually and graphically to depict the constructs and relationships between the constructs whereas the term ***tool*** refers to the measuring instrument, in essence the questionnaire.

The next chapter will encompass a literature review on public FET colleges in South Africa with specific reference to the historical background of the FET sector, the types of MISs utilised at these institutions (cf. Chapter 1, section 1.2.2.2: second sub-research question: *What types of information systems exist at public FET colleges?*), and the background on the selection of an appropriate public FET college whose MIS will serve as the focus for IS success evaluation in this study.

CHAPTER 3

LITERATURE REVIEW ON THE PUBLIC FET COLLEGE SECTOR

3.1 INTRODUCTION

In Chapter 2, two of the three sub-research questions (cf. Chapter 1, sections 1.2.2.1 and 1.2.2.3) were investigated by interrogating the existing literature on IS success evaluation models and the variables to be included in an evaluation tool for implementation at a selected public FET college in South Africa. Accordingly, the literature study informed the decision to base the model for this study on a combination of three models (cf. Chapter 2, sections 2.8 and 2.11). The questionnaire items for the MIS evaluation have been derived from the proposed theoretical model; thus, the literature study also served as the foundation for the development of one component of the instrument (cf. Chapter 2, section 2.10).

The next phase in the research was to study the domain in which the proposed model had to be applied. This was also in response to, namely, the second sub-research question (cf. Chapter 1, section 1.2.2.2: *What types of information systems exist at public FET colleges?*). It is important to be familiar with the characteristics of, and to understand the changes in, the public FET college sector in South Africa in order to be able to conclude with reliable interpretations of the research findings. Therefore, in this chapter the results of a literature review on public FET colleges in South Africa are presented. Documentation, including business plans, strategies on the implementation of the MIS, user manuals and user requirement statements, was collected and evaluated. Semi-structured interviews with officials from the DHET and FET colleges were held with the intention of understanding the sector and the types of MIS that are being implemented at public FET colleges. The rationale for the review will be given in the section that follows.

Figure 3.1 depicts the topical outline for this chapter.

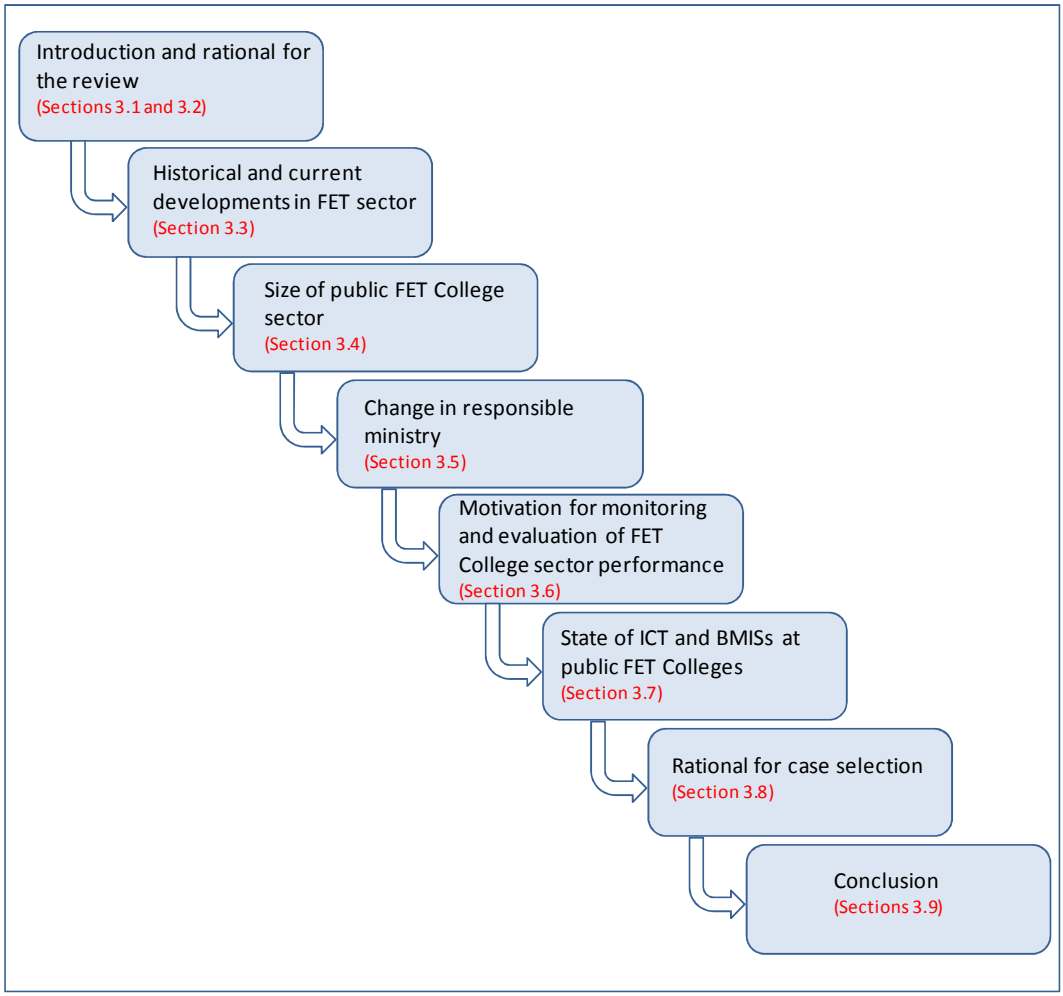


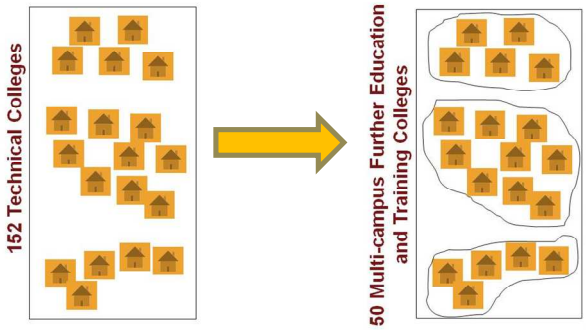
Figure 3.1: Topical outline of Chapter 3

3.2 RATIONALE FOR THE REVIEW

The continuously changing landscape of public FET colleges in South Africa suggests the ongoing change and adaptation of the business management information system(s) (MIS) employed at these institutions. Management information systems are pivotal to the efficient and effective running of any modern business, organisation or institution, including FET colleges (Irani and Love, 2008a). Apart from an extant MIS, it is also accepted that one of the key factors for successful IS planning and implementation is the close linkage between IS strategy and business strategy (Atkins, 1994, Baets, 1992, Paterson, 2005). Hence, there is a direct causal relationship between organisational change and MIS adaptation. In the next section, the main changes and developments in the public FET college sector over the past two decades are noted.

3.3 DEVELOPMENTS IN FET SECTOR

Figure 3.2 elucidates the extensive changes the public FET college sector in South Africa have endured over the past two decades by presenting a list of policies that have been implemented and legislation promulgated to create a framework for transformation in this sector.



1994:	**Public FET College sector consisted of 152 Technical Colleges.**
1995:	**Establishment of a single National Qualifications Framework NQF under the auspices of the South African Qualifications Authority (SAQA).**
1997:	**Framework for transformation by the National Committee on Further Education (NCFE) was published.**
1998:	**FET College Act No. 98 was promulgated that guided and governed the development of the FET Colleges during 1998 to 2006.**
1998:	**Skills Development Act (SDA) was introduced.**
2000:	**National Landscape Task Team was established.**
2001:	**The report: *A New Institutional Landscape for Public Further Education and Training Colleges* was published and the merging of the 152 Technical Colleges into 50 FET Colleges was recommended in this publication.**
2001:	**National Skills Development Strategy Phase I was implemented.**
2002 to 2006:	**Consolidation of merger process.**
2005:	**National Skills Development Strategy Phase II was introduced.**
2006:	**FET College Act No. 16 was promulgated.**
2006 to 2009:	**Recapitalization programme of R1,9 billion took place. This included standardization and upgrading of ICT and BMIS systems.**
2008:	***National Plan for FET* Colleges was published.**
2011:	**National audit of public FET Colleges took place.**
2011:	**National Skills Development Strategy Phase III was introduced.**

Figure 3.2: List of policies and legislation that influence and guide transformation in the FET college sector

In 1995 the vocational and technical component of the education and training system consisted of 152 technical colleges located in various education departments. The 152 technical colleges were governed, managed and funded in different ways. They furthermore served different population groups and their location was determined by the location of specific industries.

Although there was evidence of some quality provision, the public perception was that college programme offerings were of poor quality and they were regarded as unresponsive to the needs of the economy (Business Leadership, 2008, National Department of Education, 2009). The challenge was, therefore, to transform the then so-called technical colleges into a coherent system that would address the vocational education and training needs of the 21st Century (Department of Basic Education, 2010a, Department of Education, 2008a).

The first step in the transformation of vocational education was the establishment in 1995 of a single National Qualifications Framework (NQF), which aimed to promote the integration of education and training systems under the auspices of the South African Qualifications Authority (SAQA). In September the following year, the National Committee on Further Education (NCFE) was appointed to investigate FET-related problems and to make recommendations for the sector's transformation. The Committee's report on a framework for the transformation of FET colleges in South Africa was published in August 1997. Subsequently, the FET college Act No. 98 of 1998 guided and governed the development of FET colleges in the period 1998 to 2006, after which the FET Colleges Act No. 16 of 2006 was passed and promulgated on 11 December 2006 (Department of Education, 2008a, Republic of South Africa, 2006).

The recommendations of a National Landscape Task Team, which was established in 2000, were published in July 2001 as *A New Institutional Landscape for Public Further Education and Training Colleges*. This document recommended the establishment of 50 public FET colleges from the 152 technical colleges. This was later made the responsibility of the various provincial Members of the Executive Councils (MECs) (Department of Education, 2008a).

The period 2002 to 2006 saw the consolidation of the merger process through the training and development of college councils, the appointment of principals at each of the 50 colleges and the development of common administration and management systems across the various sites (campuses) of the colleges (Department of Education, 2008a).

A R1,9 billion recapitalisation programme for FET colleges, which took place during 2006 to 2009, included measures that have significantly changed the FET landscape. Among these measures was the merger of the 152 technical colleges into 50 multi-campus FET colleges.

Currently, there are 50 public FET colleges with 237 sites of programme delivery (Department of Basic Education, 2010a, Department of Education, 2008a, Sabinet, 2010, Lund, 2010).

A National Plan for FET colleges was published in 2008 and takes into account the role of FET colleges, as spelt out in the White Paper 4 and the FET colleges Act No. 16 of 2006. The plan includes determining relevant programme offerings, formation of partnerships with HE institutions and industry, institutional and staff development and internal quality assurance systems.

Government's intention to build the FET college sector into a vibrant, expanded and quality college sector to improve post-schooling options and access to skills for youth has been emphasised in the media on many occasions, as well as in speeches and documents. This underscores the intention to increase headcount enrolment at public FET colleges so that by the year 2016 the public FET colleges will have the capacity to enrol a million learners per annum (Khumalo, 2009, Business Leadership, 2008).

Evidence of improvements and upgrades within the FET college sector were reported on in a presentation at a briefing of the Portfolio Committee on FET colleges at the Department of Education (2009). As indicated in Figure 3.3, by 2008/9 local area network (LAN) and wide area network (WAN) systems had been installed at a total number of 71 sites (campuses) of public FET colleges. Furthermore, one of the main challenges of FET colleges emphasised in that briefing was the absence of effective management information systems to inform decision making. The expansion and use of ICT and the lack of uniform management information systems are challenges that still persist, and the quality of these upgrades and new systems implementations have to be assured. In this study, one of the MIS implementations at one of the FET colleges will be evaluated for efficiency and effectiveness.

Achievements

Key performance Indicators	ACHIEVEMENTS OVER THE 2006/7-2008/9 MTEF		
	2006/07	2007/08	2008/9
Number of college staff trained on delivery of NC(V)	4410	4775	4 366
LAN and WAN installed in colleges	55 sites	64 sites	71 sites
Number of workshops upgraded at FET Colleges	49	216	129
Number of new classroom purchased or built	36	166	132
Number of new workshops purchased or built	23	137	39
Number of new offices purchased or built	0	53	63
Number of laboratories purchased or built	0	81	23
Number of college sites upgraded	119	103	45
Number of college workshops installed with modern equipment.	* 85	235	232
A selection of NC(V) programmes at level 2 and 3 implemented at all FET Colleges in 2008	11 programmes	12 programmes	14 programme
Additional programme developed and implemented	0	1 programme developed	
Additional subjects developed and implemented	0	2 additional subjects developed and will be implemented in 2009	

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Education
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Figure 3.3: Achievements over the 2006/7 to 2008/9 Medium Term Expenditure Framework (MTEF) (Department of Education, 2009)

3.4 SIZE OF THE PUBLIC FET COLLEGE SECTOR

It is important to be able to contextualise the public FET college sector within the domain of education and training provisioning by the education ministries. In the most recent *Education Statistics in South Africa* (2010b), an annual publication of DoE, it is noted that in 2009 only 3 percent of the total number of participants in the education and training system enrolled at public FET colleges. Figure 3.4 shows that of the 14 122 305 learners and students enrolled in all sectors of the education system in 2009, 11 834 516 (83.8%) were in ordinary public schools and 393 447 (2.8%) were in ordinary independent schools. Of the learners in other institutions, 837 779 (5.9%) were in public HE institutions, 420 475 (3.0%) were in public FET institutions, 297 900 (2.1%) were in public Adult Basic Education and Training (ABET) centres, 237 471 (1.7%) were in Early Childhood Development (ECD) centres, and 100 717 (0.7%) were in special schools

(LSEN). In summary, there were 14 122 305 learners and students in the education system, who attended 32 103 education institutions and were served by 469 963 educators and lecturers (Department of Basic Education, 2010b:5).

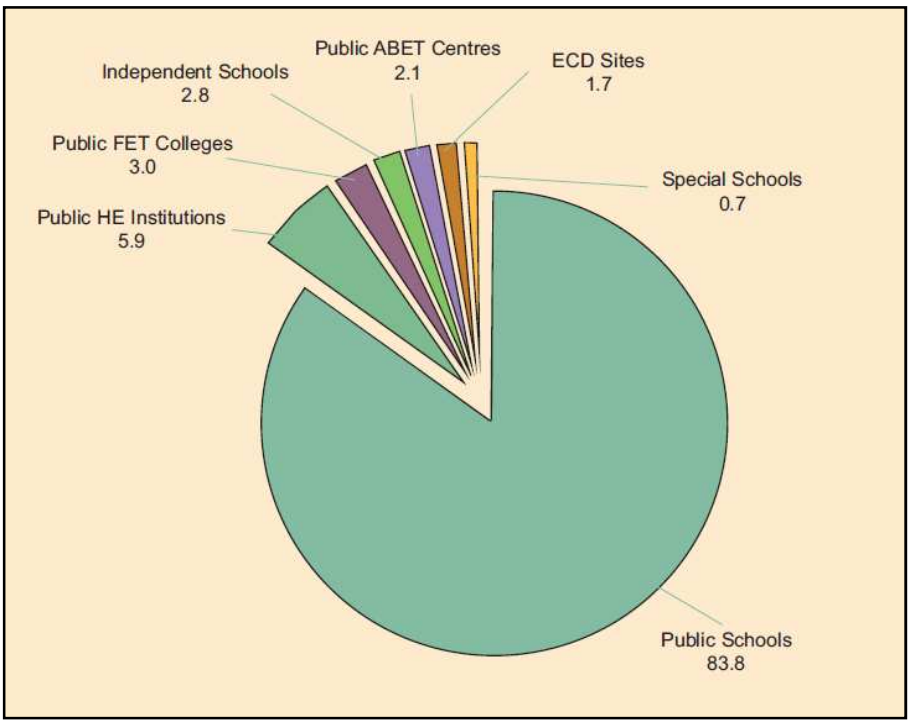


Figure 3.4: Percentage distribution of learners in the education system in 2009 (Department of Basic Education, 2010b:5)

In a recent audit of FET colleges conducted by the Human Sciences Research Council (Cosser, Kraak & Winnaar, 2011), it was reported that 470 445 students enrolled at FET colleges in 2010 (Table 3.1). This figure denotes an increase of 49 970 students or 12% from 2009. Only one FET college reportedly enrolled more than 15 000 students. Additionally, more than half of the public FET colleges (26 colleges or 52%) enrolled between 3 000 to 5 999 students in 2010.

Table 3.1: Number of colleges by 'size', headcount, 2010

Very small colleges 0–2999	**Small colleges** 3000–5999	**Medium colleges** 6000–14999	**Large colleges** > 15000	Total
10	26	11	1	48

***Source**: HSRC 2010 FET college Audit 'Profiles' Questionnaire: Q9, 10, 11, 12; n = 48*
***Note**: Only 48 FET colleges' responses are included.*

Considering the above, the public FET sector comprises a small part of the education and training domain; however, much is expected of this sector in the future, as this sector has

become the focus of government's plan to address youth unemployment and intermediate skills development in South Africa. To be able to govern and manage this sector efficiently and effectively, government decided to move the responsibility for the FET college sector from the various provincial departments to the national department. This move is discussed in section 3.5.

3.5 CHANGE IN RESPONSIBLE MINISTRY

Since the advent of democracy in 1994, educational law and policy have been steered by the national Department of Education. A number of policies have been implemented and legislation promulgated to create a framework for transformation in FET. The key legislation and policies include the following:

- Further Education and Training Act No. 98 (1998)
- Education White Paper No 4 on the Transformation of Further Education and Training (1998)
- National Strategy for Further Education and Training (1999–2001)
- Further Education and Training College Act No. 16 (2006)
- Strategic Plan for 2008 to 2012 (2008b)
- operational plans for 2011 to 2015 (2011)

Since the general elections of April 2009, the organisation and administration of the education system have undergone their first major alteration since 1994. Restructuring has been undertaken to ensure that balanced attention is given to improving access and quality in all sub-systems of the education and training system, and in particular to raise the poor learning performance levels in schools and attend to major priority skills needs in the economy (Department of Basic Education, 2010a).

Before the restructuring of 2009, the Constitution provided that the national government had exclusive responsibility for tertiary education; while responsibility for all other education was a concurrent responsibility of the national government and the nine provincial governments.

Under this constitutional scheme, schools, adult learning centres and FET colleges have been administered by provincial education departments in terms of national policy and legislation, supplemented by provincial policies and laws (Department of Basic Education, 2010a).

The restructuring of 2009 led to the establishment of two new ministries to govern the education and training sector: the Ministry of Basic Education and the Ministry of Higher Education and Training.

The new Department of Basic Education (DBE) is responsible for the school system, that is, to raise the quality of school provision and outcomes in the provincial education systems, as well as adult literacy, which were formerly managed by the Department of Education.

On the other hand, the new Department of Higher Education and Training (DHET) is responsible for HE institutions, FET colleges and adult learning centres all of which previously resided under the Department of Education.

The DHET is also responsible for the system of workforce skills development, including the National Skills Authority (NSA), the Sector Education and Training Authorities (SETAs), trade testing centres and skills development institutes that were previously developed and managed by the Department of Labour. The DHET therefore considers its mandate to cover all post-school education and training. In the light of these new departmental arrangements and mandates, the constitutional and legislative framework of education and training is being reviewed (Department of Basic Education, 2010a).

On 15 June 2010, the Cabinet of the Republic of South Africa approved the change in the constitution to relocate the functions of the Adult Basic and Training Act of 2000 and the Further Education and Training Colleges Act No. 16 of 2006 from provincial administrations to the Minister of Higher Education and Training. The advantages of making this a national competence include improved planning and increased articulation with universities and the skills development sector; in addition, the Minister will be in a better position to give a national focus to the education and training needs of young adults (Sabinet, 2010).

In section 3.6 some points are given to support the monitoring and evaluation of the FET sector.

3.6 MOTIVATION FOR MONITORING AND EVALUATION OF FET COLLEGE SECTOR PERFORMANCE

In this section, reasons for the need for efficient and effective monitoring and evaluation systems at FET colleges with regard to policy and the educational needs of young adults are presented.

3.6.1 One of the objectives of the National Plan

Concurrent with the changing landscape and the critical need for skills development in South Africa, is an urgent need for the monitoring and evaluation of systemic and institutional performance and the fostering of public accountability. It has been reported that for the FET system to function optimally it must be able to reflect on and take stock of its successes and failures in order to consolidate its strengths and improve on its weaknesses. It is for this reason that performance on the objectives set in the National Plan at systemic and institutional levels should be monitored and evaluated (Department of Education, 2008a).

One of the focus areas of the FET Colleges Act No. 16 (Government, 2006) is quality assurance systems, which include the evaluation of information systems performance as a key performance indicator of organisational success. One of the strategies proposed to accomplish this is to identify weaknesses in, and monitor, evaluate and strengthen business management information systems at FET colleges (Government, 2006, Department of Education, 2008a, Department of Education, 2008b, Republic of South Africa, 2006, Lund, 2010). After the implementation of the college mergers, substantive integration of college business information systems and processes followed, which further added to the need for information systems evaluation.

3.6.2 Young people unable to participate in meaningful education and training

Despite many interventions to enhance skills development, such as the implementation of learnership qualifications, an improved public FET sector, and Extended Public Works Programmes, many young people between the ages 16 and 24, estimated at three million (Cloete, 2009), are still unable to participate in meaningful education and training (UMALUSI, 2009). This situation points not only to a waste of talent, but also to the possibility of serious social disruption (Cloete, 2009). This seems to suggest that these interventions have not yet impacted sufficiently on the scale of the challenge. The number of youth between the ages mentioned, who are not in education, employment or training, the so-called NEET youth as this group is described in the United Kingdom, is growing in South Africa. This may be as a result of the lack of a more accessible and flexible post-schooling, post-literacy and post-compulsory education sector. Since appropriate education and training is seen to improve the life chances of this group, it is incumbent on the government and its statutory bodies to respond to this need (Cloete, 2009, Stumpf et al., 2009, UMALUSI, 2009).

3.6.3 Supply of students ready to enter the FET college sector

When compared internationally in terms of the number of youth in the tertiary sector, South Africa needs to improve. It has been reported that highly successful countries in the knowledge economy have up to 60 percent of their 18 to 24 years old participating in the college and university sector. In the case of Korea, it is 91 percent. In contrast, the South African figure for 2007 was 16 percent. Accordingly, a short-term target on the part of the South African government is to reach a figure of beyond 20 percent (James, 2009).

About 2.8 million potential students in the 18 to 24 years age range belong to the NEET group. Of these, roughly 700 000 *with Grade 12* are not studying, are not in employment and are not disabled. Of the 2.8 million, approximately 1 million students can enter the further education and training sector. Hence, there is a ready college-level market on the supply side and the question is whether the FET colleges can respond quickly enough to absorb these students. If that were to happen, the participation in the knowledge economy would improve radically (James, 2009, Sheppard, 2009, Sheppard and Cloete, 2009).

3.7 STATE OF ICT AND MISs AT PUBLIC FET COLLEGES

In this section the current state of ICT and MISs at public FET colleges is considered.

Prior to 1994, the then so-called *Technical Colleges* were expected to provide statistically summarised information on headcount and full-time equivalent (FTE) enrolments, numbers of staff and the programmes offered in a standardised format to their respective government departments. No specific software applications were prescribed to these colleges for managing their internal data – some used paper-based systems while others used automated computer systems varying in sophistication. Each technical college decided autonomously on the type of suitable and affordable system to use. This led to inconsistencies in the practices of technical colleges with regard to the type of internal MISs employed.

The FET Audit (Cosser et al., 2011) on the computerised systems being utilised at public FET colleges revealed that many different computer software products are being used. These include the following: BMS, COLTECH, Integrated Tertiary System (ITS), DB 2000, FETMIS, Pastel, IQUAL, VIP Payroll, MS Access, TRACTEC, BAUD, and COLTSMS. The predominant product used by colleges is COLTECH (30 colleges or 60%), followed by DB 2000 (13 colleges or 26%). Most of the colleges are using a combination of these products to facilitate different functions. For instance a college could use COLTECH for assets, finance and student registration, but another product for human resources and personnel management (Cosser et al., 2011).

Since almost two thirds of the colleges are currently using COLTECH, this product was investigated in more depth. The COLTECH Windows System is an MIS designed to run on either an LAN or a WAN and can handle the versatility of multi-campus colleges (Interview 4, 2011). Some of the public FET colleges had been using the system for many years even prior to 1994. Figure 3.5 is an illustration of the products offered by COLTECH on its website (Coltech, 2005). The website lists the following products: Coltech Student System; Coltech Photo System; Coltech Personnel System; Coltech Library System; Coltech Financial System; and Coltech Staff & Management.

Figure 3.5: Coltech website (Coltech, 2005)

As previously noted, the period 2002 to 2006 saw the consolidation of the public FET college merger process through the training and development of college councils, the appointment of principals at each of the 50 colleges and the development of common administration and management systems across the various sites (campuses) of the colleges (Department of Education, 2008a). Officials at DHET confirmed the findings of the FET Audit when reported in an interview as part of this study (Interview 1, 2011) that the ICT infrastructure and administration systems of the FET colleges differ immensely in sophistication and complexity, as some colleges are still employing paper systems and others hugely fragmented computer systems. It was for this reason that, with the re-structuring process, the National Education Department (DoE) decided to standardise ICT infrastructure and MISs at public FET colleges.

Subsequently, a tender for the development of a MIS for public FET colleges was advertised and the company awarded the contract started implementing components of the proposed BMS[1]

[1] Refer to Chapter 2, section 2.10 for an explanation of the acronym BMS.

system at the DHET and three selected public FET colleges in 2006, as part of a pilot implementation phase (CINOP, 2011). Components of the BMS have been implemented sequentially and are now fully operational at the three pilot FET colleges. (A few examples of screen displays of the BMS can be viewed in Appendix 9.) The DHET plans to expand the standard BMS to an additional four public FET colleges by March 2012 (Department of Higher Education and Training, 2011). One of the main benefits of the BMS is that it is an internet-based system and is therefore linked directly to the DHET for quick updated strategic management and planning information, and indicator development to facilitate monitoring and evaluation of the FET sector.

The National Plan (Department of Education, 2008a) makes the expansion and use of ICT one of the priority areas. Indeed, one of the government's Apex Priorities is the speeding up of ICT interventions to provide cost-effective ICT platforms. This entails increasing the use of broadband and other ICT by addressing infrastructure development, cost and other issues related to access to ICT. By using the Recapitalisation Conditional Grant, the DoE took a decision to equip all 50 colleges with modern ICT infrastructure. This included the installation of LAN and WAN to enable students, teachers and management to have access to e-mail and the internet (cf. Section 3.3 for progress on goals). The National Plan further entails that the DoE and the Provincial Departments of Education, in partnership with the Department of Communication, should continue to support colleges to build suitable connectivity infrastructure and to create access to quality vocational education through quality e-learning and distance education.

3.8 RATIONALE FOR CASE SELECTION

In this section the underlying principles applied in the selection of an appropriate FET college for this study are discussed.

Since this study – an evaluation of IS success at a public FET college – is the first of its kind (according to the knowledge of the researcher) in South Africa, the college that was chosen had to represent a benchmark for the FET sector. Accordingly, it was decided to select one of the top performing public FET colleges on which to apply the proposed evaluation model. Another condition was that the FET college should be one of the three pilot colleges in which the new

BMS had been implemented, since all public FET colleges will eventually use the BMS system. Hence, the selected college, *FET college X* (called *FET college X* according to the confidentiality agreement), was purposefully selected on those bases and also since this specific college was proposed by the head of the FET unit at the DHET (Interview 1, 2011).

One of the eventual aims of the BMS is that all college staff will have access to and use the system on a daily basis for academic, administrative and management purposes. At the time of the survey, 163 staff members at *FET college X* were already using the BMS as part of their daily activities. The average system usage duration per staff member was reportedly between one and two years.

3.9 CONCLUSION

In the past, the FET college sector was referred to as the Cinderella of the education and training domain. Considering the new focus on, and the South African government investment in, this sector, there are high expectations for it to grow and contribute to the alleviation of unemployment and the development of critical scarce intermediate skills in the labour market. This is the time for this neglected sector to rise to the challenge.

In the following chapter the research methodology that was applied in this study will be explicated.

CHAPTER 4

RESEARCH METHODOLOGY

4.1 INTRODUCTION

Literature studies on the three knowledge fields of the study, namely, IS success evaluation, BIS and the public FET college sector in South Africa, were presented in Chapters 2 and 3. In this chapter the principles and procedures applied to address the research questions and the justification for the research methodologies selected based on the research questions and the literature review will be presented. The chapter will also present a discussion on the research process, the research design and the way in which ethical considerations were taken into account. Figure 4.1 depicts the topical outline of this chapter.

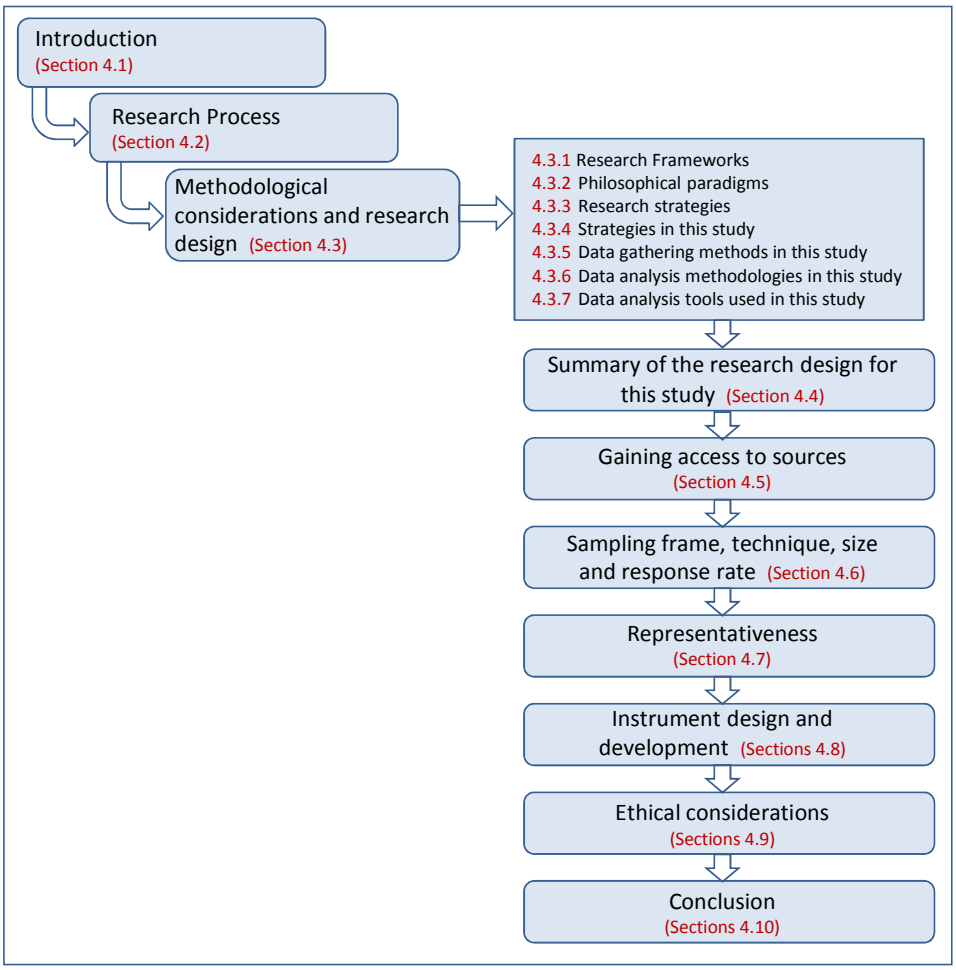


Figure 4.1: Topical outline of Chapter 4

4.2 RESEARCH PROCESS

The research methodology guides the research process. In this context, *research* is defined as a systematic method of gathering and analysing information or data in order to enhance our understanding of the facts that we are concerned with or interested in (Leedy and Ormrod, 2010) and a *methodology* refers to an organised way, comprising sequences, procedures and systems, to manage and run a research process (Burns, 2000).

The goal of the research process is to produce new knowledge; such processes can take three main forms: *exploratory research*, which structures and identifies new problems, *constructive research*, which develops solutions to a problem and *empirical research*, which tests the feasibility of a solution using empirical evidence (Bernard and Whitley, 2002, Oates, 2006). This study mainly falls into the third category: testing the variables contained in an IS success evaluation tool by gathering empirical evidence using a case study and a survey.

Research falls into two distinct types: primary research which denotes the collection of data that does not already exist, and secondary research which uses summary, collation and/or synthesis of existing data or research findings. This study uses findings in secondary sources to develop a framework for conducting primary research.

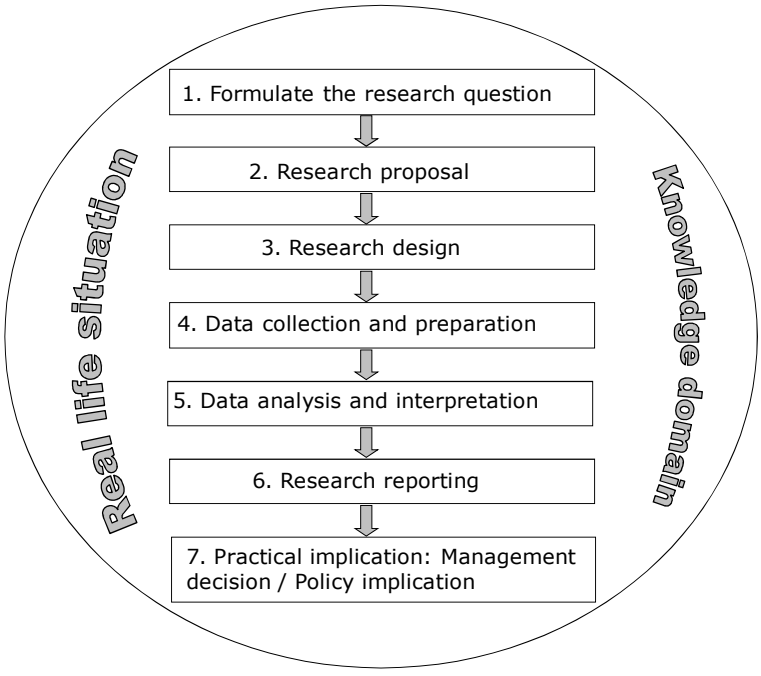


Figure 4.2: Stages of the research process adapted from Cooper and Schindler (2003)

The stages of the research process adapted from Cooper and Schindler (2003) are illustrated in Figure 4.2. Each of these stages is guided by the chosen research methodology

The research process relates in one way or another to the following elements as defined by Crotty (1998):

- **Methods**: the technique or procedures used to gather and analyse data related to some research question or hypothesis.
- **Methodology**: the strategy, plan of action, process, or design lying behind the choice and use of particular methods and linking the choice and use of methods to the desired outcomes.
- **Theoretical perspective**: the philosophical stance informing the methodology and thus providing a context for the process and grounding its logic and criteria.
- **Epistemology**: the theory of knowledge embedded in the theoretical perspective and thereby in the methodology.

Oates (2006:33) provides a model of the research process, which is illustrated in Figure 4.3. The author explains that the formulation of the research question(s) is based on researchers' experiences and motivation and is also informed by a literature review, while the conceptual framework of the study is informed by the literature review.

Figure 4.3 depicts six strategies that one can follow in the research process: survey strategy, design and creation, experiment, case study, action research and ethnography. Usually, a one-to-one relationship exists between a research question and a research strategy – typically, one research question has one research strategy. Data gathering methods include interviews, observation, questionnaires and documents (Mouton, 2001, Oates, 2006, Olivier, 2004). The authors further claim that there is often a one-to-many (1:N) relationship between the research strategy and the data gathering methods used. Data analysis can furthermore make use of qualitative and quantitative methods.

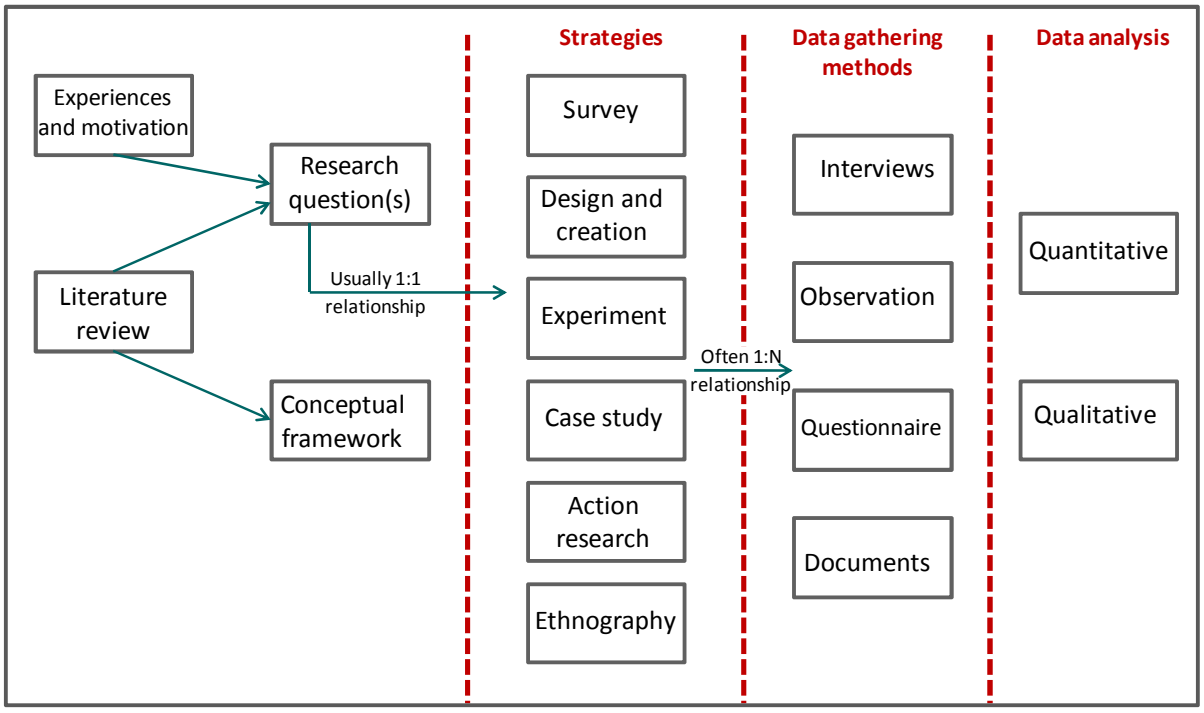


Figure 4.3: Model of the research process (Oates, 2006:33)

A research plan for this study can be viewed in Appendix 1. Section 4.3 serves as a background to describing the research design for this study.

4.3 METHODOLOGICAL CONSIDERATIONS AND RESEARCH DESIGN

The research design is a master plan that explains the proposed research methods in terms of data collection, enhancement of data quality and data analysis (Oates, 2006).

This section will provide the research methodology considerations for this study by explaining the framework (section 4.3.1), the philosophical paradigm (section 4.3.2), the strategies of enquiry (section 4.3.3), the strategies used in this study (section 4.3.4), the data gathering methods (section 4.3.5), the data analysis methodologies (section 4.3.6) and, finally, the data analysis tools (section 4.3.7).

4.3.1 Research frameworks

Three main research frameworks for approaching research can be identified (Bazeley, 2006, Burke Johnson, R., Onwuegbuzie, A. J. & Turner, L. A.Burke Johnson et al., 2007, Creswell and Clark, 2011, Greene, 2006):

1. Qualitative approach – understanding of human behaviour and the reasons that govern such behaviour.
2. Quantitative approach – systematic empirical investigation of quantitative properties and phenomena and their relationships.
3. Mixed methods which include both quantitative and qualitative approaches.

The choice of which approach to use depends on the properties of the subject matter and on the objective of the research (Creswell, 2009).

Burke Johnson et al. (2007) studied various researchers'-definitions and approaches to mixed methods and defined mixed methods as follows: "Mixed methods research is the class of research where the researcher mixes or combines quantitative and qualitative research techniques, methods, approaches, concepts or language into a single study or set of related studies."

The authors presented the qualitative–quantitative continuum graphically, as depicted in Figure 4.4, by incorporating different researchers' views of the mixed methods approach.

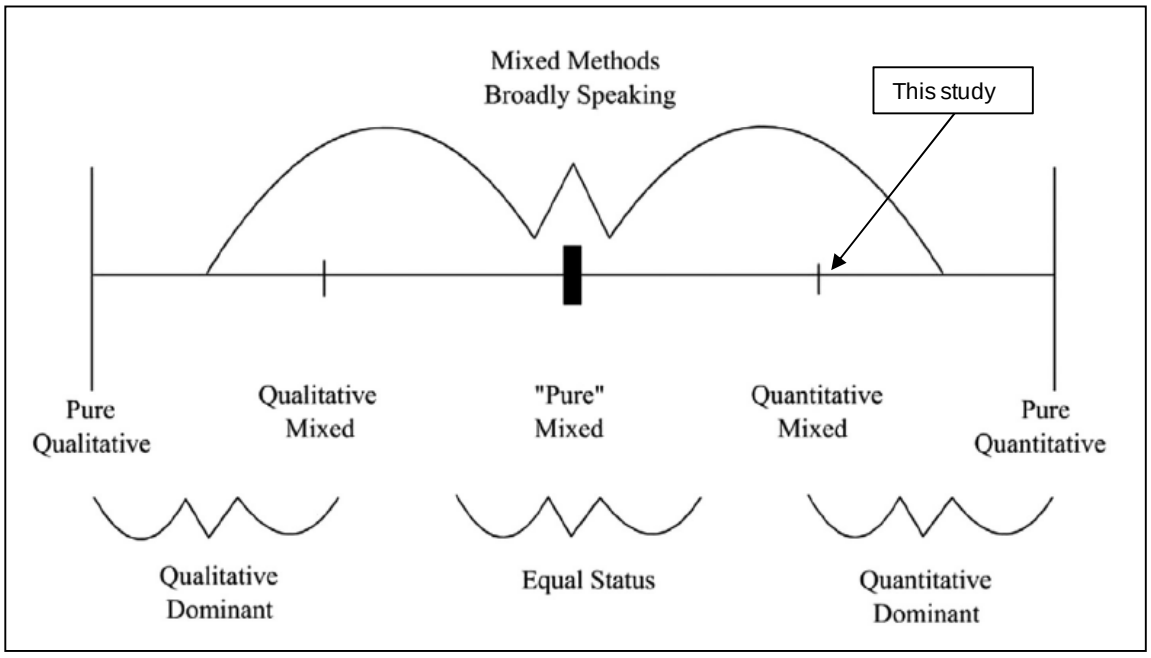


Figure 4.4: Graphic of the three major research paradigms, including subtypes of mixed methods research

The illustration in Figure 4.4 can be used to describe all the different possible types of mixed methods approach. The area in the centre of the figure, moving outward in both directions (and

excluding the area near the poles) is where mixed methods research, broadly speaking, falls, with the centre representing the strongest or *purest* form (Burke Johnson, R., Onwuegbuzie, A. J. & Turner, L. A, 2007).

This study comprises a mixed methods framework which is quantitative dominant. This type of research is symbolised as **QUAN+qual** research and is defined as follows: "Quantitative dominant mixed methods research is the type of mixed research in which one relies on a quantitative, postpositivist view of the research process, while concurrently recognizing that the addition of qualitative data and approaches are likely to benefit most research projects" (Burke Johnson et al., 2007).

A typology of different categories of mixed method approaches has been identified by Creswell and Clark (2011); while the concept of *mixed methods* is defined by Creswell (2009) as follows: "Mixed methods research is a research design (or methodology) in which the researcher collects, analyzes, and mixes (integrates or connects) both quantitative and qualitative data in a single study or a multiphase program of inquiry."

This study makes use of a mixed methods approach in which two strategies have been used: a case study and a survey. Creswell and Clark (2011) categorise this approach as a ***concurrent triangulation procedure***. Figure 4.5 depicts the research design as adapted from Creswell and Clark (2011). Accordingly, two procedures, a survey questionnaire and semi-structured interviews, were conducted concurrently. The survey questionnaire produced mainly quantitative data (numeric data), which was analysed by using statistical analysis procedures. The semi-structured interviews, on the other hand, were used to collect qualitative data which was analysed through theme identification and presented as narratives (cf. Chapter 5).

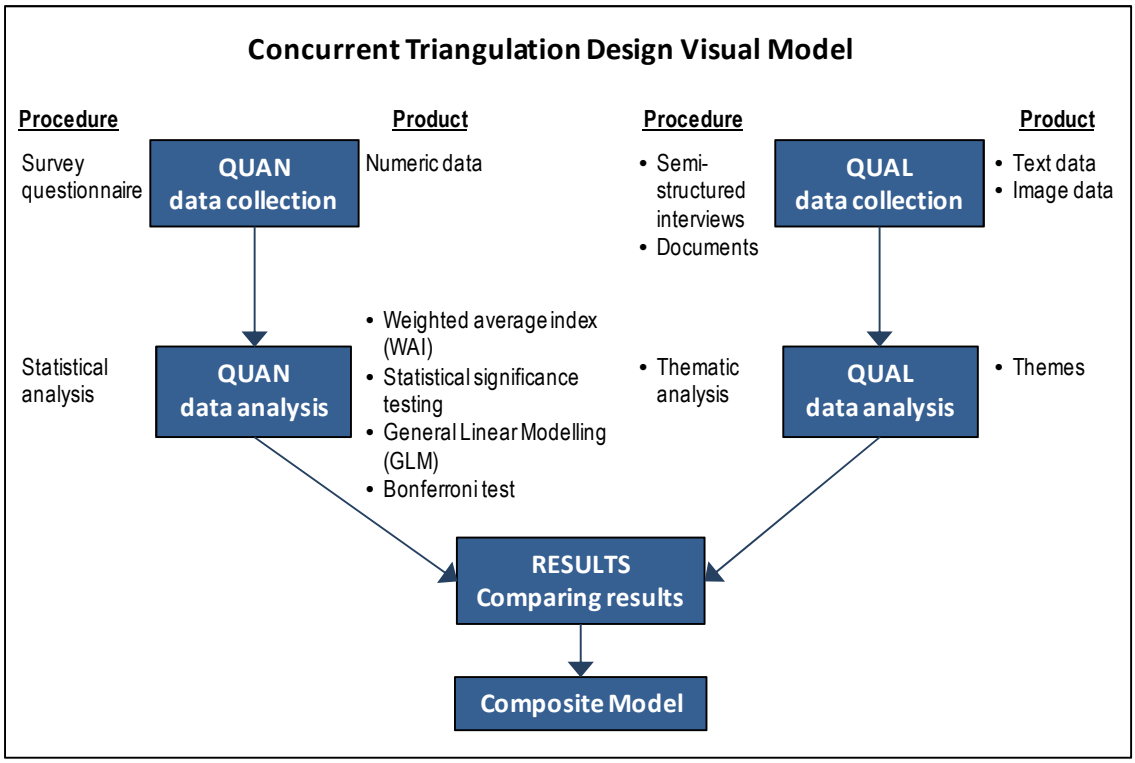


Figure 4.5: Concurrent triangulation model for this study adapted from Creswell and Clark (2011)

A typical research framework consists of three elements, namely, the underlying philosophical paradigm, the strategies of inquiry, and the methods (detailed procedures of data collection, analysis and writing), which are explicated in the following sections.

4.3.2 Philosophical paradigms

The academic research community consists of a wide range of sub-communities who are researching different knowledge domains, each with its own assumptions and way of thinking about some aspects of the world. These sub-communities have different ways of approaching research. Their approaches are shaped by their underlying philosophical paradigms, in other words, their underlying knowledge claims. Researchers start a project with certain assumptions about how they will learn and what they will learn during their inquiry. Different philosophical paradigms have different views about the nature of the world (ontology), the ways in which knowledge about the world can be acquired (epistemology), what values are in the world (axiology), how they write about the world (rhetoric), and the process for studying the world (methodology). The selection of a research strategy reflects this shared way of thinking and is

seen as appropriate in a particular research community (Creswell, 1994, Creswell, 1997, Creswell, 2003, Creswell, 2009, Oates, 2006).

There are three main philosophical assumptions or paradigms (knowledge claims): (1) positivism and post-positivism; (2) interpretivism; and (3) critical research (Creswell, 2009, Creswell and Clark, 2011, Crotty, 1998, Oates, 2006):

Positivism underlies the *scientific method*. It is the oldest and is perceived as the more acceptable research paradigm. The main research strategies used in this paradigm are experiments (positivism) and surveys (post-positivism).

Interpretive studies do not prove or disprove a hypothesis, as in positivist research, but try to identify, explore and explain how all the factors in a particular social setting are related and interdependent.

Although critical researchers do the same as interpretivists, they go further by analysing the patterns of power and control that regulate and legitimise particular ways of seeing the world. Critical research is concerned with identifying power relations, conflicts and contradictions, and empowering people to eliminate them as sources of alienation and domination.

Ethnographies and case studies are typical research strategies used by interpretivists, whereas action research and design and creation research can be used by all three paradigms. Creswell (2003) presents similar categories, although he adds 'pragmatism' as an additional category (Table 4.1).

Table 4.1: Knowledge claim positions

Postpositivism	**Constructivism**
Determination	Understanding
Reductionism	Multiple participant meanings
Empirical observation and measurement	Social and historical construction
Theory verification	Theory generation
Advocacy/participatory	**Pragmatism**
Political	Consequences of actions
Empowerment issue oriented	Problem centred
Collaborative	Pluralistic
Change oriented	Real-world practice oriented

Source (Creswell, 2003)

Creswell (1997, 2003, 2009) discusses four schools of thought about knowledge claims:

(1) post-positivism

(2) constructivism

(3) advocacy/participatory

(4) pragmatism

Table 4.1 presents the main elements of these philosophical paradigms. Constructivism is similar to interpretivism and the advocacy/participatory paradigm is comparable to the critical research paradigm. For pragmatists, knowledge claims arise out of actions, situations and consequences, rather than antecedent conditions as in post-positivism. Moreover, there is a concern with applications and solutions to problems. For pragmatists the problem is more important than the methods used and researchers use all approaches to understand the problem.

This study comprises a mixed method approach that includes both post-positivist and interpretivist philosophical paradigms. Both approaches (qualitative and quantitative) have been used to understand the problem of finding a solution to what is necessary in designing an evaluation tool to assist in the evaluation of MIS success at public FET colleges in South Africa. Hence, a pragmatic approach was applied.

The elements of research, as presented by Crotty (1998), are noted in Table 4.2 for the purpose of comparing Oates's, Creswell's and Crotty's viewpoints.

Table 4.2: Elements of research

Epistemology	Theoretical perspective	Methodology	Methods
Objectivism Constructionism Subjectivism (and their variants)	Positivism (and post-positivism) Interpretivism • Symbolic interactionism • Phenomenology • Hermeneutics Critical inquiry Feminism Postmodernism etc.	Experimental research Survey research Ethnography Phenomenological research Grounded theory Heuristic inquiry Action research Discourse analysis Feminist standpoint research etc.	Sampling Measurement and scaling Questionnaire Observation • participant • non-participant Interview Focus group Case study Life history Narrative Visual ethnographic methods Statistical analysis Data reduction Theme identification Comparative analysis Cognitive mapping Interpretative methods Document analysis Content analysis Conversation analysis etc.

Source: (Crotty, 1998)

4.3.3 Research strategies of inquiry

Research strategies have multiplied over the years as computer technology has advanced data analysis and the ability to analyse complex models, and as individuals have articulated new procedures for conducting social science research. The main research strategies identified by Oates (2006) and Creswell (1997, 2003, 2009), as discussed below, are experiments, surveys, ethnographies, case studies, action research, grounded theory, phenomenological research, narrative research and design and creation research.

Strategies associated with the quantitative approach include experiments and surveys; strategies related to the qualitative approach include ethnographies, grounded theory, case studies, phenomenological research and narrative research; while strategies connected to the

mixed method approach include sequential, concurrent and transformative procedures (Creswell and Clark, 2011).

The different strategies will now be discussed briefly:

- An **experiment** is a strategy that investigates cause-and-effect relationships, seeking to prove or disprove a causal link between a factor and an observed outcome (Oates, 2006). Experiments include true experiments, with the random assignment of subjects to treatment conditions, as well as quasi-experiments that use nonrandomised designs (Keppel, 1991).
- **Surveys** include cross-sectional and longitudinal studies using questionnaires or structured interviews for data collection, with the intent of generalising from a sample to a population (Babbie, 1990, Mouton, 2001, Olivier, 2004).
- **Ethnographies** are a form of research in which the researcher studies an intact cultural group in a natural setting over a prolonged period of time by collecting primarily observational data (Creswell, 2009). The research process is flexible and typically evolves contextually in response to the lived realities encountered in the field setting (LeCompte and Schensul, 1999).
- **Grounded theory**, in which the researcher attempts to derive a general, abstract theory of a process, action or interaction grounded in the views of participants in a study. This process involves using multiple stages of data collection and the refinement and interrelationship of categories of information (Strauss and Corbin, 1990). Two primary characteristics of this design are the constant comparison of data with emerging categories and the theoretical sampling of different groups to maximise the similarities and the differences of information (Creswell and Clark, 2011).
- **Case studies**, in which the researcher explores in depth an IS, a programme, an event, an activity, a process, or one or more individuals. The case(s) are bounded by time and activity, and researchers collect detailed information using a variety of data collection procedures, such as observations, interviews and document reviews, over a sustained period of time (Stake, 1995, Yin, 2003).

- **Action research** is the process of identifying, planning, developing and implementing actions that can be adopted to resolve a certain problem; once the actions have been implemented their outcomes are observed, recorded and validated to determine their effectiveness in resolving the problem. This process is continuous until the desired outcome is achieved. It is therefore a process of implementing the developed theory into practice and validates the outcomes to observe if the problem was really solved (Cooper and Schindler, 2003).
- **Phenomenological research** is research in which the researcher identifies the 'essence' of human experiences of a phenomenon, as described by participants in a study. Understanding the 'lived experiences' marks phenomenology as a philosophy as well as a method, and the procedure involves studying a small number of subjects through extensive and prolonged engagement to develop patterns and relationships of meaning (Moustakas, 1994).
- **Narrative research** is a form of inquiry in which the researcher studies the lives of individuals and asks one or more individuals to provide stories about their lives. This information is then retold or re-storied by the researcher into a narrative chronology. In the end, the narrative combines views from the participant's life with those of the researcher's life in a collaborative narrative (Clandinin and Connelly, 2000).
- **Sequential procedures**, in which the researcher seeks to elaborate on or expand the findings of one method with another method (combined procedure). This may involve beginning with a qualitative method for exploratory purposes and following up with a quantitative method with a large sample so that the researcher can generalise results to a population. Alternatively, the study may begin with a quantitative method in which theories or concepts are tested, to be followed by a qualitative method involving detailed exploration with a few cases or individuals (Creswell, 2003, Creswell, 2009, Creswell and Clark, 2011).
- **Concurrent procedures**, in which the researcher converges quantitative and qualitative data in order to provide a comprehensive analysis of the research problem. In this design, the investigator collects both forms of data at the same time during the study

and then integrates the information in the interpretation of the overall results. Also, in this design, the researcher nests one form of data within another, larger data collection procedure in order to analyse different questions or levels of units in an organisation (Creswell, 2003, Creswell, 2009, Creswell and Clark, 2011).

- **Transformative procedures**, in which the researcher uses a theoretical lens as an overarching perspective within a design that contains both quantitative and qualitative data. This lens provides a framework for topics of interest, methods for collecting data, and outcomes or changes anticipated by the study. This lens could include a data collection method that involves a sequential or a concurrent approach (Creswell, 2003, Creswell, 2009, Creswell and Clark, 2011).

4.3.4 Strategies used in this study

This study makes use of a concurrent triangulation procedure in which quantitative and qualitative data are converged in order to provide a comprehensive analysis of the research problem. In this design, both forms of data was collected at the same time during the study and then the information was integrated in the interpretation of the overall results. The strategies used in this study include a *case study* of the selected public FET college and a *survey* of all BMS users in that college. More information on strategies for conducting case studies and surveys is provided in sections 4.3.4.1 and 4.3.4.2, respectively.

4.3.4.1 Case study

According to Yin (2003) and Lazar, Feng and Hochheiser (2010:156), there are three types of case study namely (1) Intrinsic or instrumental; (2) single cases or multiple cases; and (3) embedded or holistic case studies. The authors explain these types as follows:

1. **Intrinsic or instrumental case studies**. Intrinsic studies describe cases that are of inherent interest; however, the results of these studies apply only to the relevant case. Instrumental case studies, on the other hand, ask questions in the hope of generating insights that go beyond the case at hand.

2. **Single or multiple case studies**. The goals of the study may play a role in determining whether one should use a single case or multiple cases. Multiple cases are most useful when one is interested in generalising the results. However, as some case studies may describe a unique case that cannot easily be compared to others, multiple-case studies are difficult, if not impossible. Olivier (2004:99) notes that multiple-case studies facilitate comparisons between cases which will contribute to the conclusions. Olivier further identifies different types of single case study: critical case, extreme case, unique case and revelatory case.
3. **Embedded or holistic case studies**: Yin (2003) and Laser et al. (2010) explain that the inclusion of multiple units of analysis within a single case is referred to as an embedded case study, in contrast to holistic studies that address only one unit of analysis in each case.

Considering the above explanation on the different types of case study, this study can be classified as an **intrinsic, single, embedded case study**.

Lazar et al. (2010:150) note further that case studies can have any one or a combination of the following four goals:

1. **Exploration** – understanding novel problems or situations, often with the hopes of informing new designs.
2. **Explanation** – developing models that can be used to understand a context of technology use.
3. **Description** – documenting a system, a context of technology use, or the process that led to a proposed design.
4. **Demonstration** – showing how a new tool was used successfully.

In this study the aim was to describe the BMS system and its impact within the context of the selected FET college and also in the broader education domain. Lazar et al. (2010:152) note in this regard that, in general, a single-case study with the aim of *describing* the case begins by

describing the problem, the steps that were taken to understand it, the details of the eventual design and the lessons learnt that might be of more general interest.

4.3.4.2 Survey strategy

Surveys are one of the most commonly used research strategies across all fields of research. They are frequently used to describe populations, to explain behaviours and to explore unknown topics (Babbie, 1990). According to Lazar et al. (2010:100), a survey questionnaire is a well-defined and well-written set of questions to which an individual is asked to respond. Questionnaires are typically self-administered by an individual, with no researcher present; because of this, the data collected is not as deep or in-depth as with other strategies such as ethnographies. Lazar et al. (2010) further note that the strength of the survey strategy is the ability to get a large number of responses quickly from a population of users – findings can then be generalised to the larger population. Surveys also allow one to make statistically accurate estimates for a population.

The difference between surveys and questionnaires can be explained as follows: a survey is the complete methodological approach (strategy), including sampling, the questionnaire, reminders and incentives, while a questionnaire is the list of structured questions (Lazar et al., 2010). Therefore a questionnaire is only one element of a well-done survey. In this study a survey was conducted on all BMS users by means of the administration of a questionnaire.

4.3.5 Data gathering methods used in this study

According to Oates (2006), a data generation method is the means by which one produces empirical data or evidence. Data can either be quantitative (e.g. numeric data) or qualitative (e.g. words, images, sounds, etc.).

Data collection techniques allow us to systematically collect information about our objects of study (computer systems, people, objects, phenomena) and about the settings in which they occur. In primary data collection, data is collected by using methods such as interviews and questionnaires. The key point here is that the data collected is unique to the current research and, until published, no one else has access to them. There are many methods of collecting data

and the main methods include questionnaires, individual interviews, focus group interviews, observation, documents, critical incidents and portfolios (Oates, 2006). The data gathering methods used in this study include the following:

- **Documents.** Extensive literature reviews were conducted and all the types of sources illustrated in Figure 2.1, that is, primary, secondary and tertiary sources, were consulted (cf. Chapter 2, section 2.3). Institutional documents pertaining to the implementation, maintenance and management of the BMS in question, that is, business plans, strategies on the implementation of the ICT, user manuals and user requirement statements were collected and studied in order to obtain a clear understanding of IS success evaluation models and the BMS employed at public *FET college X*. Literature reviews and document analysis also informed the design of the proposed BMS IS success evaluation model (cf. Chapter 2, section 2.11) and the survey instrument (cf. Chapter 2, section 2.10) used.
- **Interviews:** Lazar et al. (2010:187) explain that one should ensure that all relevant groups are represented when planning and conducting interviews. According to these authors, a stakeholder is anyone affected by the use of a system. In this study, meetings were arranged and held with the BMS manager and the IT manager at *FET college X* to solicit information pertaining to the BMS and its stakeholders. Semi-structured interviews were also held with national FET directorate officials to gain insight into the DHET's plans and strategies. The manager of the COLTECH MIS was also interviewed as a representative of systems providers in order to obtain more information on the MIS that is currently being used by most of the FET colleges in South Africa (Chapter 3, section 3.7). The final group of interviewees included the BMS users. Accordingly, interviews were conducted with a 5% sample of all BMS users in order to gain more insight into the BMS system from the users' perspective. Interviewing schedules were developed and can be viewed in Appendix 4. The interviews conducted with the BMS and IT managers at *FET college X* were audiotaped and the other interviews were recorded in the researcher's field notes. Photographs of the college building and screen displays of the BMS were taken during the visit to *FET college X*.

- **Questionnaire:** Questionnaires are a popular means of collecting data, but are difficult to design and often require many rewrites before one that is acceptable is produced. The following types of question can be included in a questionnaire: closed, open-ended and attitudinal questions (Oates, 2006). Mouton (2001:103) lists the most common errors in questionnaire construction as follows:
    - No piloting or pre-testing is done.
    - Ambiguous or vague items – words that are undefined, too vague, or that assume too much about the respondents.
    - Double-barrelled questions – these are questions that combine two or more questions in one.
    - Item order effect – research has shown that the order or sequence of questions may affect response accuracy and response rates.
    - Fictitious constructs – sometimes constructs or attitudes are measured that do not exist, for example asking people about matters of which they have no knowledge.
    - Leading questions –questions where the respondent is being led or influenced to give a certain response through the wording of the questions.
    - Negatively phrased questions or double negatives (especially when asking people to agree or disagree with such a question).
    - Poor or confusing layout of the questionnaire can lead to non-response or other errors.
    - Instruments that are too long can have a negative impact on the quality of the responses.
    - Sensitive or threatening questions may lead to non-responses or refusal to participate.
    - Avoid mono-operational bias, that is, measuring constructs using only a single item or question – instead construct a scale or index where possible.

The questionnaire that was specially designed and developed for this study took these warnings into account. Subsequently, this questionnaire was piloted, revised and finally administered to all users of the BMS at public *FET college X* (cf. section 4.8).

This study used more than one data generation method to corroborate findings and, hence, enhance their validity. According to Oates (2006), this use of more than one method is called *method triangulation*. This study also made use of strategy triangulation by using two research strategies: a survey and a case study. Oates further explains that many types of triangulation are possible and notes the following types:

- **Method** triangulation – the study uses two or more data generation methods.
- **Strategy** triangulation – the study uses two or more research strategies.
- **Time** triangulation – the study takes place at two or more different points in time.
- **Space** triangulation – the study takes place in two or more different countries or cultures to overcome the parochialism of a study based in just one country or culture.
- **Investigator** triangulation – the study is carried out by two or more researchers who then compare their accounts.
- **Theoretical** triangulation – the study draws on two or more theories rather than one theoretical perspective only.

4.3.6 Data analysis methods used in this study

In this section, the data analysis methods that were used in this study are explained. Oates (2006) explains that quantitative data analysis uses mathematical approaches such as statistics to examine and interpret data, while qualitative data analysis looks for themes and categories within the words people use or the images they create. In this study qualitative and quantitative data analysis methods were used to analyse the data. Tables 2.2, 2.3 and 2.4 in Chapter 2 are examples of document analysis and theme identification, both of which are examples of qualitative data analysis. Theme identification was also used in the analysis of the qualitative data that was gathered by means of semi-structured interviews. Quantitative data analysis methods were used to analyse the data gathered by means of the survey questionnaire (cf. Chapter 5).

The questions in the questionnaire were designed to generate two types of data: factual data and opinions. Most of the questions that produced factual data were closed questions where the respondents were forced to choose from a range of answers that was predefined. Only one question was an open question where the respondent had to state his/her position in the college. The questions that related to the respondents' opinions were about IS success evaluation and were in the form of *frequency-of-use Likert rating scale* questions (where 1 equals *almost never*, 2 equals *some of the time*, 3 equals *about half of the time*, 4 equals *most of the time*, and 5 equals *almost always*). Therefore, it was essential to use exploratory analysis (such as frequencies and descriptive analysis, including mean, mode, minimum, maximum, range and standard deviation) and inferential statistical analysis (Huck, 2008:19). With inferential statistics, the aim was to try to reach conclusions that extend beyond the immediate data alone. For instance, inferential statistics were used to try to infer from the sample data what the population might think or to make judgements of the probability that an observed difference between groups was a dependable one or one that might have happened by chance in the study (Huck, 2008:99). Thus, inferential statistics were used to make inferences from the data to more general conditions; and descriptive statistics were used simply to describe what was going on in the data.

Table 4.3 provides a list of all statistical analysis techniques that were used in the study. The first column in the table provides the section in which each procedure has been defined and explained and the third column states the purpose of the technique for this study.

Table 4.3: Statistical analysis techniques used in this study

Section	Statistical analysis technique	Purpose
4.3.6.1	Exploratory data analysis	All variables in the questionnaire were subjected to exploratory data analysis such as frequency tables and graphs.
4.3.6.2	Weighted average index (WAI)	WAI was only calculated for variables related to perceptions/opinions of the BMS success evaluation.
4.3.6.3	Principal component analysis (PCA), rotated factor patterns	This procedure was conducted to evaluate the unidimensionality of the underlying variables of constructs or indicators in the BMS evaluation model.

4.3.6.4	Cronbach's alpha (reliability of constructs)	This procedure was conducted to establish the internal reliability of the underlying variables of constructs or indicators in the BMS evaluation model.
4.3.6.5	Statistically significant relationships (Pearson's chi-square test and Cramer's V value)	Pearson's chi-square testing was conducted to establish the statistical significance of an association between two categorical variables, while Cramer's V value was calculated to establish the strength of the association between two categorical variables. Pearson correlation coefficient, Kendall's tau_b and Spearman's rho were calculated to establish the statistical significance of an association between two continuous variables.
4.3.6.6	General linear modelling (GLM)	The sets of BMS success evaluation construct scores represent continuous data (derived as averages from rating scale responses) and the biographical data represent categorical data; therefore, analysis of variance with GLM presented itself as a suitable analysis technique.
4.3.6.7	Bonferroni test	After statistically significant associations (by conducting an analysis of variance with GLM) were established between biographical and continuous data variables, further multiple comparisons of means tests were conducted to explore the effects of sub-categories.

The following sections contain brief descriptions of the different statistical procedures conducted in this study:

4.3.6.1 Exploratory data analysis

Pietersen and Damianov (2001) explain that although research may be conducted in some known area, the data that is gathered should still be looked upon as something unknown that needs some exploration. This is true, since no two samples (even concerning the same subject matter) will yield the same data. According to these authors, the two tools researchers generally start with when exploring non-metric variables are one-way frequency tables and graphs. Exploratory data analysis also includes descriptive analysis; that is, the mean, mode, minimum, maximum, range and standard deviation (Field, 2005:4).

4.3.6.2 Weighted average index (WAI)

The exploration of the data (related to the BMS success evaluation) started with the calculation of an average or mean (WAI) for each question based on a *frequency-of-use Likert rating scale* response. This methodology was adapted from a study that was conducted by the HSRC (Kruss, Visser, Aphane, Haupt, 2011:34). An average for each question was calculated within each IS evaluation construct, as well as for the total population. This was done to facilitate the exploration of the importance of each variable against the other variables and overall.

The formula below was used in the calculation of the WAI (Kruss et al., 2011:35):

$$WAI = \frac{\sum_{i=1}^{5} F_i W_i}{N}$$

where F equals the frequency of a specific value (between 1 and 5) selected by the respondents, W equals the actual value selected, that is, the weight (value between 1 and 5) and N the number of responses.

4.3.6.3 Principal component analysis (PCA) and rotated factor patterns

Another series of procedures in the data analysis included principal component analysis (PCA). PCA is often used in the social sciences, but in the natural sciences it is more commonly known as factor analysis (Field, 2005:620). These analyses were done to assess the feasibility of reducing the large number of variables within each IS success evaluation construct to components of variables that describe these constructs. Information about the development of first- and second-order factors and their underlying variables is presented in Chapter 5, section 5.4.2.

The principal component factor analysis extraction method was used to develop the IS success evaluation variables. The Kaiser criterion, which was developed in 1960, was used to select the number of underlying factors or principal components explaining the data (Field, 2005:633). In this study, this number was decided by leaving out components with corresponding eigenvalues of less than one. This is the rule of thumb when conducting PCA using a correlation matrix (Field, 2005). Since PCA uses the prior communalities of one, it tends to inflate factor loadings, which makes identification of patterns/themes relatively easier.

4.3.6.4 Cronbach's alpha (reliability of constructs)

According to Field (2005:667), Cronbach's alpha is a measure of reliability based on the split-half reliability test. In 1951, the statistician Cronbach designed a measure that is loosely equivalent to splitting data into two in every possible way and computing the correlation coefficient for each split (Field, 2005). The average of these values is equivalent to Cronbach's alpha, which is the most common measure of scale of reliability. Hence, Cronbach's α is

$$\alpha = \frac{N^2\overline{Cov}}{\sum s^2_{item} + \sum Cov_{item}}$$ (Field, 2005:667).

Field (2005) further notes that a value of 0.7 to 0.8 is an acceptable value for Cronbach's α. This procedure was used to test whether the questions in each IS success evaluation construct did in fact measure the same thing, that is, whether or not they were unidimensional.

4.3.6.5 Statistically significant relationships (Pearson's chi-square test and Cramer's V value)

After all the different IS success evaluation variables had been created, the need to evaluate the relationships between the different constructs arose. Therefore, another series of analyses was undertaken in which the chi-square test (p-value of significance) and Cramer's V value were calculated to determine whether significant associations between factors could be identified.

The chi-square test performs the basic Pearson chi-square test. This test detects whether there is a significant association between two categorical variables ($p < 0.05$) (Field, 2005:725). However, it does not say anything about how strong that association might be. To this end, Cramer's V measures the strength of the association between the two categorical variables. Cramer's V is a measure between 0 and 1; accordingly, the closer the value is to 1 the stronger the association (Field, 2005:727).

4.3.6.6 General linear modelling (GLM)

The general linear model (GLM) is a flexible statistical model that incorporates normally distributed dependent variables and categorical or continuous independent variables. Conducting GLM with SPSS enables one to accommodate designs with empty cells, to more readily interpret the results using profile plots of estimated means, and to customise the linear model so that it directly addresses the research questions one asks (SPSS Library, 2011). This study made use of univariate GLM, where the effects of more than one independent variable on one dependent variable (the success evaluation construct variables) were investigated.

4.3.6.7 Bonferroni test

A Bonferroni test is a type of multiple comparison test used in statistical analysis. When an experimenter performs enough tests, he or she will eventually end up with a result that shows statistical significance, even if there is none. If a particular test yields correct results 99% of the time, running 100 tests could lead to a false result somewhere in the mix. Hence, the Bonferroni test attempts to prevent data from incorrectly appearing to be statistically significant by lowering the alpha value. This test, also known as the 'Bonferroni correction' or 'Bonferroni adjustment' suggests that the 'p' value for each test must be equal to alpha divided by the number of tests (Investopedia, 2011).

4.3.7 Data analysis tools used in this study

Four main software application tools facilitated the data analysis for this study: MS Access 2007, SPSS version 19, AMOS Graphics version 19 and MS Excel 2007. MS Access is a database management tool that forms part of the Microsoft Office Professional package. MS Excel is a mathematical spreadsheet-type application that is also one of the software applications included in the Microsoft Office package. The computer software package, AMOS, was developed for the analysis of structural equation models (SEM) and path analysis and has a user-friendly graphical interface (Cunningham and Wang, 2005). Finally, SPSS is a Statistical Software Package for Social Sciences.

The data collected through the administration of the survey questionnaire was captured on a form that was designed and developed in MS Access 2007. MS Access was also used for data cleaning and the initial querying of the data set. Thus, simple exploratory analysis was done in MS Access. Inferential statistical procedures were conducted using SPSS version 19 and verified with AMOS version 19. Any further calculations needed and the graphical representation of data was carried out using MS Excel 2007.

4.4 SUMMARY OF THE RESEARCH DESIGN FOR THIS STUDY

In this section a summary of the research design for this study is given by applying Saunders, Lewis and Thornhill's (2007) research design *blueprint,* which enables researchers to conduct systematic research. Figure 4.6 represents the research design of this study based on the *research onion* proposed by Saunders et al. (2007). According to these authors, the decision, represented by the outer layers of the research onion, influences and guides the direction of the research as well as subsequent layers of the onion.

In this chapter, the layers of the research onion are explained in general (cf. Figure 4.3) and also specifically for this study in the following sections: research philosophy (cf. section 4.3.2), research approach (cf. section 4.3.1 on research frameworks); research strategies (cf. sections 4.3.3 and 4.3.4); research choices (cf. sections 4.3.1 and 4.3.2); and data collection, triangulation and data analysis methods (cf. sections 4.3.5, 4.3.6, 4.3.7 and 4.6).

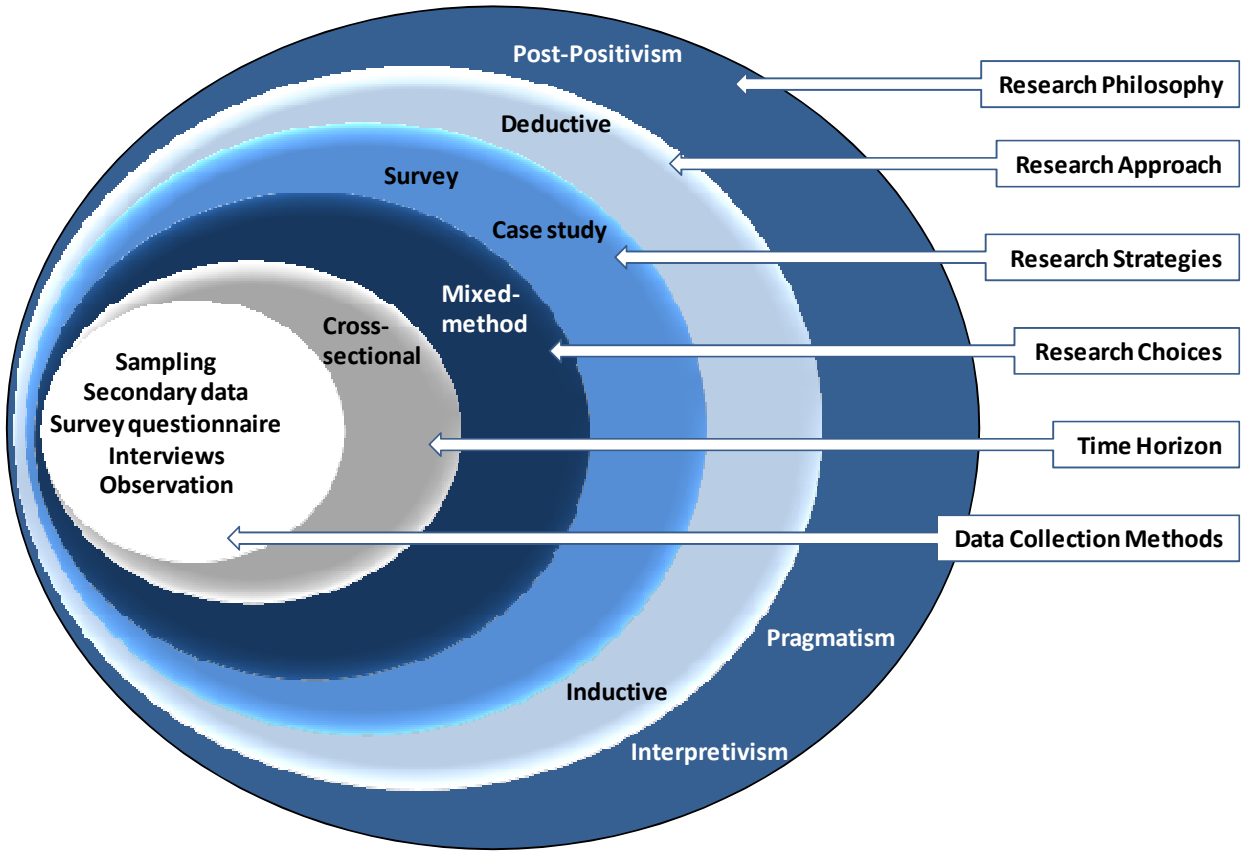


Figure 4.6: The research onion for this study as adapted from Saunders et al. (2007)

4.5 GAINING ACCESS

It can sometimes be very difficult and/or expensive to obtain access to confidential sources of information. In this study most of the sources of information that were studied were already in the public domain, thus gaining access was not difficult (cf. reference list). Most of the literature sources specific to the operation and strategic planning related to the BMS at *FET college X* were given to the researcher by the contact persons at the college or communicated through semi-structured interviews. Nevertheless, the researcher did experience some hesitance in the willingness of interviewees to reveal more in-depth information about the BMS. This behaviour could have been due to officials trying to protect information that might be seen as confidential and which could have, if revealed, had a negative impact on the institution's competitive advantage.

Access to the selected public FET college went exceptionally well. The CEO and staff of the college were extremely efficient and helpful in all the relevant facets of the study. A letter requesting access to *FET college X* was sent via email (as requested by *FET college X* in a telephone call to the college) on 22 March 2011 and permission was granted by the CEO on 23 March 2011. The pilot study was conducted in the final week of April and the main survey took place during May 2011. The letter requesting permission to visit the college is attached in Appendix 7 and proof of permission granted by the CEO in Appendix 8.

The initial plan for this study was to convert the questionnaire, after finalisation, into a computer-assisted telephonic interviewing (CATI) tool based on MS Access software. However, at a meeting with officials from *FET college X*, in which a request for the telephone contact details of all BMS users was made, these officials suggested that the questionnaire be administered internally. Subsequently, college management requested users of the BMS to complete the questionnaire (self-administration).

4.6 SAMPLING FRAME, SAMPLING TECHNIQUE, SAMPLE SIZE AND RESPONSE RATE

A sampling frame is a kind of list or collection of the whole population of people or events or documents that could be included in a survey (Oates, 2006, Olivier, 2004). In this study the sampling frames constituted, firstly, all public FET colleges in South Africa and, secondly, all people at the selected public FET college who are users of the BMS.

A sampling technique refers to the way in which one will go about selecting a sample from the sampling frame. Two main categories of sampling technique exist: probability and non-probability sampling techniques (Oates, 2006). In probability sampling there is a high probability that the sample of respondents that was chosen is representative of the overall population (findings are generalisable), while in non-probability sampling researchers do not know whether the sample is representative or not. Oates (2006) provides the following types of technique within these categories (Table 4.4).

Table 4.4: Sampling techniques (Oates, 2006)

Probability	Non-probability
Random sampling	Purposive sampling
Systematic sampling	Snowball sampling
Stratified sampling	Self-selection sampling
Cluster sampling	Convenience sampling

In this study the first sampling frame from which a selection had to be made was the population of public FET colleges. The selected public FET college was purposively sampled (non-probability sampling technique) for reasons explained in Chapter 3, section 3.8. The second sampling frame consisted of the population of all users of the BMS at the selected public FET college. No sample selection was done on this population – the plan was to survey the full population. Although it was initially thought that not all users of the BMS would participate in the survey, officials at *FET college X* were so efficient that all BMS users completed and submitted the survey questionnaire. All current users of the BMS, a total of 163 respondents completed the questionnaire – hence a 100% response rate was achieved.

4.7 REPRESENTATIVENESS (GENERALISABILITY)

The FET college sector is characterised by the uniqueness of its institutions. The nature of programmes offered, the skills needs of the immediate community, and the physical location of the institutions with the type of industry associated with that geographical area are just some of the factors that emphasise this uniqueness. Hence, it might not be possible to generalise findings on specific unique characteristics of *FET college X* to all other FET colleges. Nevertheless, the unique common factor among all FET colleges is the BMS system. The value of this study is in the methodology and outcome related to the IS success evaluation model. It will be possible to apply the developed model, methodology and evaluation tool to all other public FET colleges and consequently establish an index of IS success in the public FET sector.

Furthermore, since a response rate of 100% was achieved in the survey, all the findings obtained from the survey will be representative of the population and are therefore generalisable.

4.8 INSTRUMENT DEVELOPMENT AND DESIGN (VALIDITY AND RELIABILITY)

As already mentioned, a survey questionnaire (evaluation tool) was specially designed and developed as no standardised questions applicable to this study could be found (cf. Appendix 2). One of the four sections of the final questionnaire relates to IS success evaluation and the development of these questions was informed by empirically tested survey instruments on IS success evaluation that were found in the literature (cf. Chapter 2, section 2.10). The questionnaire was administered to all the BMS users at public *FET college X*. This survey instrument was developed and refined to suit the required purposes using the following process:

- grounding in the literature on evaluation of IS success
- case studies of research-oriented forms of IS success evaluation in the literature
- an iterative process of revision with comments and inputs from the study supervisors and experts in the field from DHET and *FET college X*
- pilot administration with a small number of users of the system at *FET college X*.

The questionnaire consists of four sections of questions: (Section 1) identification and consent, (Section 2) employment information, (Section 3) BMS evaluation, and (Section 4) personal information. The questionnaire is attached to this report in Appendix 2.

The questions related to BMS success evaluation, within each evaluation construct, are in the form of *frequency-of-use Likert rating scale* questions, which asked the respondents to indicate their degree of satisfaction with specific aspects of the BMS on a scale of 1 to 5, where 1 equals *almost never*; 2 equals *some of the time*; 3 equals *about half of the time*; 4 equals *most of the time*; and 5 equals *almost always.* To be able to identify missing or no responses another option, 6 equals *not applicable/don't know*, was added.

The questions included in the questionnaire are a well-balanced sample of the domain intended to cover, as discussed in Chapter 2 (Section 2.10). Furthermore, the use of previously empirically tested questionnaires, with assistance and opinions of experts in constructing the questionnaire, assisted in addressing content validity. Construct validity was established by correlating responses to questions in the questionnaire with other information gathered from

the literature reviews and the semi-structured and unstructured interviews with key system users at the relevant institution.

It should be noted that the first section in the questionnaire (Appendix 2, section 1) was included in which participants were reminded that their participation was voluntary and that their answers would remain confidential. Ethical considerations will be discussed in the next section.

4.9 ETHICAL CONSIDERATIONS

Apart from having to abide by the law in general with regard to the data protection rights of individuals; whether it is permissible to offer incentives for participation; intellectual property rights; restriction on the kinds of technology allowable for use and investigating, and so forth, it is important to behave ethically when doing research and to conduct ethical research (Oates, 2006:55) According to Olivier (2004:23), any research that involves human participants should be reviewed by an ethics committee in order to determine whether the research should be allowed to go ahead or not.

It is important to apply for ethical clearance as soon as possible after the research proposal and the instruments for the study have been finalised. In this study application forms for ethical clearance were completed and submitted to the research ethical clearance (REC) committees of the University of South Africa (UNISA), where the researcher is a registered student, and the Human Sciences Research Council (HSRC) where the researcher is an employee. Since the HSRC's ethical clearance committee gathers on a monthly basis and UNISA's meets on a quarterly basis, the HSRC REC considered the application first. The details of the issues that were considered in the applications for ethical clearance are the following:

- Description of the research project (purpose, aims, objectives, nature and requirements of the research)
- Participants involved (who and how – adults or minors, how they will be selected - sampling, potential risks of harm from research, benefits from research, incentives)
- Storage and future use of research information

- Costs and sponsors involved

Both REC committees granted ethical clearance for this research and the approval for the study by the HSRC (20 January 2011) and UNISA (5 April 2011) is attached in Appendices 5 and 6 respectively.

4.10 CONCLUSION

The research process used in this study can be compared to the universal picture illustrated in Figure 4.3 and follows the illustration of the research onion in Figure 4.6. The formulation of the research questions for this study were informed by the student's experiences, a literature review, as well as discussions with supervisors and other experts in the field. The theoretical framework, strategies and the data gathering and data analysis methods were based on the types of research question formulated and the literature studies.

This study has a mixed-method framework which is quantitative dominant, symbolised as QUAN+qual. Furthermore, the underlying philosophical paradigm is pragmatism. The research was problem-centred, consequence-oriented and pluralistic in method, with two strategies, a case study (interpretivism) and a survey (post-positivism), being employed. Creswell (2009) categorises this study as a *concurrent triangulation design*. Accordingly, IS success evaluation models and tools and the BMS at public *FET college X* were studied.

The literature study guided the development of the proposed *BMS success evaluation model* and an evaluation tool which was applied to the public *FET college X* in the form of a survey. The following data gathering methods were used in the research: literature review (primary, secondary and tertiary sources – refer to Chapter 2, section 2.3), document analysis, a questionnaire and interviews. A few photographs were taken of the building of *FET college X* and of some of the screen displays of the BMS.

The matrix in Table 4.5 relates the sub-research questions to

- the research strategy
- data gathering methods
- data analysis method

- the chapter in which the relevant investigation was reported on, in support of the specific question.

Table 4.5: Sub-research questions by strategy, chapter, type of data collection instrument and data analysis method used

Research question		Research strategy	Explicated in chapter:	Data gathering methods					Data analysis methodology
Main question	What is necessary in designing an evaluation tool to assist in the evaluation of MIS success at public FET colleges in South Africa?			Literature review, documents	Structured questionnaires	Semi-structured Interviews and Audiotapes	Observations and Photographs	Anecdotal records	
Sub-question 1	1.2.2.1 What types of evaluation models and tools exist for MISs?	Case study	Chapter 2	√					Qualitative
Sub-question 2	1.2.2.2 What types of information systems exist at public FET colleges?	Case study	Chapter 3	√		√	√	√	Qualitative
Sub-question 3	1.2.2.3 Which variables need to be included in an evaluation tool to enable effective measurement of success of the MIS at public FET colleges?	Survey	Chapter 2 Chapter 5	√	√	√		√	Quantitative

The next chapter will explain and discuss the research results and findings of both the qualitative and quantitative data analysis.

CHAPTER 5

RESEARCH RESULTS AND FINDINGS OF CONCURRENT TRIANGULATION DESIGN MODEL

5.1 INTRODUCTION

Chapters 2 and 3 presented literature reviews on existing IS success evaluation tools and the public FET college sector in South Africa respectively. Moreover, the research methodology used in this study was explained in Chapter 4. In this chapter findings from qualitative and quantitative data analyses are presented.

Hence, this chapter addresses the third sub-research question presented in Chapter 1: *Which variables need to be included in an evaluation tool to enable effective measurement of success of the MIS at public FET colleges?* The findings in this chapter, together with the information on existing IS success evaluation models and the types of MIS employed at public FET colleges obtained in chapters 2 and 3, will assist in answering the main research question: *What is necessary in designing an evaluation tool to assist in the evaluation of MIS success at public FET colleges in South Africa?*

Section 5.2 contains an analysis of the employment details and personal information of the BMS users at public *FET college X*, while section 5.3 presents statistically significant relationships between these variables on the characteristics of BMS users. In section 5.4, a weighted average index of all BMS success evaluation items is given; the construction of the BMS success evaluation constructs is described; and findings on the constructs used to evaluate the BMS system are presented. Sections 5.2 and 5.3 serve as background information for section 5.4. Section 5.5 provides the adapted theoretical model, that is, the conceptual model for this study.

Figure 5.1 depicts the topical outline of this chapter.

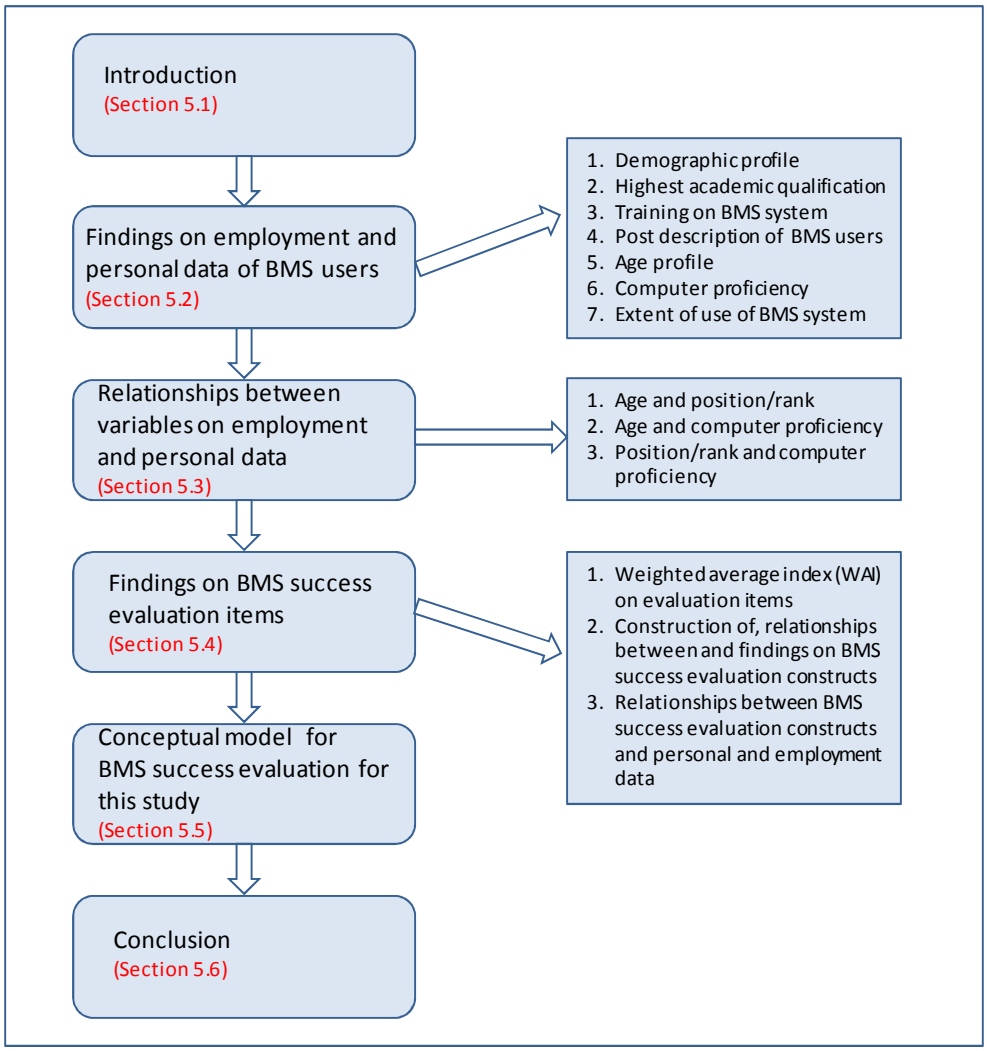


Figure 5.1: Topical outline of Chapter 5

5.2 FINDINGS ON EMPLOYMENT AND PERSONAL DATA

In this section the results of the analysis of the demographic profile of BMS users, the distribution of BMS users by type of training received on the BMS, post description, age, computer proficiency and, finally, the extent of the users' utilisation of the BMS, are provided.

5.2.1 Demographic profile of BMS users

This section provides information on the demographic details of the BMS user population at *FET college X* determined by exploratory analysis.

A total of 163 completed questionnaires were received from *FET college X,* which claimed that this is the entire population of BMS users at the college. Hence, this represents a 100% response rate. According to a recent audit of public FET colleges conducted by the Human Sciences Research Council (HSRC), a total of 379 staff members are employed at the college (Cosser et al., 2011). This means that almost half (43%) of the college staff uses the BMS system regularly in their daily tasks. Nevertheless, if the aim of having all college staff using the system is taken into consideration, many staff still need to start using the system.

The gender distribution at the college gave a more favourable picture with regards to equity than either the schooling sector or the higher education sector. In the schooling sector, the gender distribution of staff in 2009 was 32% male and 68% female (Department of Basic Education, 2010b:19), whereas the male-to-female ratio at the college was 0.7, with 42% (or 69 of 163) male and 58% (94 of 163) female (Figure 5.2). In 2009, the female staff at higher education (HE) institutions comprised 44% of instruction and research staff, 63% of administrative staff and 40% of services staff (Department of Basic Education, 2010b:39).

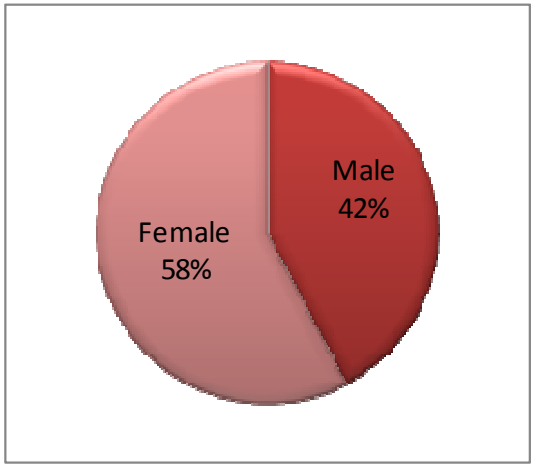


Figure 5.2: Gender distribution at FET college X

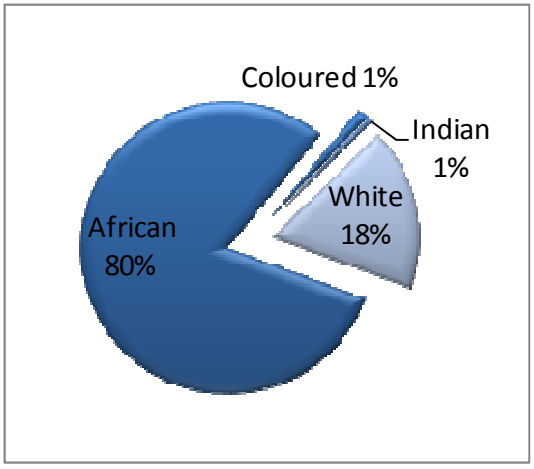


Figure 5.3: Staff by population group at FET college X

A total of 131 (80%) of the survey participants were African, two were coloured, one Indian and 29 white (Figure 5.3). In 2009, the overall proportion of black (when the African, coloured and Indian population groups are combined) staff in HE institutions comprised 42% of instruction and research staff, 65% of administrative staff and 97% of services staff. What should be noted here is the variation in the proportion of black staff across the different HE institutions – for

example from 91% in one HE institution to 17% of instruction and research staff in another institution (Department of Basic Education, 2010b:39).

5.2.2 Highest academic qualification of BMS users

Since the focus of FET colleges in general is on offering vocational qualifications such as the National Certificate (Vocational) (NC(V)), it was not surprising that the highest qualification of the majority of survey participants (57%) was a diploma or occupational certificate, which is set at level 5 of the national qualifications framework (NQF). Figure 5.4 depicts the distribution of survey participants by their highest academic qualification[2]. It is also evident from Figure 5.4 that almost one in every three BMS users had a degree as highest qualification.

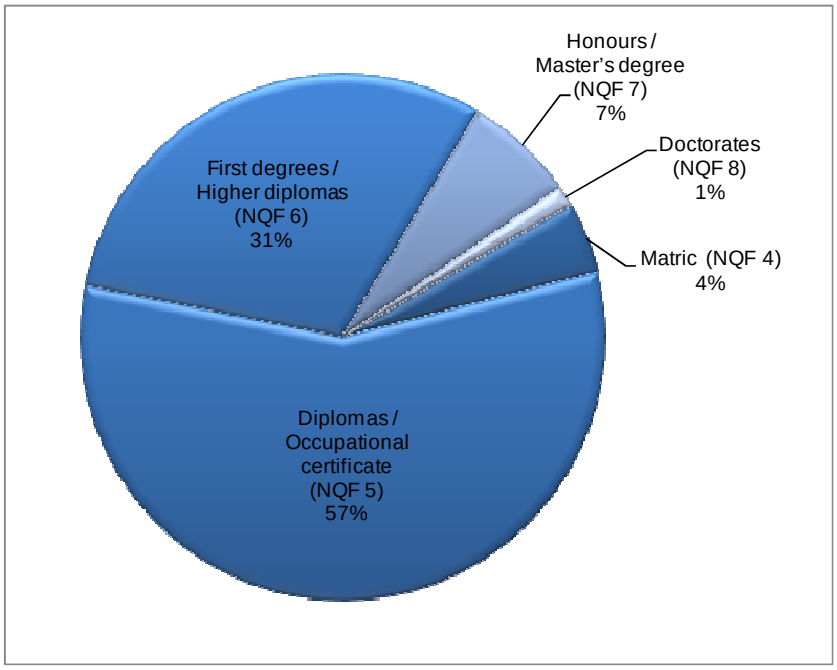


Figure 5.4: Survey participants by highest academic qualification achieved

[2] A new Higher Education Qualifications Framework (HEQF) with more differentiated higher education levels was signed into effect as of 1 January 2009, resulting in 10, instead of the previous 8, national qualification levels − GOVERNMENT 2007. The Higher Education Qualifications Framework HIGHER EDUCATION ACT, 1997 (Act No. 101 of 1997). *No. 928*. Government printers: Cape Town.
The structure used by the FET college to describe the qualifications corresponds with the previous NQF structure, where an NQF level 4 is equivalent to Grade 12, NQF level 5 refers to pre-degree certificates or diplomas, and the highest higher education qualification possible is level 8 (doctoral degrees).

5.2.3 Training of BMS users

A total of 141 (or 87%) of the survey participants reported that they had received training on the utilisation of the BMS system, while 22 participants had not been trained to use the BMS. Of the group that had received training, 79% had received in-house training presented by officials at *FET college X*, while 48% had been trained externally by the BMS service provider. A group of 38 (or 27%) reported to have received training by both internal and external trainers. Thus, more than a quarter of the group that had received training had been trained both internally and externally.

More in-depth qualitative data on how the training took place and who attended the training sessions are presented in Box 5.1.

Box 5.1: Synthesis of interviewees' responses regarding training on the BMS system at *FET College X*

Question 2 of interview schedule:

Tell me about the training that you received on the system (type, training provider, etc.).

Synthesis of responses:

At the beginning when the system was implemented general training sessions were provided by the external service provider. These training sessions were merely demonstrations of how certain functions can be performed on the system and the majority of the college staff attended these sessions. No practical sessions were conducted where trainees could physically work on the system on a computer.

Unfortunately not all staff could attend these training sessions, especially lecturing staff who is bound to fixed lecturing times. The BMS manager conducted follow-up training sessions at different campuses to further prepare staff on the utilisation of the system. These training sessions also did not facilitate practical exercises.

For academic assistants initial training included the following topics: how to create class lists; how to register a student; how to capture information on the system; how to link lecturers to students; and how to create a timetable; whereas training for lecturing staff included how to

enter student marks on the system. Management staff focused on generating reports from the system for monitoring and evaluation purposes.

Furthermore, staff members who had attended the initial training sessions took the task upon themselves to assist other staff members and a network of on-the-job training started developing and is currently in practice. The BMS users across the three campuses refer to the unit that maintains and manages the BMS system as the ***corporate unit***. The corporate unit is located at the head office and all queries and problems experienced with the system are addressed to this unit. If this unit is unable to deal with these queries and problems they are referred to the external service provider (Interview 5, 2011, Interview 6, 2011, Interview 7, 2011).

Question 3 of the interview schedule:

Do you receive continuous training on the BMS system?

Synthesis of responses:

Yes, all staff receive continuous training usually in the form of individual, one-to-one, on-the-job support whenever any difficulties are experienced while utilising the system (Interview 5, 2011, Interview 6, 2011, Interview 7, 2011).

From **triangulation of the quantitative (method 1) and qualitative data (method 2)** it is evident that the two methods provided comparable results. The information retrieved from the interviews confirmed the statistical results produced by the survey data: the FET college management values training and capacity building of BMS users. The quantitative results provide confirmation – 87% of staff received training.

5.2.4 Position/post description of BMS users

The questionnaire contains one open-ended qualitative question/item. In this question participants were requested to provide their position in *FET college X*. Many different responses were received that had to be standardised. It was decided to group all responses into three main categories: support staff, management staff and lecturing staff. Table 5.1 provides a

summary of the different responses with regard to the number of participants in the specific reported category as well as the new category allocated to the response.

Table 5.1: Re-categorisation of responses to the question on the position/post description of respondent

Response	Number of respondents	Re-categorised (S=Support staff, M=Management staff, L=Lecturing staff)
ACADEMIC ADMIN ASSISTANT	1	S
ACADEMIC ASSISTANT	4	S
ACADEMIC ASSISTANT IT	1	S
ACADEMIC SUPPORT OFFICER	1	S
ACCOUNTANT	3	S
ADMIN ASSISTANT	6	S
ADMINISTRATION	1	S
ADMINISTRATION CLERK	1	S
ADMINISTRATOR	15	S
ADVICE DESK	1	S
CLERK	1	S
CORPORATE COMMUNICATION AND CALL CENTRE ASSISTANT	1	S
CORPORATE COMMUNICATIONS ASSISTANT	1	S
DATA ADMINISTRATOR AND ASSISTANT	1	S
DATA AND STATISTICS OFFICER	1	S
DATA CAPTURER	2	S
FRONT LINE OFFICER	1	S
FRONTLINE AND SWITCHBOARD OPERATOR	1	S
HR ASSISTANT	3	S
IT TECHNICIAN	4	S
JUNIOR ACCOUNTANT	1	S
PAYROLL OFFICER	1	S
PROCUREMENT/FINANCE ASSISTANT	1	S
SENIOR ACCOUNTANT	2	S
SENIOR PAYROLL OFFICER/ADMINISTRATOR	1	S
STUDENT SUPPORT OFFICER	2	S
STUDENT SUPPORT OFFICIAL	1	S
SUPPLY CHAIN AND ASSET ASSISTANT	1	S
SUPPLY CHAIN ASSISTANT	1	S
BMS MANAGER	1	M
CAMPUS MANAGER	1	M
CORPORATE COMMUNICATION MANAGER	1	M
DEPUTY CAMPUS MANAGER	1	M
FINANCE MANAGER	1	M
HEAD OF ADMINISTRATION	1	M
HEAD OF DEPARTMENT	5	M
HOSTEL SUPERVISOR	1	M
HR MANAGER	1	M
IT MANAGER	1	M

Table 5.1: Re-categorisation of responses to the question on the position/post description of respondent

Response	Number of respondents	Re-categorised (S=Support staff, M=Management staff, L=Lecturing staff)
MANAGER	1	M
STUDENT SUPPORT MANAGER	1	M
SUPPLY CHAIN AND ASSET MANAGER	1	M
TALENT MANAGEMENT AND DEVELOPMENT	1	M
LECTURER	75	L
SENIOR LECTURER	9	L
Total	163	

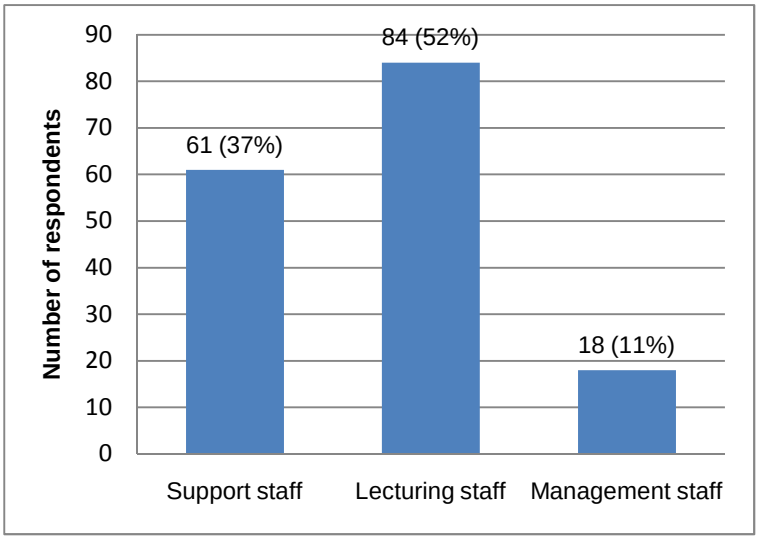


Figure 5.5: Number of participants by type of position at college

The data revealed, as illustrated in Figure 5.5, that after re-categorisation, 52% of the respondents fell into the lecturing staff category, 11% were management staff and 37% were categorised as support staff (Figure 5.5).

Box 5.2 contains more information on the utilisation of the BMS system by the different groups of employees at *FET college X.*

Box 5.2: Synthesis of interviewees' responses regarding the use of the BMS system at *FET College X*

Question 1 of the interview schedule:

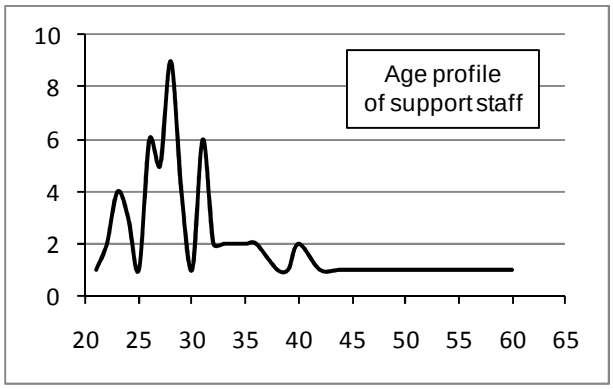
Which staff members use the BMS system? For what purposes?

Synthesis of responses:

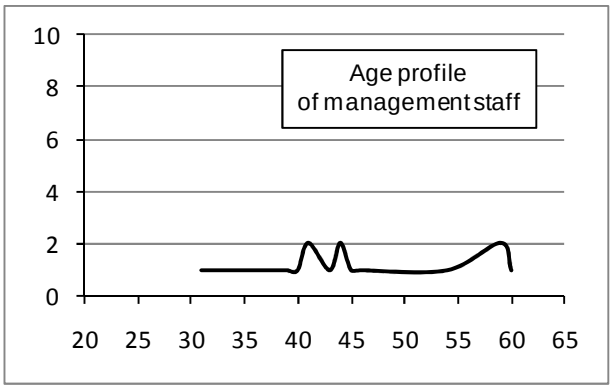
All staff members of *FET college X*, excluding grounds men and cleaners, have been allocated rights on the BMS system and are supposed to use it. At the time of the survey there were some lecturers who struggled to login to the system as a result of problems with their passwords. Support staff such as academic assistants and administrators uses the system constantly in their daily tasks. These staff members are responsible for registering students, capturing student and course information on the system, entering timetables, linking lecturers to students and conducting other administrative activities such as communicating problems (via emailing) with the system and logging calls to the corporate communications office. Lecturing staff uses the system less extensively and is responsible for capturing their students' marks on the system. Management staff in general is skilled in all functions of the system but concentrate mainly on the use of the BMS system's reporting functionality. It was reported that the system's report-generating functionality is still being developed, for example additional standard report templates are being generated and existing report templates are being refined (Interview 5, 2011, Interview 6, 2011, Interview 7, 2011).

5.2.5 Age profile of BMS users

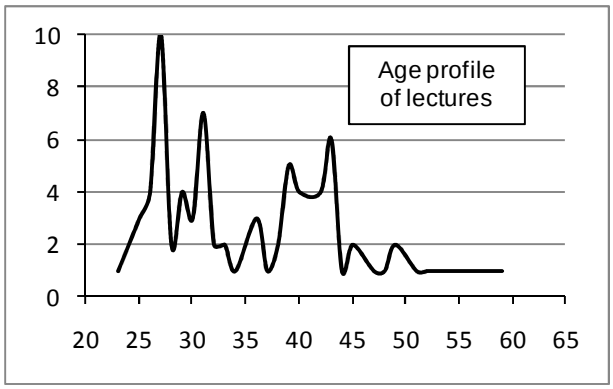
The following characteristic that was examined was the age profile of BMS users. The *age* of respondents was derived from their responses to the *date-of-birth* variable. The ages as depicted in Figure 5.6 and Table 5.2 were calculated as at the end of December 2011. The data suggests that, in general, the survey population tends to be young with more than half (52%) being younger than 35 years of age and 81% younger than 45 years of age (Figure 5.5(d)). It is evident from the graphs depicted in Figure 5.6, which have been designed to illustrate the age profile by type of position, that support staff (Figure 5.6(a)) tends to be younger than lecturing staff and management staff (Figure 5.6(b) and (c)). The histograms in Figure 5.7 confirm this finding.



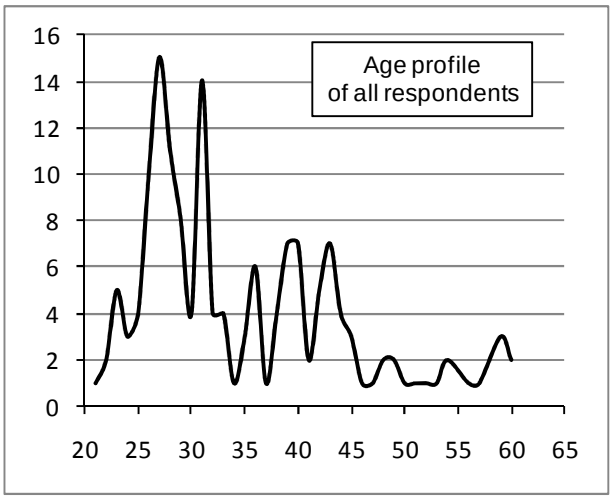
(a)



(c)



(b)



(d)

Figure 5.6: Age profile of three distinct groups of staff: support staff, management staff and lecturing staff as well as the profile of the total population

Normal distribution curves have been added to each histogram to indicate more or less normal response patterns. It is evident from the top-left histogram of the population of BMS users in Figure 5.7 that although the mean age of the population was 34.95 years, high numbers of staff fell within the age group of 26 to 32 years. The histograms further reveal that the ages of support staff were more concentrated around 30 years while the age pattern for lecturers was more spread out over the spectrum of all age groups.

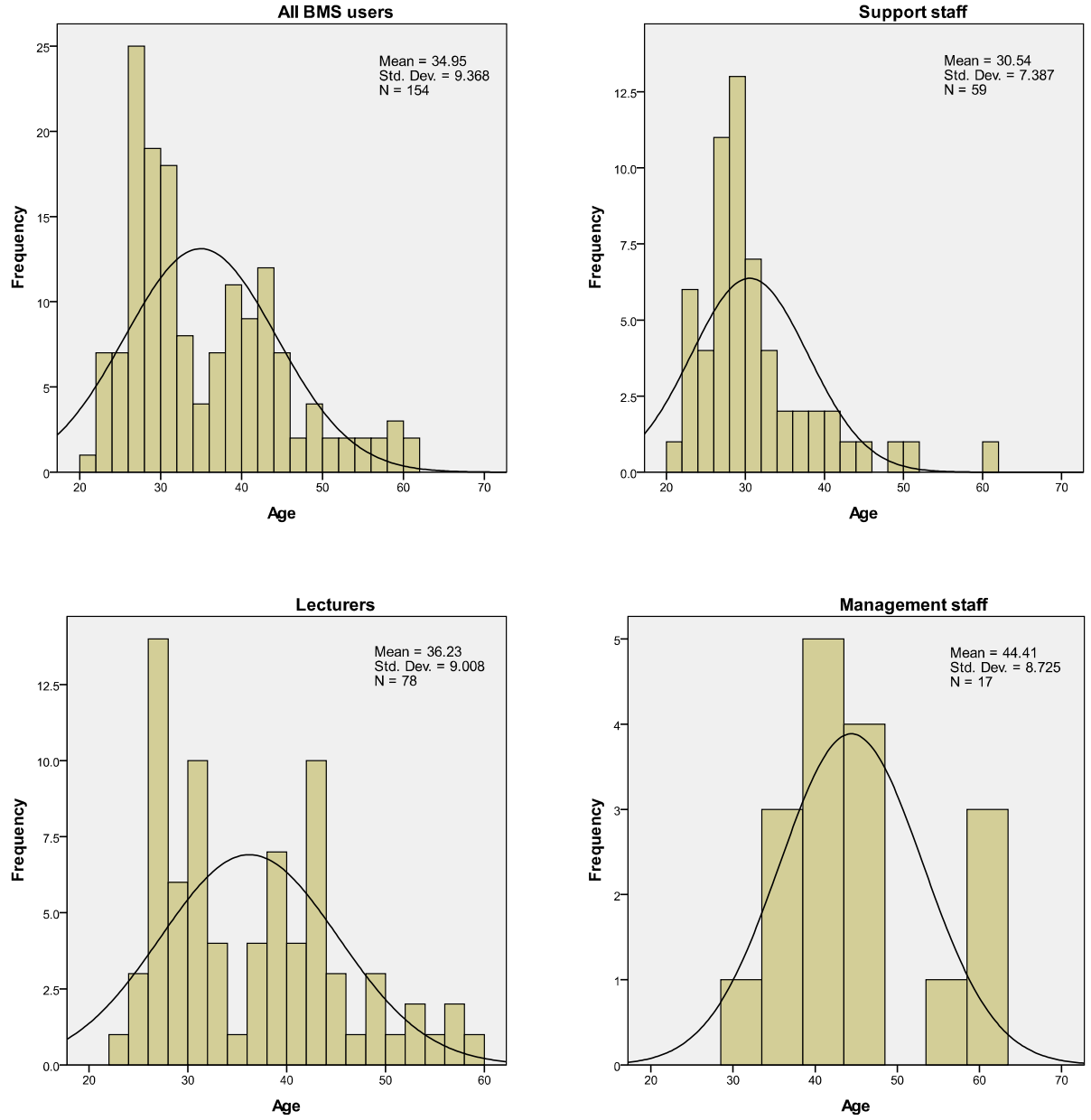


Figure 5.7: Histograms of BMS users by age and type of staff

A new variable was created to depict age categories with five-year intervals. Table 5.2 contains the frequencies per age category, the range, mean, mode, maximum, minimum, and standard deviation for the survey population, as well as for the groups by type of position. The support staff had the lowest mean age of 31 with the widest range (39) of ages compared to the other types of position (management staff mean was 44 years and lecturing staff 36 years). These

statistics confirm the previous findings depicted in Figures 5.6 and 5.7 that support staff tends to be younger when the mean ages are compared.

Table 5.2: Age profile of three distinct groups of staff: support staff, management staff and lecturing staff

Frequencies / **Age category**	**Support staff**	**Management staff**	**Lecturers**	**Total**
Younger than 25 years	10	0	1	11
25–29	25	0	23	48
30–34	11	1	15	27
35 and older	13	16	39	68
Total	59	17	78	154
Not indicated	2	1	6	9
Statistics				
Range	39	29	36	39
Maximum	60	60	59	60
Minimum	21	31	23	21
Mode	28	41, 44, 59	27	27
Mean	31	44	36	35
Std. Deviation	7.39	8.73	9.01	9.37

Furthermore, the relationship between age and the three groups of staff was tested for statistical significance (Table 5.3). The results, as shown in Table 5.3, reveal a strong statistically significant relationship between age and staff position. The strength of the association is measured by Phi = .503 and Cramer's V = .355, which should be interpreted by comparing the values to 1; accordingly, the closer these values are to 1 the stronger the relationship (Field, 2005:689). The association is furthermore statistically significant because the value of p is less than 0.05 (Pearson's chi-square test value = 38.893 with p = 0.000). In fact, the value is highly significant since p is smaller than 0.001, meaning that there is a highly significant relationship between the age and position of BMS users at *FET college X*.

Table 5.3: Statistical significant testing of age against groups of staff

Chi-square tests			(p-value)
	Value	**df**	**Asymp. Sig. (2-sided)**
Pearson Chi-Square	38.893	6	.000
Likelihood Ratio	44.432	6	.000
Linear-by-Linear Association	33.368	1	.000
N of Valid Cases	154		
a. 3 cells (25.0%) have expected count less than 5. The minimum expected count is 1.21.			
Symmetric measures		**Value**	**Approx. Sig.**
Nominal by nominal	Phi	.503	.000
	Cramer's V	.355	.000
N of valid cases		154	

5.2.6 Computer proficiency of BMS users

Questions 12(a) to (e) and 13 in the questionnaire investigated the level of proficiency of survey participants on technical and computer skills. Participants were requested to rate their competencies in technical skills in general, in computer skills in general, in MS Word, in MS Excel, in email software, and in the web/internet on a scale of one (poor) to five (excellent). The responses to these questions (captured as the variables *v12a_tech, v12b_comp, v12c_word, v12d_excel, v12e_email*, and *v13_web*) were used to develop a new variable (named *comp_prof*), that is, an indicator of computer proficiency.

Principal component analysis (PCA), a technique for identifying groups or clusters of variables, was used to determine if these six variables measured the same underlying component: *computer proficiency* (Field, 2005:619). The results of the PCA are given in Table 5.4. This analysis extracted only one component, which shows that the relevant variables were unidimensional and were in fact measuring the same thing. The eigenvalue of the first factor that was extracted was substantially larger than the eigenvalue of the next factor (3.299 versus 0.969), and the first factor accounted for 54.984% of the total variance as is evident from Table 5.4.

Table 5.4: Results of the PCA on computer proficiency variables

Total Variance Explained						
Component	**Initial eigenvalues**			**Extraction sums of squared loadings**		
	Total	**% of variance**	**Cumulative %**	**Total**	**% of Variance**	**Cumulative %**
1	3.299	54.984	54.984	3.299	54.984	54.984
2	.969	16.158	71.142			
3	.752	12.539	83.681			
4	.436	7.271	90.952			
5	.300	4.996	95.948			
6	.243	4.052	100.000			

The factor loadings calculated as a result of the PCA, together with descriptive statistics, are presented in Table 5.5.

Table 5.5: Results of PCA and descriptive statistics on variables related to computer proficiency

Variable name	Component matrix (Factor loadings)	Mean	Std. Deviation	N
v12b_comp	.887	4.23	.808	160
v12c_word	.850	4.48	.699	161
v12d_excel	.846	4.06	1.008	161
v12e_email	.813	4.10	1.020	159
v13_web	.577	4.35	1.001	151
v12a_tech	.281	3.21	1.200	152

Since the factor loading of variable: *v12a_tech* was small (.281), it was uncertain whether to exclude it from the calculation of the proficiency indicator or not. Accordingly, scale reliability testing (Cronbach's alpha) was done to evaluate the level of internal consistency of the variables where *v12a_tech* was included and again where *v12a_tech* was excluded. Subsequently, Cronbach's alpha was calculated at 0.783 and 0.842 respectively as depicted in Table 5.6. According to Field (2005:667), a reliability coefficient (Cronbach's alpha) of 0.70 or higher is considered acceptable in most social sciences, therefore it was decided to include *v12a_tech* in the proficiency indicator. The computer proficiency indicator variable for each BMS user was therefore calculated by determining the mean of the six variables listed in Table 5.5 (*comp_prof*). The overall mean of the total population of BMS users on *computer proficiency* was calculated as 4.07, which indicates that the skills of the survey population were above average in the use of computers.

Table 5.6: Scale reliability testing results of the variables

Reliability statistics	Cronbach's alpha	Cronbach's alpha based on standardised items	No of items
Including *v12a_tech*	.783	.812	6
Excluding *v12a_tech*	.842	.853	5

Table 5.7 contains the results of a PCA on the computer proficiency variables excluding *v12a_tech* and reveals similar results on the eigenvalues, as shown in Table 5.4 (where *v12a_tech* was included), with the difference being that the first factor accounted for 64.114% of the total variance (almost 10% more).

Table 5.7: Results of the PCA where v12a_tech is excluded

Total variance explained: Excluding *v12a_tech*						
Component	Initial eigenvalues			Extraction sums of squared loadings		
	Total	% of variance	Cumulative %	Total	% of variance	Cumulative %
1	3.206	64.114	64.114	3.206	64.114	64.114
2	.784	15.677	79.792			
3	.434	8.686	88.478			
4	.308	6.161	94.639			
5	.268	5.361	100.000			

The *comp-prof* variable value for each participant was calculated by determining the mean of the six variables. Thereafter the mean was rounded off to reflect the original *frequency-of-use Likert rating scale* (1 equals *poor*, 2 equals *below average*, 3 equals *average*, 4 equals *above average* and 5 equals *excellent*).

Table 5.8 provides the number of participants by computer proficiency level, while Figure 5.8 represents the distribution of the participants by their computer proficiency level. It is evident from the results that the majority, 81%, of the respondents was competent in using computers on an above average to excellent level. There were also no participants in the category of *poor* computer proficiency level. These findings might imply that users who were comfortable with the use of computers were the first to start using the BMS at *FET college X*.

Table 5.8 Participants by level of computer proficiency

Computer proficiency level	Frequency	Percent	Valid percent	Cumulative percent
Below average	4	2.5	2.5	2.5
Average	27	16.6	16.7	19.1
Above average	75	46.0	46.3	65.4
Excellent	56	34.4	34.6	100.0
Total	162	99.4	100.0	
Missing (no responses)	1	.6		
Total	163	100.0		

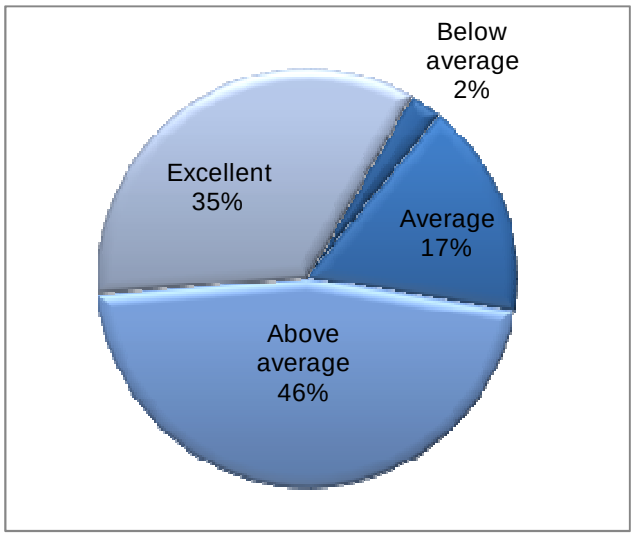


Figure 5.8: Distribution of survey participants by their computer proficiency

In pondering this result, the question arose as to the possibility of using one of the variables contained in the *computer proficiency* variable to represent this indicator. Hence, correlation coefficients between the underlying variables of *comp_prof* were calculated, including Pearson correlation coefficient, Kendall's tau_b and Spearman's rho, and similar results were found.[3]

In all three methods (Tables 5.9 and 5.10), it was found that BMS users' rating of their technical skills correlated positively with *comp_prof* (Table 5.10), but did not correlate highly with any of the other computer proficiency variables. Furthermore, relationships between *v12a_tech* and most of the other variables were found not to be statistically significant (Table 5.10).

Interestingly, the highest Pearson's correlation coefficient between the newly created *computer proficiency* variable (*comp_prof*) and the other variables were between *comp_prof* and the BMS users' rating of their *computer skills* (Pearson's – *v12b_comp* correlation coefficient of 0.831) and their competencies in MS Excel (Pearson's correlation coefficient of 0.813 for *v12d_excel*). For this study, therefore, one could assume that a question asking respondents to rate their computer skills (*v12b_comp*) or to rate their competencies in MS Excel (*v12d_excel*) could have

[3] Pearson correlation coefficient: or Pearson's product moment correlation coefficient is a standardized measure of the strength of relationship between two variables. It can take any value from -1 to 0 to +1.
Kendall's tau: a non-parametric correlation coefficient similar to Spearman's correlation coefficient, and is preferred when one have a small data set with a large number of tied ranks.
Spearman's correlation coefficient is a standardized measure of the strength of relationship between two variables that does not rely on the assumption of a parametric test. It is Pearson's correlation coefficient performed on data that have been converted into ranked scores. Definitions are as in: FIELD, A. 2005. *Discovering Statistics using SPSS*, London, Thousand Oaks, New Delhi, SAGE Publications Ltd.

been used as a proxy for the computer proficiency indicator. *Comp_prof* was, however, retained in further analysis. This is based on participant opinions of their competency and should therefore be seen as perceived computer proficiency.

Table 5.9: Three correlation coefficient tests among the computer proficiency indicator and the other variables

	v12a_tech	v12b_comp	v12c_word	v12d_excel	v12e_email	v13_web	comp_prof
Pearson Correlation	0.470***	0.831***	0.731***	0.813***	0.789***	0.619***	1.000
Sig. (2-tailed)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	
N	152	160	161	161	159	151	162
Kendall's tau_b: Correlation Coefficient	0.420***	0.708***	0.607***	0.668***	0.657***	0.465***	1.000
Sig. (2-tailed)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	.
N	152	160	161	161	159	151	162
Spearman's rho: Correlation Coefficient	0.531***	0.814***	0.714***	0.779***	0.772***	0.558***	1.000
Sig. (2-tailed)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	.
N	152	160	161	161	159	151	162
** 95% confidence level							
*** 99% confidence level							

Table 5.10: Pearson's correlation coefficient among the computer proficiency indicator and the other variables

Pearson correlation (Pearson correlation Sig. (2-tailed))							
	v12a_tech	**v12b_comp**	**v12c_word**	**v12d_excel**	**v12e_email**	**v13_web**	**comp_prof**
v12a_tech	1.000						
Sig. (2-tailed)							
v12b_comp	0.247**	1.000					
Sig. (2-tailed)	(0.002)						
v12c_word	0.070	0.708***	1.000				
Sig. (2-tailed)	(0.394)	(0.000)					
v12d_excel	0.143	0.701***	0.672***	1.000			
Sig. (2-tailed)	(0.080)	(0.000)	(0.000)				
v12e_email	0.166**	0.608***	0.571***	0.580***	1.000		
Sig. (2-tailed)	(0.043)	(0.000)	(0.000)	(0.000)			
v13_web	0.081	0.364***	0.307***	0.413***	0.413***	1.000	
Sig. (2-tailed)	(0.340)	(0.000)	(0.000)	(0.000)	(0.000)		
comp_prof	0.470***	0.831***	0.731***	0.813***	0.789***	0.619***	1.000
Sig. (2-tailed)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	
** 95% confidence level							
*** 99% confidence level							

A synthesis of the responses given by interviewees is provided in Box 5.3.

Box 5.3: Synthesis of interviewees' responses regarding computer proficiency levels at *FET College X*

Question 5 of the interview schedule:

How would you describe the computer proficiency of an average staff member at *FET college X*?

Synthesis of responses:

All interviewees reported that the computer proficiency of the majority of staff is above average. It was reported that one of the requirements for new appointees to the college is to practically prove their ability on reported computer skills (screening of applicants). One interviewee said: '*The college has enough computers for all staff members to enhance their computer proficiency and staff is also encouraged to enrol for the computer course called: International Computer Driver's License (ICDL)*.' It was been reported that many staff members are in possession of a N4 qualification in Computer Practice. Instructional offerings at a N4 level are usually associated with the first year after Grade 12 (Interview 5, 2011).

From **triangulation of the quantitative (method 1) and qualitative data (method 2)** it is evident that the two methods provided comparable results. The information retrieved from the interviews confirmed the statistical results produced by the survey data: the BMS users have above average computer proficiency skills.

5.2.7 Extent of utilisation of the BMS

Question 14 in the survey instrument requested the respondents to select the appropriate business processes for which they were using the BMS. (More than one option could have been selected.) This question can be used as a proxy for the intensity of BMS system use. The different components from which they could choose together with examples of the activities involved are as follows:

- **Student administration**, for example, student registration, administration of students' biographical and enrolment information, student finance, attendance, student cards, alumni, time tabling.

- **Academic administration**, for example, study programmes and qualifications, examination enrolment, examination administration, academic records (assessments, examinations results etc.)
- **Financial administration**, for example, budget management, procurement, expenditure records, accounting package.
- **Human resource management and development**, for example, appointments, leave, recruitment, evaluation, skills development and disciplinary/grievance systems, personnel iEnabler, payroll management, personnel records, personnel utilisation information.
- **Asset management**, for example, stock registers, stock control, physical infrastructure, venue reservations, vehicle reservations.
- **Technical administration/maintenance of the BMS**, for example, batch processing, printing, contact management, enquiries, web updates.

Almost two-thirds of the participants in the survey (103 participants or 63%) indicated that they were only using one component of the BMS system (Table 5.11), more than a quarter (27%) reported that they used two components of the system in their daily activities and 9%, or almost one in every ten of the respondents, used three or more components of the system. Only two staff members (the BMS manager and finance manager) reported using all system components. The largest portion, 52%, of the group who used only one component of the BMS was using the academic administration component and these users were predominantly lecturers. Of the sole-component users of the system, the second most used component was student administration (28%). In addition, 73% (or 33 participants) of the 45 dual component users were using the student and academic administration components.

Table 5.11: Respondents by extent of system use

N of selected components	No of respondents	%
1 system component	103	63
2 system components	45	28
3 system components	10	6
4 system components	2	1
5 system components	1	1
6 system components	2	1
Total	163	100

Further analysis was done to establish the components most frequently used (in number of staff) and it was found that the components in descending order of use were academic administration, student administration, financial administration, technical administration, asset management and, lastly, human resource management (Figure 5.9).

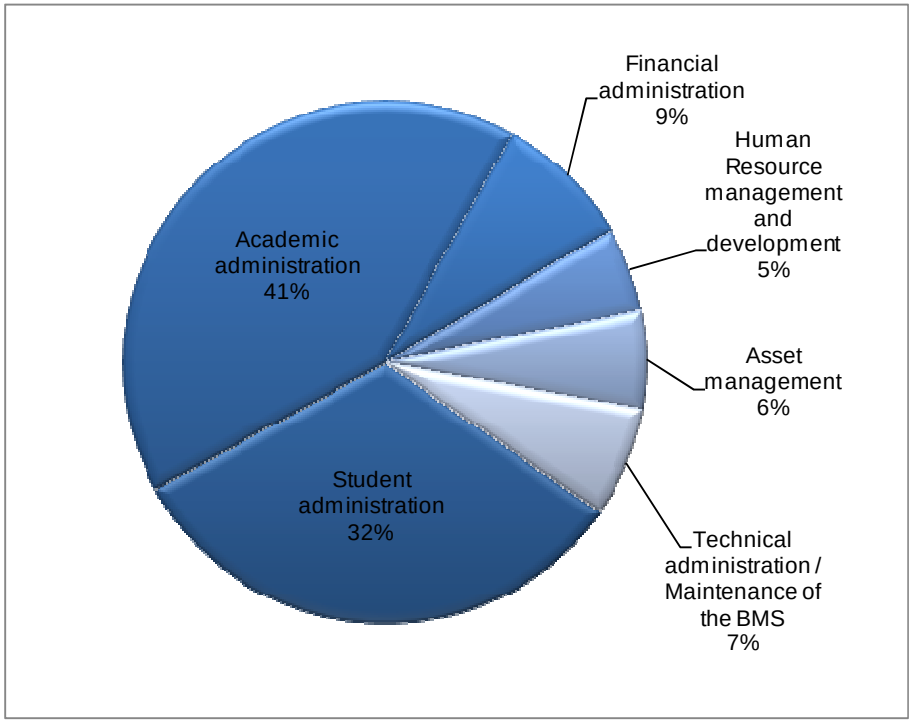


Figure 5.9 Distribution of survey participants by frequency of use of the BMS components

A question on the average percentage time spent on using the BMS system per day was not included in the questionnaire – this has been identified as a limitation in the questionnaire and inclusion might be considered in a revised version of the questionnaire.

Section 5.3 explores the relationships among the demographic characteristics of the BMS users.

5.3 RELATIONSHIPS BETWEEN VARIABLES ON EMPLOYMENT AND PERSONAL DATA

In this section the results of tests for statistically significant relationships between the attributes of BMS users are presented. In summary, only two statistically significant associations between the characteristics of BMS users were found, as depicted in Table 5.12. Evidence of the statistically significant testing of relations, as conducted using SPSS version 19, is presented in sections 5.3.1, 5.3.2 and 5.3.3.

Table 5.12: Statistically significant relationships between BMS users' characteristics obtained using Pearson's chi-square test

	Computer proficiency	Training received	Age	Position/Rank	Extent of use
Computer proficiency					
Training received	Not statistically significant				
Age	17.004 0.002**	Not statistically significant			
Position/Rank	Not statistically significant	Not statistically significant	31.118 0.000***		
Extent of use	Not statistically significant	Not statistically significant	Not statistically significant	Not statistically significant	

** 95% confidence interval
*** 99% confidence interval

5.3.1 Relationship between age and position of staff

A statistically significant relationship between age and the position of staff has already been indicated in the analysis in section 5.2.5. A box plot depicting the relationship between rank and age of respondents is provided in Figure 5.10 and shows that age increases when the rank moves from support staff to teaching staff to management staff. The results also show that there were four outliers (of which there was one extreme point) in the support staff group and three outliers in the management staff group.

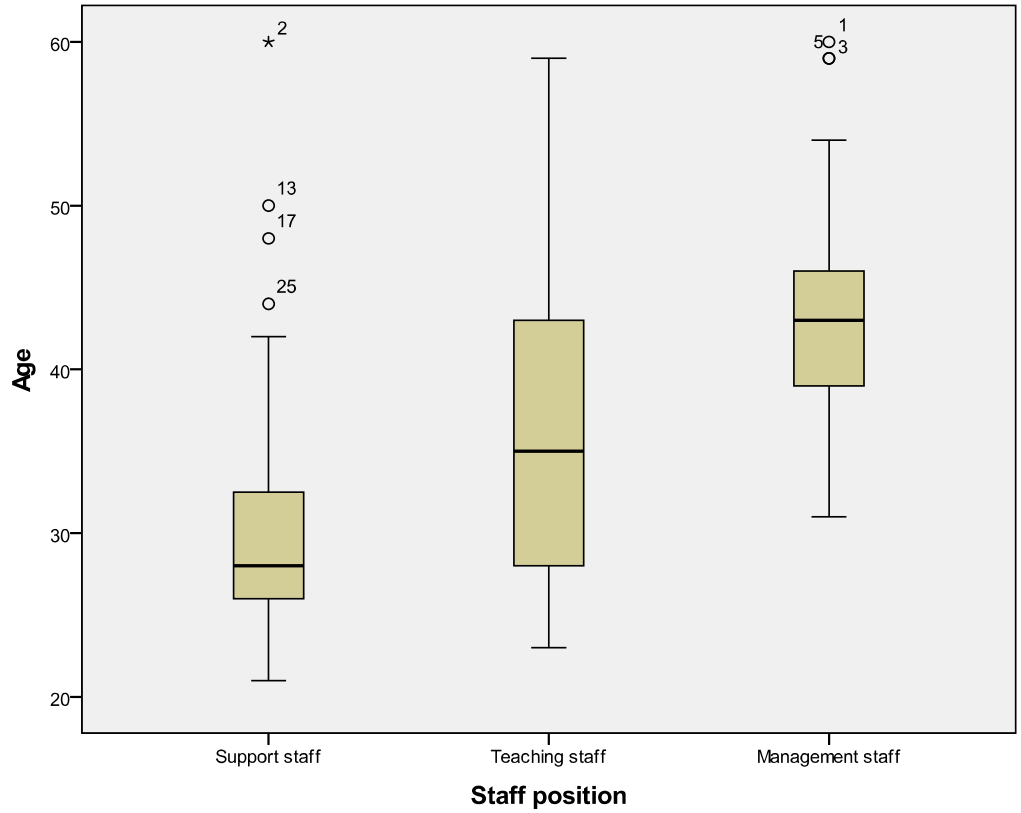


Figure 5.10 Relationship between rank/staff position and age of participant

5.3.2 Relationship between age and computer proficiency of participants

Table 5.13 shows that, through a bivariate correlation of Kendall's tau_b and Spearman's Rho tests, the relationship between age and computer proficiency (two continuous variables) is a negative statistically significant relationship (Kendall's tau_b correlation coefficient is −.202 and Spearman's rho correlation coefficient is −.298 with both giving a significance value of .000).

The box plot in Figure 5.11 shows that, currently, older people are less proficient in computer use. It is also evident from Figure 5.11 that many outliers (7), which include four extreme values, occurred in the group of participants who reportedly were excellent in the use of computers. This result shows that seven out of a total of 56 (13%) BMS users with an excellent rating for computer proficiency were older than 42 years of age.

Table 5.13 Correlations between age and computer proficiency

Correlations			comp_prof	Age
Kendall's tau_b	comp_prof	Correlation coefficient	1.000	-.202***
		Sig. (2-tailed)	.	.000
		N	162	154
	Age	Correlation coefficient	-.202***	1.000
		Sig. (2-tailed)	.000	.
		N	154	154
Spearman's rho	comp_prof	Correlation coefficient	1.000	-.298***
		Sig. (2-tailed)	.	.000
		N	162	154
	Age	Correlation coefficient	-.298***	1.000
		Sig. (2-tailed)	.000	.
		N	154	154

***. Correlation is significant at the 0.01 level (2-tailed).

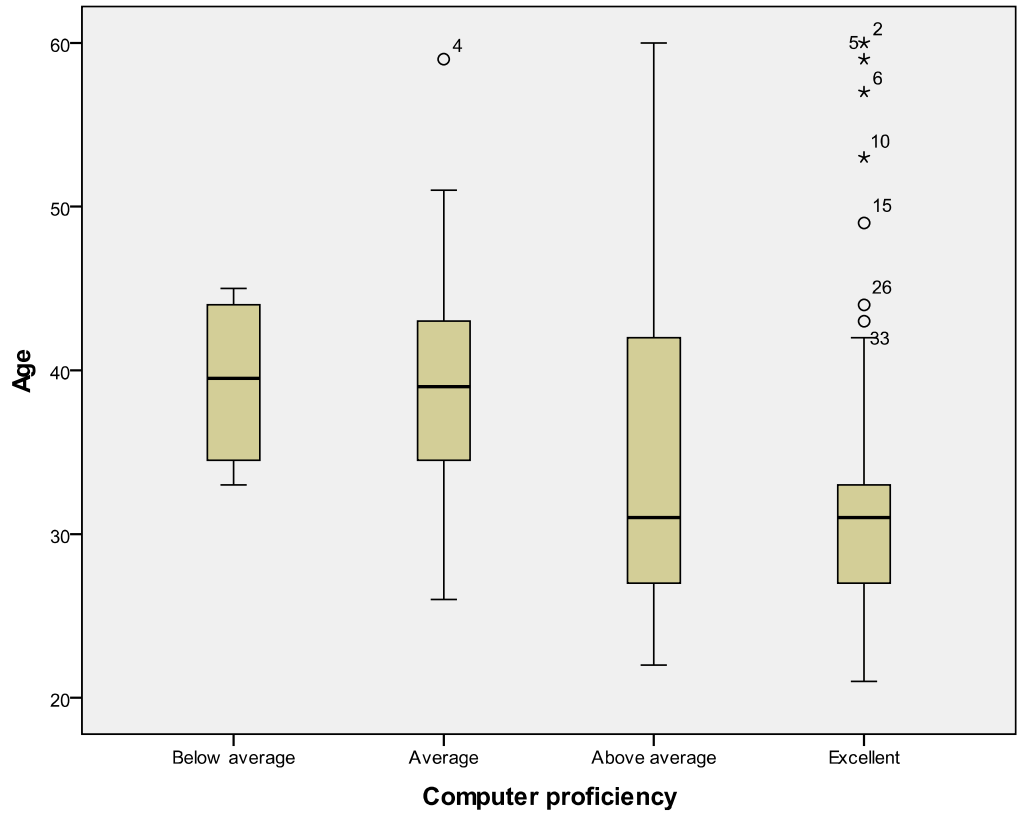


Figure 5.11 Relationship between computer proficiency and age of participant

5.3.3 Relationship between rank/position of staff and computer proficiency of participants

A cross-tabulation between the two discrete variables (categories *v3_post_rw3* and *comp_prof_rw*) representing the position of staff and computer proficiency levels of BMS users was conducted. A Pearson's chi-square test revealed that the relationship between the two variables mentioned is not statistically significant (p =.275) as is evident in Table 5.14; therefore no further analysis was done.

Table 5.14 Results of a statistically significant test on rank and computer proficiency of BMS users

v3_post_rw3 * comp_prof_rw Crosstabulation					
v3_post_rw3 (Position of staff)	comp_prof_rw				Total
	Below average	Average	Above average	Excellent	
Support staff	0	6	31	23	60
Teaching staff	3	19	35	27	84
Management staff	1	2	9	6	18
Total	4	27	75	56	162

Chi-Square Tests			
	Value	**df**	**Asymp. Sig. (2-sided)**
Pearson Chi-Square	7.521[a]	6	.275
Likelihood Ratio	8.896	6	.180
Linear-by-Linear Association	2.275	1	.131
N of Valid Cases	162		

a. 4 cells (33.3%) have expected count less than 5. The minimum expected count is .44.

The following section contains the findings of an analysis of question 15 of the questionnaire, which relates to perceptual questions regarding the perceived success of the BMS system on different success constructs.

5.4 FINDINGS ON BMS SUCCESS EVALUATION

As depicted in Table 5.15, the first step in the analysis of the BMS success evaluation variables was to calculate exploratory statistics. When interpreting the data in this section it is important to remember the meaning of the five scores: a value of 1 means *almost never*, 2 means *some of the time*, 3 means *about half of the time*, 4 means *most of the time*, and 5 means *almost always*. The third to seventh columns in Table 5.15 provides the frequencies of responses with regard to the five scores by evaluation question.

5.4.1 Weighted average index (WAI)

Means for each item were calculated and are presented in Table 5.15. The means varied from a high of 4.112 to a low of 3.244. It is evident from the data in Table 5.15 that users of the system valued the content of the BMS highly, since the item, *Information available from the BMS is important,* had the maximum mean of 4.112, which indicates that most of the users perceived that the information available from the BMS was important, most of the time. The second and fourth highest rated characteristics of the BMS, with means of 3.902 and 3.837, were *Information from the BMS appears readable, clear and well formatted* and *The BMS contains all the key data that is needed,* respectively. These characteristics relate to data and output quality which are very important indicators of quality outputs; this is a key source for monitoring and evaluation, as well as strategic planning.

Two items, the third and ninth highest rated (with means of 3.889 and 3.759), relate to the internal and external service providers. The BMS users were of the opinion that the service providers were experienced and provided quality training most of the time. The item that was rated sixth highest (3.790) relates to the usability of the BMS. The users reported that they found it easy to learn how to use the BMS system. This could have been as a result of the quality training that they had reportedly received (cf. section 5.2.3).

The item that received the lowest mean of 3.244 relates to the connectivity of the BMS. The users reported that the BMS was up-and-running just more than half of the time. This could have been a result of the fact that the system is still new and that components of the BMS were implemented sequentially, which might have necessitated regular time-outs for upgrades,

maintenance and new installations. The second (3.299), fourth (3.318) and fifth (3.344) lowest rated items have relevance for the impact of the BMS on individuals' job performance. BMS users believed that they had not learnt much through the presence of the BMS and that the BMS had not enhanced their recall and awareness of job-related information.

Figures 5.12 and 5.13 illustrate the frequencies of the different scores in a composite bar graph (by question) and a pie graph (overall) respectively. It is evident from the graphs that the score value mostly selected by BMS users across all questions was the value *four*. This score denotes satisfaction with the BMS system on the specific items almost all of the time. The frequency of selection of the scores *three* and *five* was equal, in both instances 21% of all scores (Figure 5.13).

Table 5.15: Statistics with regard to the variables that were used in the success evaluation of the BMS

Variable name	Question 15	Frequency of score					Sum	WAI	N	Range	Minimum	Maximum	Mean	Std. Deviation	Variance
		1	2	3	4	5									
v15b1	Information available from the BMS is important	2	14	14	57	65	625	4.112	152	4	1	5	4.11	1.000	1.001
v15b9	Information from the BMS appears readable, clear and well formatted	3	10	26	74	40	597	3.902	153	4	1	5	3.90	.930	.865
v15c15	The BMS's service provider is experienced	2	8	30	58	37	525	3.889	135	4	1	5	3.89	.928	.861
v15b2	The BMS contains all the key data that is needed	4	20	23	56	50	587	3.837	153	4	1	5	3.84	1.103	1.217
v15b10	Information from the BMS is concise	3	16	21	84	31	589	3.800	155	4	1	5	3.80	.943	.888
v15c2	The BMS is easy to learn	4	18	26	68	41	595	3.790	157	4	1	5	3.79	1.038	1.077
v15c6	The BMS includes necessary features and functions	2	11	32	69	29	541	3.783	143	4	1	5	3.78	.905	.819
v15c5	The BMS meets (the FET college's) information requirements	4	13	26	71	31	547	3.772	145	4	1	5	3.77	.977	.955
v15c16	The BMS's service provider provides quality training	7	9	32	61	36	545	3.759	145	4	1	5	3.76	1.049	1.101
v15c4	All data within the BMS is fully integrated and consistent	3	14	36	59	37	560	3.758	149	4	1	5	3.76	.998	.995
v15b8	Information from the BMS is easy to understand	3	17	24	79	30	575	3.758	153	4	1	5	3.76	.960	.921
v15c14	The BMS's service provider has up-to-date facilities	2	9	36	60	26	498	3.744	133	4	1	5	3.74	.902	.813
v15c17	The BMS's service provider provides quality services	7	10	25	71	28	526	3.730	141	4	1	5	3.73	1.020	1.041
v15d4	The BMS has resulted in improved business processes	5	17	27	64	33	541	3.705	146	4	1	5	3.71	1.052	1.106
v15c1	The BMS is easy to use	10	14	26	69	37	577	3.699	156	4	1	5	3.70	1.121	1.257
v15d2	The BMS has resulted in improved outcomes or outputs	6	12	30	77	26	558	3.695	151	4	1	5	3.70	.980	.960
v15d5	The BMS has helped to improve communication and relationships with partners such as DHET, SETAs, government, private companies, etc.	7	16	28	56	37	532	3.694	144	4	1	5	3.69	1.117	1.249
v15c13	The BMS's service provider is reliable	3	16	30	62	28	513	3.691	139	4	1	5	3.69	.992	.983
v15d3	The BMS has resulted in an increased capacity to manage a growing volume of activity (e.g. transactions, population growth, etc.)	8	12	30	71	28	546	3.664	149	4	1	5	3.66	1.044	1.089
v15b5	The BMS provides output that seems to be exactly what is needed	6	18	33	65	32	561	3.643	154	4	1	5	3.64	1.058	1.120
v15c3	It is not difficult to get access to information that is in the BMS	4	17	37	65	28	549	3.636	151	4	1	5	3.64	.997	.993

v15d1	The BMS has resulted in overall productivity improvement	8	14	34	60	31	533	3.626	147	4	1	5	3.63	1.087	1.181
v15b11	Information from the BMS is always timely	4	19	31	72	24	543	3.620	150	4	1	5	3.62	.988	.975
v15b7	Information from the BMS is in a format that is readily usable	6	17	39	59	31	548	3.605	152	4	1	5	3.61	1.056	1.115
v15a4	The BMS enhances my effectiveness in the job	9	22	29	59	38	566	3.605	157	4	1	5	3.61	1.164	1.356
v15d6	The BMS is cost effective	7	19	25	45	29	445	3.560	125	4	1	5	3.56	1.167	1.361
v15b4	Information from the BMS is always updated and current	7	29	23	57	34	532	3.547	150	4	1	5	3.55	1.173	1.377
v15c7	The BMS always does what it should	4	24	40	54	28	528	3.520	150	4	1	5	3.52	1.054	1.110
v15c11	The BMS requires only the minimum number of fields and screens to achieve a task	8	17	40	63	22	524	3.493	150	4	1	5	3.49	1.048	1.097
v15b6	Information needed from the BMS is always available	7	28	30	63	25	530	3.464	153	4	1	5	3.46	1.106	1.224
v15c8	The BMS user interface (screen) can be easily adapted to one's personal approach (customize)	10	14	41	52	23	484	3.457	140	4	1	5	3.46	1.102	1.214
v15d8	The BMS has resulted in cost reductions (e.g. inventory holding costs, administration expenses, etc.)	6	19	30	50	18	424	3.447	123	4	1	5	3.45	1.073	1.151
v15a5	The BMS increases my productivity	12	23	38	55	31	547	3.440	159	4	1	5	3.44	1.178	1.387
v15d7	The BMS has resulted in reduced staff costs	7	23	27	42	23	417	3.418	122	4	1	5	3.42	1.163	1.353
v15c12	Modifications to the functionality of the BMS can easily be done (modified, corrected and improved)	6	24	38	48	23	475	3.417	139	4	1	5	3.42	1.089	1.187
v15b3	Information available from the BMS is always accurate (does not often need correction)	6	32	39	49	27	518	3.386	153	4	1	5	3.39	1.119	1.252
v15c10	The BMS programme speed is quickly enough (responds quickly)	9	27	42	56	24	533	3.373	158	4	1	5	3.37	1.109	1.229
v15a2	The BMS enhances my awareness of job related information	10	29	32	64	19	515	3.344	154	4	1	5	3.34	1.117	1.247
v15a1	I have learnt much through the presence of the BMS	7	30	47	52	21	521	3.318	157	4	1	5	3.32	1.068	1.142
v15b12	Information from the BMS is unavailable elsewhere	10	26	30	39	23	423	3.305	128	4	1	5	3.30	1.207	1.458
v15a3	The BMS enhances my recall of job related information	8	31	37	63	15	508	3.299	154	4	1	5	3.30	1.061	1.126
v15c9	The BMS is always up-and-running as necessary (It has good connectivity, e.g. to network, server access, etc.)	19	25	32	59	21	506	3.244	156	4	1	5	3.24	1.231	1.514

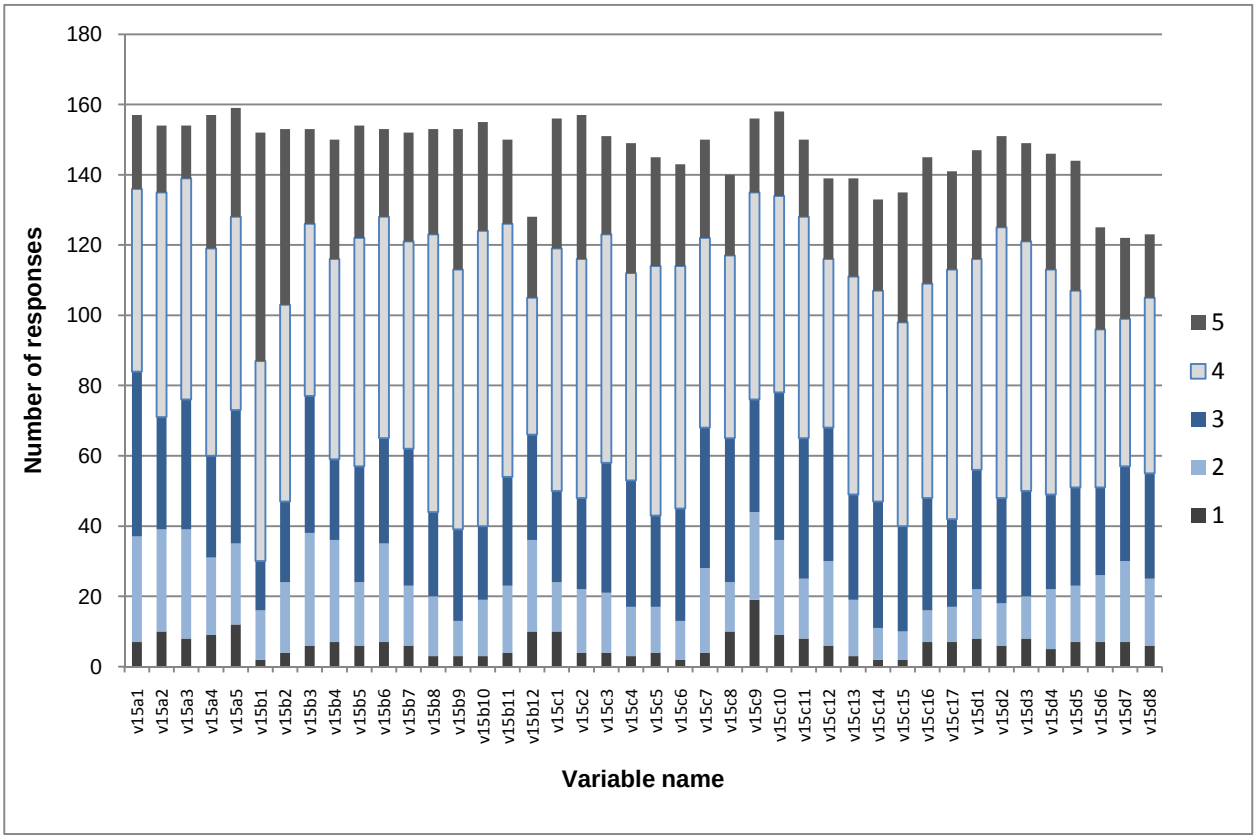


Figure 5.12: Number of responses by question and score

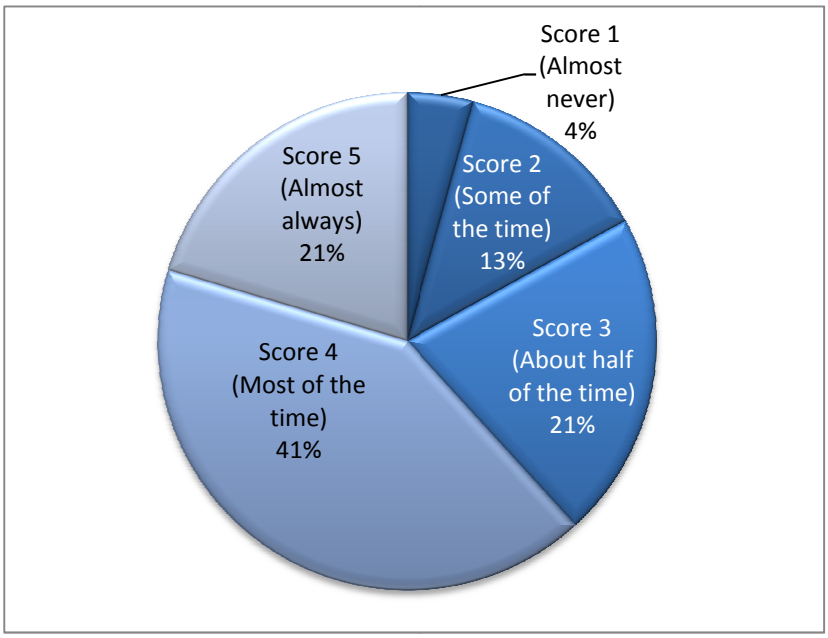


Figure 5.13 Distribution of participants' scores across all BMS evaluation items

5.4.2 Construction of first- and second-order variables related to IS success evaluation

Question 15 in the questionnaire (cf. Appendix 2) contains a list of questions on IS success evaluation. This section of the questionnaire is composed of an amalgamation of four empirically tested questionnaires, as already explained in Chapter 2, section 2.10. In this study, the terms *success evaluation constructs* and *success evaluation indicators* are used interchangeably.

The underlying items or variables for each success evaluation indicator were tested simultaneously for **internal consistency** (Cronbach's alpha scale reliability testing) and **unidimensionality** (Principal Component Analysis (PCA)), as given in sections 5.4.2.1 (Table 5.16) and 5.4.2.2, respectively. The last item under question 15, Category B, *Information from the BMS is unavailable elsewhere*, had a poor response rate and was therefore dropped from the analysis.

From the results of the tests for unidimensionality, new first-order underlying constructs were discovered, which suggested changes to the proposed theoretical model (cf. Chapter 2, section 2.11) of the study. The changes will be discussed in section 5.5.

The newly discovered constructs are **data quality** (*dataq*), **output quality** (*outpq*), **ease of access** (*eoa*) and **ease of functioning** (*eof*). The data analysis further revealed that the construct **end-user computing satisfaction** (eucs) for this study is composed of three underlying variables (**ease of use** (*eou*), **content** (*con*) and **format** (*for*)) and not five as suggested in the theoretical model (Figure 2.19) and informed by the literature review.

A structural representation of how the final IS success evaluation indicators (cf. sections 2.5.5 – 2.5.12) for this study were calculated is given in Figure 5.14.

The IS success evaluation indicators, as defined in Chapter 2, section 2.5, including the newly discovered constructs, were calculated as follows:

- **Individual impact** (*indi*), a first-order factor, was created by calculating the mean of five items (*v15a1, v15a2, v15a3, v15a4, v15a5*).
- **Information quality** (*infq*), a second-order factor, was created by calculating the mean of the eleven items that were used to create two first-order factors:

- **Data quality** (*dataq*), a first-order factor, was created by calculating the mean of six items (*v15b1, v15b2, v15b3, v15b4, v15b5, v15b6).*
- **Output quality** (*outpq)*, a first-order factor, was created by calculating the mean of five items (*v15b7, v15b8, v15b9, v15b10, v15b11)*.

- **System quality** (sysq), a second-order factor, was created by calculating the mean of the twelve items that were used to create two first-order factors:
  - **Ease of access** (*eoa*), a first-order factor, was created by calculating the mean of three items (*v15c1, v15c2, v15c3).*
  - **Ease of functioning** (*eof*), a first-order factor, was created by calculating the mean of nine items (*v15c4, v15c5, v15c6, v15c7, v15c8, v15c9, v15c10, v15c11, v15c12)*.
- **Service quality** (*serq*), a first-order factor, was created by calculating the mean of five items (*v15c13, v15c14, v15c15, v15c16, v15c17)*.
- **Organisational impact** (*orgi*), a first-order factor, was created by calculating the mean of eight items (*v15d1, v15d2, v15d3, v15d4, v15d5, v15d6, v15d7, v15d8)*.
- **End-user computing satisfaction** (*eucs*), a second-order factor, was created by calculating the mean of the thirteen items that were used to create three first-order factors:
  - **Ease of use** (*eou*), a first-order factor, was created by calculating the mean of three items (*v15c1, v15c2, v15c10).*
  - **Content** (*con*), a first-order factor, was created by calculating the mean of five items (*v15b2, v15b3, v15b4, v15b5, v15c5)*.
  - **Format** (*for*), a first-order factor, was created by calculating the mean of five items (*v15b7, v15b8, v15b9, v15b10, v15b11).*
- **Overall IS success** (*bmseval*), a third-order factor, was created by calculating the mean of fourty-one items that were used to create *indi, infq, sysq, serq, orgi,* and *eucs*.

The results of the scale reliability testing and the mean values of each success evaluation construct are discussed in section 5.4.2.1 and presented in Table 5.16. The testing for

unidimensionality (PCA) is presented in section 5.4.2.2 and a structural representation of the construction of the success evaluation indicators for *FET college X* is given in Figure 5.14.

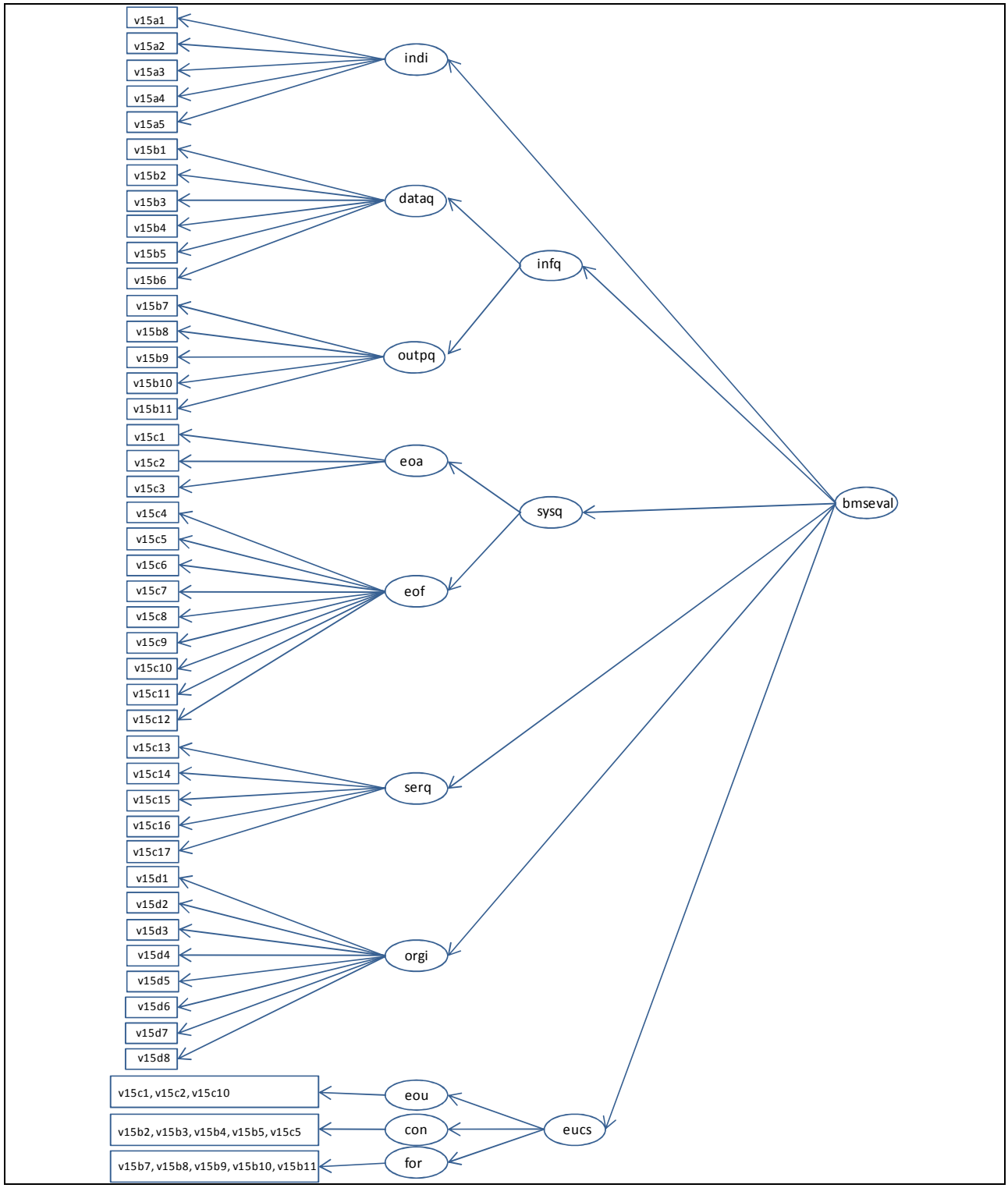


Figure 5.14: Structural representation of the construction of IS success evaluation indicators for this study

5.4.2.1 Scale reliability statistic (Cronbach's Alpha) testing

In 1993, Cortina discovered that the value of Cronbach's alpha depends on the number of items on the scale and is also affected by reverse scored items (Field, 2005). When the questionnaire for this study was developed special care was taken to ensure that all BMS evaluation items were phrased in such a way that all responses by participants were in the same direction (positively).

The scale reliability statistic (Cronbach's alpha) was calculated for all first-, second- and third-order factors (success evaluation indicators) and the results are provided in Table 5.16. Evidently all success evaluation indicators have high internal consistency with all Cronbach's alpha values higher than 0.7.

Once the internal reliability was established for each of these constructs, construct scores for each respondent for each construct were calculated. Each of the seven construct scores for each respondent were calculated as a mean response (called score) from the subset of responses recorded by the respondent on those questionnaire items that describe a particular construct (For example the mean of the responses of items v15a1 to v15a5 for respondent 1 will indicate respondent 1's perception of individual impact, *indi,* and will be labelled the impact score for respondent 1).

By calculating the mean response of all respondents for each construct, the researcher was able to gain an overall perception of how BMS users perceived each of the aspects probed. The general evaluation is presented in Table 5.16. For example, the *information quality* mean score (mean score (*infq*)) was calculated as 3.71; which can be rounded off to 4.0. Since the individual construct scores and the mean construct scores are derived as mean values from responses on a *frequency-of-use Likert rating scale*, the individual construct scores and mean construct scores may also be interpreted according to the Likert frequency-of-use rating scales; where '1' indicates *almost never*; '2' indicates *some of the time*;.'3' indicates *half of the time*, '4' indicates *most of the time*; and '5' indicates *almost always*.

According to the frequency-of-use rating scale, an *information-quality* construct mean score of 4.0 – indicated above – will thus indicate that BMS users were very positive regarding the

information quality obtained via the BMS evaluation tool, most of the time. The general perception of computer users regarding the other aspects of the BMS evaluation tool, as presented in Table 5.16, can be expressed likewise. The shaded rows in Table 5.16 indicate the main success evaluation constructs (sorted by their mean values in descending order) with the underlying success evaluation constructs beneath each main construct.

Table 5.16: Reliability statistic and mean of each success evaluation indicator/construct

Success evaluation indicator/construct	Number of items	Reliability statistic (Cronbach's alpha)	Level of factor	Mean	Standard deviation	N
serq (Service quality)	5	0.934	First order	3.76	.88987	148
infq (Information quality)	11	0.943	Second order	3.71	.82062	159
outpq (Output quality)	5	0.909	First order	3.75	.82489	158
dataq (Data quality)	6	0.922	First order	3.67	.92921	159
eucs (End-user computing satisfaction)	13	0.928	Second order	3.68	.76684	162
for (Format)	5	0.909	First order	3.75	.82489	158
con (Content)	5	0.898	First order	3.65	.91810	160
eou (Ease of use)	3	0.765	First order	3.64	.91022	160
bmseval (Overall BMS evaluation)	41	0.981	Third order	3.61	.75981	163
orgi (Organizational impact)	8	0.944	First order	3.59	.96102	156
sysq (System quality)	12	0.929	Second order	3.58	.80093	161
eoa (Ease of access)	3	0.858	First order	3.71	.93213	158
eof (Ease of functioning)	9	0.915	First order	3.52	.83043	160
indi (Individual impact)	5	0.931	First order	3.44	1.00656	161

The overall mean of *bmseval* is 3.61, suggesting that BMS users were satisfied with the BMS system between half of the time and almost always. This is an indication that there is room for improvement in the performance of the BMS system on all levels of evaluation.

Serq (service quality) has the highest mean (3.76) showing that BMS users were almost always satisfied with the services rendered by the internal and external service providers. They felt that the service providers were reliable, had up-to-date facilities, were experienced, and provided quality training.

Both the indicator, ***for*** *(format)* (which is one of the first-order factors within *eucs (end-user computing satisfaction))* and the indicator ***outpq*** (output quality) (which is one of the first-order factors within *infq* (information quality)) have the same mean score of 3.75, which is the second highest score compared to all other indicators. This suggests that BMS users were highly

satisfied with the format and quality of the outputs of the BMS system. The mean scores of *con* (content) and *dataq* (data quality) were 3.65 and 3.67 respectively, which means that BMS users were less satisfied with the quality of the data and content than with the appearance of the outputs of the BMS system.

Information quality (*infq,* mean of 3.71, the construct with the second highest mean) consists of data quality (*dataq*) and output quality (*outpq*). Although BMS users were satisfied with the quality of both, higher scores were achieved for output quality (3.75) versus 3.67 for data quality. Respondents believed that the BMS system contained important and key information and data which were not always accurate and often needed to be updated. The survey revealed that the respondents perceived the output of the BMS to be readily usable, easy to understand, clear and well formatted.

The mean score of the construct *eucs* (3.68) was the third highest score among the main constructs. It is evident from the data that the end-user computing satisfaction levels of the BMS users depended mainly on the format of the output (mean of 3.75). The other two underlying constructs, *content* and *ease-of-use,* achieved mean scores of 3.65 and 3.64 respectively.

The IS success evaluation measure perceived to be the third weakest was organisational impact (*orgi*, with a mean of 3.59). This means that the respondents felt that the BMS did not greatly contribute to organisational benefits such as overall productivity improvement; increased capacity to manage growing volume of activity; improved communication and relationships with external organisations; and reduced staff costs, and that the BMS was not perceived to be highly cost effective.

The second weakest main construct was *sysq* (systems quality). The BMS users believed that although the system is easy to use, to learn and to obtain access to the information within the system (*eoa* with mean value of 3.71), the functionality of the system could be improved (*eof* with mean value of 3.52). BMS users thought that the functionality of the system could be improved by being more integrated, more consistent, up-and-running, improve on connectivity

(network, server access), reduction in the number of screens and fields to move through to achieve a task.

The analysis furthermore revealed that BMS users were of the opinion that the BMS system had the lowest impact (compared to the other success measures) on the development, productivity, efficiency and effectiveness of the users (*indi*, with mean of 3.44), meaning that the presence of the BMS did not have a high influence on users' individual capabilities and effectiveness in their job on behalf of the organisation.

5.4.2.2 Unidimensionality testing (PCA)

A PCA was carried out on all indicators to illustrate unidimensionality in the underlying variables. The results of the PCA on each success evaluation indicator/construct follow:

Individual impact (indi)

Table 5.17 illustrates that **one** component, which explains 78,528% of the total variance in the sample, is extracted, showing that the five items used to create *indi* are unidimensional. Furthermore, all items load highly (above 0.8 factor loadings) to this component.

Table 5.17 PCA on *indi's* five underlying items

Total Variance Explained

Component	Initial eigenvalues			Extraction sums of squared loadings		
	Total	% of variance	Cumulative %	Total	% of variance	Cumulative %
1	3.926	78.528	78.528	3.926	78.528	78.528
2	.455	9.106	87.635			
3	.329	6.587	94.221			
4	.163	3.266	97.487			
5	.126	2.513	100.000			

Component Matrix[a]

	Component
	indi
v15a4	.919
v15a2	.905
v15a3	.903
v15a5	.867
v15a1	.835

Extraction Method: Principal component analysis. a. 1 components extracted.

Information quality (infq)

Table 5.18 shows that a PCA extracted **two** components from the eleven items that underlie *infq;* these were named ***outpq*** *(output quality)* and ***dataq*** *(data quality).* Together, these two components explain 74.478% of the total variance in the sample. The rotated component matrix (bottom part of table 5.18) depicts high factor loadings – factor loadings less than 0.6 were excluded from the analysis.

Table 5.18 PCA on *infq's* eleven underlying items

Total variance explained

Comp.	Initial eigenvalues			Extraction sums of squared loadings			Rotation sums of squared loadings		
	Total	% of variance	Cum %	Total	% of variance	Cum %	Total	% of variance	Cum %
1	7.073	64.304	64.304	7.073	64.304	64.304	4.167	37.882	37.882
2	1.119	10.173	74.478	1.119	10.173	74.478	4.025	36.595	74.478
3	.541	4.921	79.399						
4	.421	3.823	83.222						
5	.361	3.281	86.504						
6	.318	2.890	89.394						
7	.280	2.548	91.941						
8	.268	2.432	94.374						
9	.233	2.116	96.490						
10	.206	1.868	98.358						
11	.181	1.642	100.000						

Rotated Component Matrix[a]

	Component	
	outpq	***dataq***
v15b9	.859	
v15b8	.857	
v15b10	.795	
v15b7	.735	
v15b11	.721	
v15b5		.850
v15b3		.843
v15b2		.774
v15b4		.772
v15b1		.654
v15b6		.650

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.
a. Rotation converged in 3 iterations.

System quality (sysq)

Table 5.19 shows that the PCA extracted **two** components from the twelve items that underlie *sysq*, which were named: ***eof*** *(ease of functioning)* and ***eoa*** *(ease of access),* as illustrated in Figure 5.14. Together these two components explain 65.998% of the total variance in the sample. The rotated component matrix (bottom part of table 5.19) depicts high factor loadings.

Table 5.19 PCA on *sysq's* twelve underlying items

Total Variance Explained

Comp.	Initial eigenvalues			Extraction sums of squared loadings			Rotation sums of squared loadings		
	Total	% of Variance	Cum %	Total	% of Variance	Cum %	Total	% of Variance	Cum %
1	6.878	57.320	57.320	6.878	57.320	57.320	4.494	37.453	37.453
2	1.041	8.679	65.998	1.041	8.679	65.998	3.425	28.545	65.998
3	.779	6.495	72.493						
4	.707	5.890	78.383						
5	.625	5.208	83.591						
6	.491	4.093	87.685						
7	.414	3.446	91.131						
8	.323	2.689	93.820						
9	.248	2.070	95.890						
10	.218	1.813	97.703						
11	.164	1.366	99.069						
12	.112	.931	100.000						

Rotated component matrix[a]

	Component	
	eof	***eoa***
v15c10	.785	
v15c7	.778	
v15c9	.752	
v15c11	.701	
v15c6	.673	
v15c4	.665	
v15c5	.653	
v15c8	.575	
v15c12	.567	
v15c2		.865
v15c1		.799
v15c3		.790

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.
a. Rotation converged in 3 iterations.

Service quality (serq)

Table 5.20 illustrates that **one** component which explains 79.444% of the total variance in the sample is extracted with PCA, showing that the five items used to create *serq* are unidimensional. Furthermore, all items load highly (above 0.8 factor loadings) to this component.

Table 5.20 PCA on serq's five underlying items

Total Variance Explained

Component	Initial eigenvalues			Extraction sums of squared loadings		
	Total	% of variance	Cumulative %	Total	% of variance	Cumulative %
1	3.972	79.444	79.444	3.972	79.444	79.444
2	.491	9.814	89.258			
3	.251	5.028	94.286			
4	.157	3.135	97.421			
5	.129	2.579	100.000			

Component matrix[a]

	Component
	serq
v15c17	.918
v15c14	.913
v15c15	.899
v15c13	.870
v15c16	.854

Extraction Method: Principal Component Analysis. a. 1 components extracted.

Organisational impact (orgi)

Table 5.21 illustrates that **one** component which explains 72.329% of the total variance in the sample is extracted, showing that the eight items used to create *orgi* are unidimensional. Furthermore, all items load highly (above 0.8 factor loadings) to this component.

Table 5.21 PCA on orgi's eight underlying items

Total Variance Explained

Component	Initial eigenvalues			Extraction sums of squared loadings		
	Total	% of variance	Cumulative %	Total	% of variance	Cumulative %
1	5.786	72.329	72.329	5.786	72.329	72.329
2	.774	9.681	82.010			
3	.416	5.204	87.214			
4	.277	3.467	90.681			
5	.241	3.007	93.688			
6	.197	2.461	96.148			
7	.169	2.107	98.255			
8	.140	1.745	100.000			

Component matrix[a]

	Component
	orgi
v15d4	.889
v15d3	.882
v15d2	.863
v15d1	.850
v15d5	.849
v15d7	.838
v15d6	.827
v15d8	.803

Extraction Method: Principal Component Analysis.

a. 1 components extracted.

End-user computing satisfaction (eucs)

Table 5.22 shows that the PCA extracted **three** components which were named ***eou*** *(ease-of-use),* ***con*** *(content)* and ***for*** *(format)*. This finding, of three underlying components instead of five as proposed in the theoretical model, suggests a very important adaptation to the proposed theoretical model (cf. Chapter 2, section 2.11). The proposed theoretical model suggests five first-order variables: *eou (ease of use)*, *con (content)*, *acc (accuracy)*, *tim (timeliness)*, and *for (format)* for the construct *end-user computing satisfaction (eucs),* whereas the analysis in Table 5.22 of the data for *FET college X* shows that the thirteen underlying items of *eucs* grouped into three underlying components. Together these three components explain 73.749% of the total variance in the sample.

The adjusted and extended theoretical model is presented in Figure 5.16 as the conceptual model for the study.

Table 5.22 PCA on eucs's thirteen underlying items

Total variance explained

Comp.	Initial eigenvalues			Extraction sums of squared loadings			Rotation sums of squared loadings		
	Total	% of variance	Cum %	Total	% of variance	Cum %	Total	% of variance	Cum %
1	7.142	54.940	54.940	7.142	54.940	54.940	3.816	29.352	29.352
2	1.436	11.045	65.986	1.436	11.045	65.986	3.567	27.436	56.788
3	1.009	7.764	73.749	1.009	7.764	73.749	2.205	16.962	73.749
4	.620	4.770	78.519						
5	.528	4.063	82.582						
6	.475	3.653	86.235						
7	.351	2.698	88.933						
8	.335	2.580	91.513						
9	.300	2.307	93.820						
10	.268	2.059	95.879						
11	.229	1.762	97.642						
12	.172	1.321	98.963						
13	.135	1.037	100.000						

Rotated component matrix[a]

	Component		
	format	*content*	*eou*
v15b8	.833		
v15b9	.785		
v15b10	.738		
v15b7	.724		
v15b11	.691		

v15b5		.828	
v15b3		.789	
v15b4		.785	
v15b2		.721	
v15c5		.542	
v15c2			.861
v15c1			.796
v15c10			.643

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.
a. Rotation converged in 6 iterations.

Overall BMS success evaluation (bmseval)

Table 5.23 shows that the PCA extracted seven components which correspond to the main items of the constructs in the proposed model when the highest factor values are considered. The first five components correspond to the following constructs respectively: *infq*, *orgi*, *serq*, *indi*, and *eucs*. The last two components correspond to the two first-order underlying variables of *sysq*. Together these seven components explain 80.818% of the total variance in the sample.

Table 5.23 PCA on eucs's thirteen underlying items

Total variance explained

Comp.	Initial eigenvalues			Extraction sums of squared loadings			Rotation sums of squared loadings		
	Total	% of variance	Cum %	Total	% of variance	Cum %	Total	% of variance	Cum %
1	23.922	58.345	58.345	23.922	58.345	58.345	6.739	16.436	16.436
2	2.275	5.549	63.894	2.275	5.549	63.894	6.712	16.370	32.806
3	1.843	4.495	68.389	1.843	4.495	68.389	5.432	13.250	46.055
4	1.546	3.771	72.160	1.546	3.771	72.160	5.076	12.380	58.435
5	1.319	3.216	75.376	1.319	3.216	75.376	3.484	8.498	66.933
6	1.140	2.780	78.156	1.140	2.780	78.156	3.334	8.133	75.066
7	1.092	2.663	80.818	1.092	2.663	80.818	2.359	5.752	80.818
8	.816	1.989	82.808						
9	.651	1.588	84.396						
10	.596	1.454	85.849						
11	.578	1.410	87.259						
12	.485	1.1823	88.441						
13	.454	1.108	89.550						
14	.371	.904	90.454						
15	.363	.884	91.338						
16	.345	.842	92.180						
17	.321	.782	92.962						
18	.293	.715	93.677						

19	.279	.680	94.357						
20	.241	.587	94.944						
21	.222	.541	95.485						
22	.198	.483	95.968						
23	.189	.462	96.430						
24	.166	.405	96.835						
25	.160	.391	97.226						
26	.145	.354	97.580						
27	.129	.314	97.895						
28	.115	.279	98.174						
29	.107	.261	98.435						
30	.092	.224	98.659						
31	.087	.213	98.871						
32	.077	.189	99.060						
33	.071	.173	99.233						
34	.064	.155	99.388						
35	.054	.131	99.520						
36	.049	.120	99.640						
37	.043	.105	99.745						
38	.033	.080	99.825						
39	.027	.067	99.892						
40	.026	.062	99.954						
41	.019	.046	100.000						

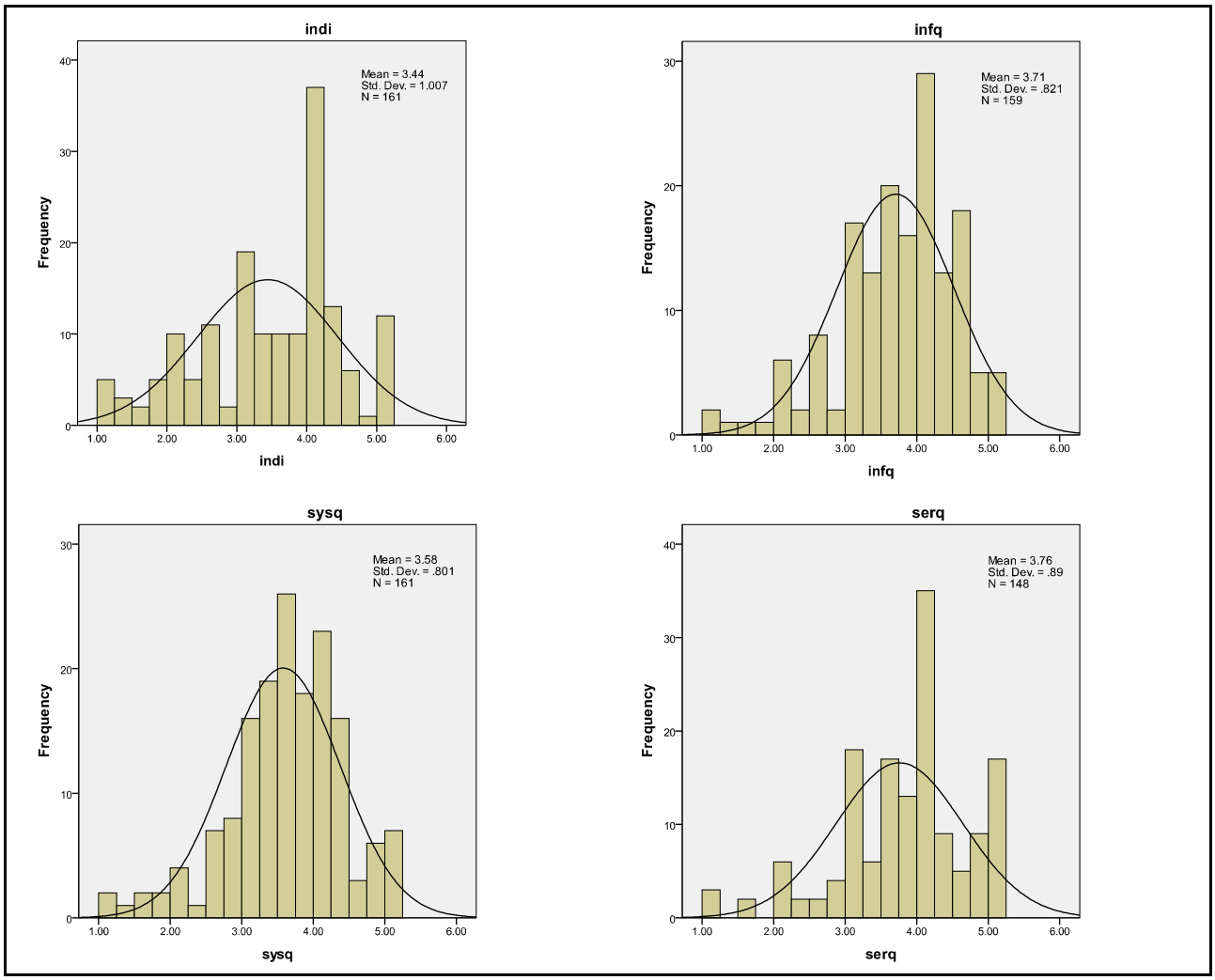
Rotated Component Matrix[a]

	Component						
	infq	orgi	serq	indi	eucs	sysq	
						eof	eoa
v15b2	.749						
v15b5	.718						
v15b3	.717						
v15c7	.697						
v15b6	.679				.361		
v15b1	.677				.403		
v15b4	.667		.390				
v15b11	.574				.549		
v15c5	.502				.350		.479
v15d2		.769					
v15d7		.738					
v15d1		.729		.386			
v15d3		.708					
v15d4		.692					
v15d5		.671				.360	
v15d8		.620				.470	
v15d6		.599					
v15c4	.426	.507	.356				
v15c16		.409	.710				
v15c11			.698				
v15c17		.434	.681				
v15c10			.674				
v15c15			.651				
v15c14	.403	.373	.640				
v15c9	.406		.570			.358	
v15c13	.444	.401	.484				
v15a1				.817			
v15a4				.791			

v15a5		.370		.770			
v15a2				.769			
v15a3				.723			
v15b8					.671		
v15b9	.353				.646		
v15b10	.399				.588		
v15c8						.746	
v15c3						.632	
v15c12			.423			.561	
v15b7	.392				.461	.467	
v15c1		.431					.591
v15c2		.396				.435	.585
v15c6	.448		.378				.483

Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization.
a. Rotation converged in 9 iterations.

The seven graphs in Figure 5.15 depict the distribution of the means calculated for BMS users on all success evaluation indicators. Normal curves have been added to indicate more or less normal response patterns.



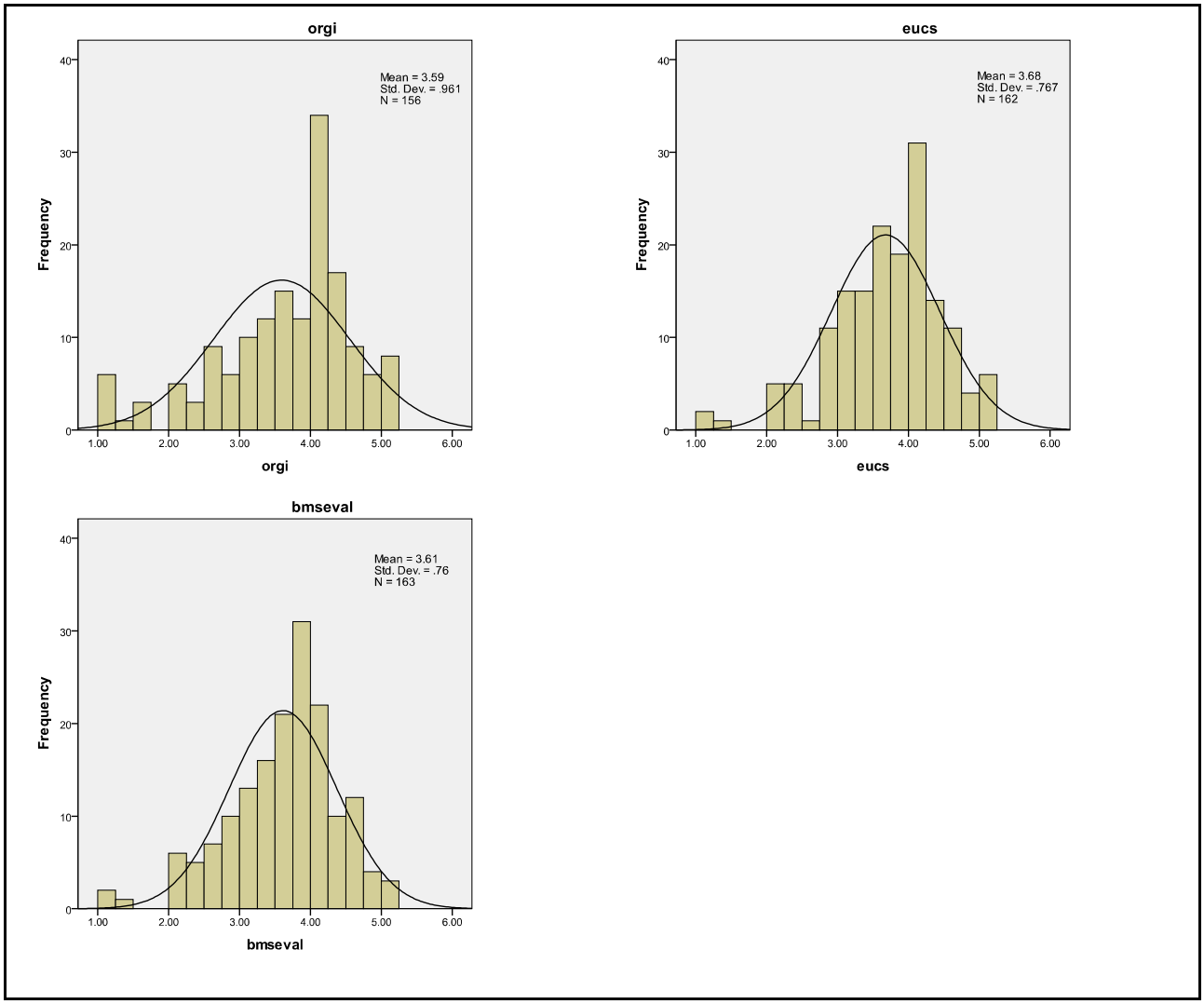


Figure 5.15: Histograms on the IS success evaluation constructs with added normal curves

Section 5.4.2 has up to now presented the quantitative (method 1 of the **triangulation** process) results of the evaluation constructs. Synthesized information on the interviews (method 2 of the **triangulation** process) is presented in Box 5.4. The box provides more in-depth qualitative information on the views of interviewees on the success of the IS evaluation constructs.

Box 5.4: Synthesis of interviewees' responses regarding perceived satisfaction with different aspects of the system.

Question 4 in the interview schedule:

How would you describe the following aspects of the system?

Information quality

Service quality

Systems quality

Individual impact

Organisational impact

End-user computing satisfaction

Synthesis of responses (Interview 5, 2011, Interview 6, 2011, Interview 7, 2011):

Information quality: The interviewees were all in agreement that the BMS system is extremely valuable with regard to the information that it contains and the outputs that it produces. They reported that outputs from the BMS report-generating options play an important role in quality assurance in the college. Different reports are available and the scrutiny of these reports assists in the monitoring and evaluation of the academic progress and absenteeism rates of students. It also provides information on registered students (proof of registration).

Service quality: Interviewees had conflicting opinions about the quality of the service that is provided by the corporate unit and the external service provider. Some interviewees responded very positively while others were not entirely happy with the services provided especially with regard to turnover times for some queries and requests. Further investigation revealed that some processes, such as registering a user on the system and providing specific rights to that user, are lengthy and take place via email correspondence and are perceived as time consuming.

Systems quality: At the time of the survey, all interviewees' perceptions of the system were very positive. The general perception was that when they were introduced to the BMS system it felt as if they had to go through too many screens and options to achieve a task, but after they became familiar with the system it no longer felt difficult or time consuming. The flow of options and processes felt quicker and easier to manage. The BMS is reportedly a comprehensive system with many different options which include all the functionalities the interviewees need to conduct their daily tasks.

Individual impact: The interviewees had differing perceptions about the impact of the system on their individual capabilities and effectiveness in their job. They revealed that perceptions of high impact on individual's capabilities and effectiveness might be linked to the extent to which the user is using the system and the position of the staff member at the college. In general, support staff reported that the system has a high impact on their personal development, productivity and effectiveness in their job, while lecturing staff reported the contrary, that is, that the system does not have a high impact on their personal development, productivity and effectiveness in their job. It should be noted that support staff is using the BMS system extensively in their daily tasks.

Organisational impact: The unanimous perception was that the organisation is benefitting from the presence of the BMS system. All interviewees from various positions and ranks reported that the BMS system is an excellent asset and contributes to productivity at the college, especially with regard to the monitoring and evaluation of different functions by means of the reports generated by the system. It was reported that the class lists of marks, generated by the system, enable lecturers to inspect and monitor student marks far more easily than in the past. Support staff also reported that the direct reporting functionality of the system is a tremendous improvement over the former manual system. Managers also benefit from having an overall picture of the number of students registered by course and the pass rates, which can be extracted from the system in an instant.

End-user computing satisfaction: Interviewees reported that the BMS system is easy to learn and easy to use. They are satisfied with the information contained in the system and they feel that the format of the outputs is very useful and a huge improvement compared to the former manual system. However, they did report that the accuracy and timeliness of the output reports could be improved.

Finally, **triangulation of quantitative and qualitative data** on the evaluation of the constructs can be summarised as follows:

- the BMS is user-friendly with provisioning of receipt of training;

- although the construct organisational impact received an average rate in the quantitative data analysis, interviewees unanimously applaud the BMS as a valuable asset to the college;
- the BMS add much value to the management of the college in terms of monitoring and evaluation of key indicators – suggesting satisfaction with information quality and quality of the format of output reports;
- the BMS is perceived to have a high impact on individual development and performance of staff who uses the system more extensively (administrators) than those who use the system less extensively (lecturers);
- furthermore, data triangulation confirms the need for more systematic data quality control.

5.4.3 Relationships between BMS success evaluation indicators and personal and employment data

The question that flows from the inferred perceptions presented in Table 5.16 is whether more insight can be gained and more information extracted from the data with regard to BMS users' evaluation of aspects of the BMS evaluation tool.

To this end, further analysis was done to investigate the nature of the effect that different biographical characteristics might have on satisfaction ratings (thus perceptions) of IS success evaluation indicators. Each of the success evaluation indicators were evaluated for the statistical significance of trends over age categories, staff position groups, staff who received training or not, computer proficiency levels, and categories of the extent to which respondents used the BMS.

In these analyses the seven sets of main IS success evaluation construct scores represented the BMS success evaluation indicators and included

- *indi* (individual impact) 5 items
- *infq* (information quality), 11 items
- *sysq* (systems quality), 12 items

- *serq* (swrvice quality), 5 items
- *eucs* (end user computing satisfaction), 13 items
- *orgi* (organisational impact), 8 items
- *bmseval* (Overall BMS success evaluation), 41 items

Further analyses of these constructs were deemed feasible since internal consistency reliability was established for each set of construct scores in scale reliability tests (indicated by means of Cronbach's alpha values greater than 0.70, cf. sections 5.4.2.1 and 5.4.2.2).

These sets of BMS construct scores represent continuous data (derived as averages from rating scale responses) and the biographical data represent categorical data; therefore analysis of variance and multiple comparisons of means tests (Bonferroni tests) were presented as suitable analysis techniques (Field, 2005:339) in this instance. The fact that the sample size is fairly large, n = 163, furthermore indicates that analysis of variance is an appropriate analysis technique. (The analysis strategy made provision for the evaluation of the requirements of analysis of variance that residuals be normally distributed and group variances be homogeneous. If these assumptions were found not to be satisfied, non-parametric analysis of variance procedures were employed.)

Separate analyses of variance were conducted on each set of BMS construct scores entered as the dependent variable and with the biographical variables entered as explanatory variables in the model. The model of best fit was selected for each BMS construct and the results of these analyses are presented in Table 5.24.

Each row in Table 5.24 represents a separate analysis of variance (the model of best fit). The summary results for a particular analysis include the dependent variable (such as *indi*), the general F-probability and the significance level associated with the analysis (column 2), the error df (column 3), and the significance of the explanatory variables which were taken up in the model (columns 4-11).

For each set of BMS success evaluation construct scores, the combined effects of the various characteristics were jointly evaluated in a single analysis of variances (e.g., the effect of age, training, computer proficiency and extent of BMS use, were jointly investigated on the system's

quality perceptions). Columns 9 to 11 in Table 5.24 report on the combined/interactive effect of any two attributes in the model on perceptions (training and computer proficiency, e.g. on systems quality perceptions).

Table 5.24: Summary of analyses of variance results on BMS perception construct scores, to evaluate the effect of age, training, computer proficiency, position and frequency of BMS-tool-use, and their interactions, on perceptions regarding the BMS

Perception construct	F-prob. & sign.	Error df	Biographical attributes entered as explanatory variables in the model. Significance of biographical effects (indicated in parenthesis)							
			Age	Training	Computer Proficiency	Position	Extent of use	Train* comp	train* age	age* comp
indi	7.06 (0.001)***	157		9.99 (0.002)**			5.89 (0.02)*			
infq	4.99 (0.0003)***	151		17.62 (<.0001)***	4.05 (0.02)*			3.29 (0.04)*		
sysq	3.77 (0.0003)***	141	2.56 (0.081)	9.89 (0.002)**	3.48 (0.034)*			2.80 (0.065)	3.16 (0.046)*	
serq	5.05 (<0.0001)***	132	0.87 (0.420)	10.04 (0.002)**		4.70 (0.010)**			3.52 (0.032)*	
orgi	3.52 (0.0001)***	133	1.86 (0.160)	9.76 (0.002)**	2.72 (0.070)	2.05 (0.133)		2.61 (0.077)		2.85 (0.026)*
eucs	5.56 (0.0001)***	154		20.36 (0.0001)***	3.90 (0.022)*			3.87 (0.023)*		
bmseval	4.58 (0.0001)***	154		20.08 (0.0003)***	2.95 (0.055)*		2.13 (0.1465)	3.20 (0.044)*		

Significance legend:
? : 10% level of significance
* : 5% level of significance
** : 1% level of significance
*** : 0.1% level of significance

Table 5.24 indicates which attributes, as well as their combined effects, statistically significantly affect perceptions on BMS success evaluation measures and shows that

- *training* and *extent of use* affected perceptions on the individual impact construct *(indi)* statistically significantly
- *training* and *computer proficiency* affected perceptions on the information quality construct *(infq)* statistically significantly
- *age, training* and *computer proficiency* affected perceptions on the systems quality construct *(sysq)* statistically significantly
- *age, training* and *position* affected perceptions on the service quality concept *(serq)* statistically significantly
- *age, training, computer proficiency,* and *position* affected perceptions on the organisational impact construct *(orgi)* statistically significantly

- *training* and *computer proficiency* affected perceptions on the end-user computing satisfaction construct *(eucs)* statistically significantly
- *training, computer proficiency* and *extent of use* affected perceptions on the overall BMS success construct *(bmseval)* statistically significantly.

Once the personal and employment attributes that affect perceptions had been identified, the next questions that needed attention were: In what way do these attributes affect perceptions? What is the nature of the effect?

Once the analysis of variance had identified the statistically significant effects, Bonferroni multiple comparisons of means tests were conducted for each construct on each set of construct mean scores (where the construct mean scores were calculated according to the categories of the specific significantly identified attribute) to describe the nature of the specific biographical attribute's effect on perceptions. This is reported in Table 5.25.

In this table, each column presents sets of construct mean scores for a particular construct, where these mean scores were calculated according to Anova-identified statistically significant attribute categories. Bonferroni test results are indicated next to category mean scores as small letters. Small letters within a group of category mean scores that differ from one another indicate that these means differ statistically significantly from each other.

Table 5.25: Mean construct scores reported according to the categories of biographical variables that proved (in analyses of variance reported in Table 5.23) to statistically significantly affect BMS perceptions constructs and Bonferroni multiple comparisons of means tests results

	BMS success evaluation variables						
Attributes & categories	**indi**	**infq**	**sysq**	**serq**	**orgi**	**eucs**	**bmseval**
Training							
yes	3.53 a				3.72 a		
no	2.88 b				3.08 b		
Extent of use							
one component	3.32 a						
more component	3.65 b						
Computer proficiency							
excellent			3.67 a				
above average			3.61 ab				
low to average			3.47 b				
Position							
Support staff				3.96 a			
Management staff				3.82 ab			
Teaching staff				3.58 b			
train*comp							

Table 5.25: Mean construct scores reported according to the categories of biographical variables that proved (in analyses of variance reported in Table 5.23) to statistically significantly affect BMS perceptions constructs and Bonferroni multiple comparisons of means tests results

	BMS success evaluation variables						
Attributes & categories	**indi**	**infq**	**sysq**	**serq**	**orgi**	**eucs**	**bmseval**
no/excellent		3.51 b				3.40 b	3.35 b
no/above		3.30 b				3.33 b	3.23 ab
no/low		2.32 a				2.31 a	2.37 c
yes/excellent		3.87 b				3.82 b	3.83 ab
yes/above		3.78 b				3.75 b	3.65 a
yes/low		3.78 b				3.78 b	3.78 ab
train*age							
no/20–29			3.37 b	3.52 abc			
yes/20–29			3.57 b	3.56 b			
no/30–39			2.52 a	2.70 a			
yes/30–39			3.74 b	4.05 c			
no/40–62			3.46 ab	3.37 abc			
yes/40–62			3.84 b	4.07 c			
Age*comp							
20–29/above average					3.03 ad		
20–29/excellent					3.74 c		
20–29/low					2.61 ab		
30–39/above average					3.56 bce		
30–39/excellent					3.66 bce		
30–39/low					2.69 ad		
40–62/above average					3.86 ce		
40–62/excellent					3.39 abcd		
40–62/low					3.48 bce		
Bonferroni Multiple Comparisons of Means Tests: Different letters next to means in the same cell indicate that the means differ significantly from one another							

From the results provided in Table 5.25 one can deduce the following:

- The effect of *training* on perceptions with regard to individual and organisational impact construct (*indi* and *orgi*):

  The effect of receiving training on the mean construct scores of participants' perceptions of individual and organisational impact was statistically significantly higher to those participants who did receive training (*indi*-mean construct scores of 3.53 as opposed to 2.88 – indicating an approximately '4' positive agreement rating for trained versus an almost '3' indifferent rating for no-training respondents. The same trend was indicated by *orgi*-mean scores). Training thus had a positive effect on perceptions of individual and organisational impact (*indi* and *orgi*).

- The effect of *extent of BMS use* on perceptions with regard to the individual impact construct (indi):

The results further show that the effect of the extent to which the BMS was used on participants' perceptions of the construct of individual impact was statistically significantly less positive (mean score of 3.32, which signifies an indifferent perception) for users who used only one component compared to users who used more than one component of the BMS (mean score of 3.65 which approximates a rating value of '4' which signifies a positive perception/or an agree).

- The effect of *computer proficiency* on perceptions with regard to systems quality *(sysq)*:

  The results revealed statistically significantly higher perception ratings on systems quality *(sysq)* by BMS users with *excellent* computer competency levels than users with *average* and *below* average computer proficiency.

- The effect of *staff position* on perceptions with regard to service quality (serq):

  Statistically significantly different scores on service quality *(serq)* were calculated for BMS users by position. It was found that *support staff* was more likely to perceive service quality *(serq)* somewhat more positively than teaching staff (a mean construct score of 3.96, approximately a positive '4' agreement rating as opposed to a mean score of 3.58 for teaching staff which falls midway between an indifference '3' rating and a positive '4' agreement rating).

- The interactive effect of *training* and *computer proficiency* of perceptions with regard to the constructs of information quality (*infq*), end-user computing satisfaction (*eucs*) and overall BMS success evaluation (*bmseval*):

  When considering the interactive effect of *receiving training* and *computer proficiency (train*comp)* on *infq, eucs* and *bmseval,* the tests revealed a statistically significant difference between the group that received *no training and who had low computer proficiency* compared to all other groups. This group was more likely to report statistically significantly lower perceptions on the three BMS success evaluation constructs (*infq, eucs* and *bmseval*) than the other groups.

- The interactive affect of *training* and *age* on perceptions of *systems quality* and *service quality* (*sysq* and *serq*):

  Statistically significant differences in the combined effects of *training* and *age (training*age)* in the 30–39 age group were calculated for *sysq* and *serq.* BMS users who did not received training in the 30–39 age group exhibited statistically significantly lower perceptions on *systems quality* and *service quality* constructs. (For example, trained 30–39 and trained 40–62 year olds perceived *service quality* statistically significantly more positively than untrained 30–39 year olds and trained 20–29 year olds.)

- The interactive affect of *age* and *computer proficiency* on organisational impact (*orgi*):

  The most significant effect of the interactive effect *age* and *computer proficiency* (*age*comp*) is exhibited by the statistically significant difference between perceptions of younger, 20–29 year olds with excellent computer proficiency who perceived statistically significantly higher organisational impact than 30–39 year olds with below average computer proficiency (mean construct scores of 3.74 and 2.69).

During data analysis it was established that changes needed to be made to the initial proposed theoretical model for this study. These changes are discussed in section 5.5.

5.5 MODEL EVALUATION

The data analysis provided evidence for adaptations and extensions to the proposed theoretical, conceptual model as presented in Chapter 2, section 2.11. The following adaptations were revealed by the tests for internal reliability and consistency (Cronbach's alpha) and unidimensionality (PCA) (cf. section 5.4.2):

- the theoretical model (cf. Figure 2.19) was extended by the addition of the two underlying components for the construct, *infq* (information quality), namely *dataq* (data quality) and *outpq* (output quality), which were identified in Table 5.18
- the theoretical model (cf. Figure 2.19) was extended by the addition of the two underlying components for the construct, *sysq* (system quality), namely *eof* (ease of functioning) and *eoa* (ease of access), which were identified in Table 5.19, and finally
- the theoretical model (cf. Figure 2.19) was adapted by reducing the five components for end-user computing satisfaction (*eucs*) to only three underlying components, namely *eou* (ease of use), *con* (content) and *for* (format) that have been identified in Table 5.22.

The theoretical model has therefore been extended and adapted accordingly, and the final conceptual model for this study is presented in Figure 5.16.

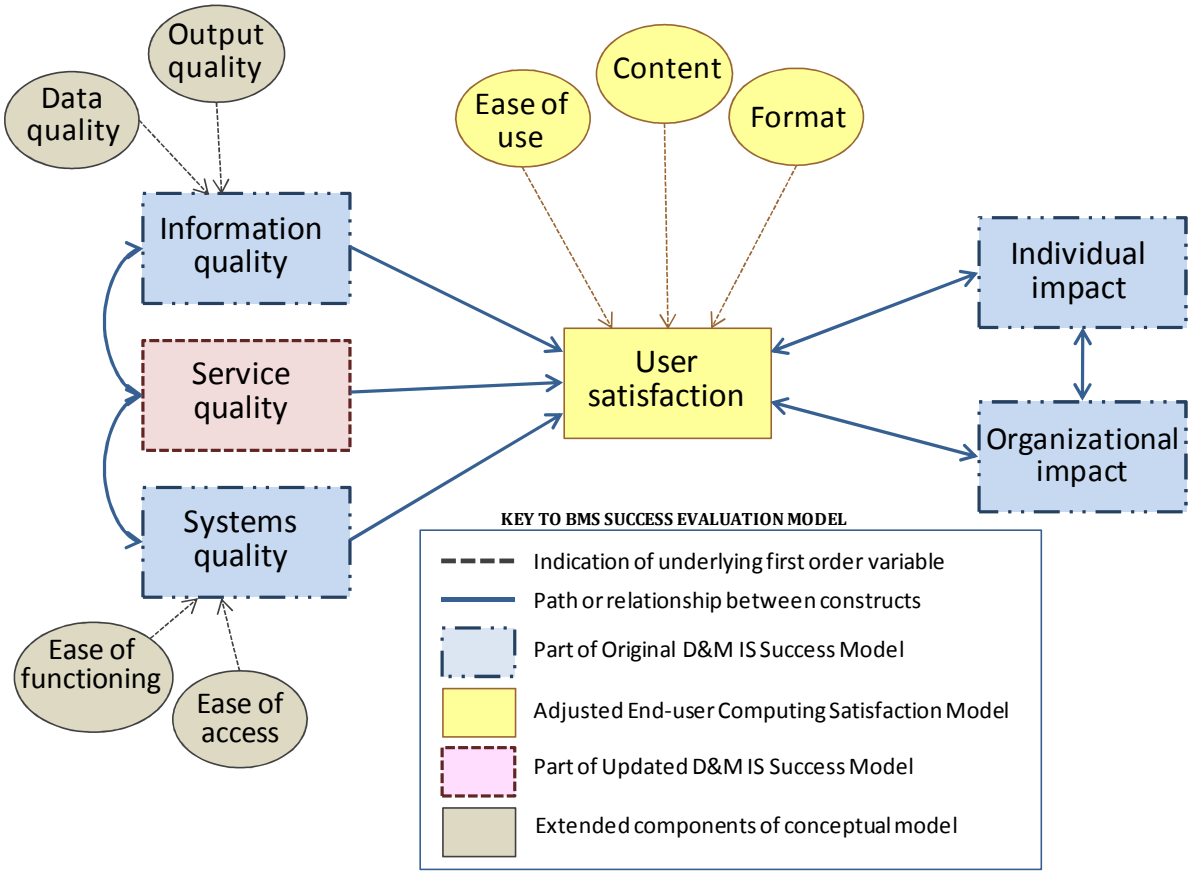


Figure 5.16: Conceptual model for BMS success evaluation at public *FET college X*

5.6 CONCLUSION

In this chapter the quantitative and qualitative data that were concurrently gathered through a survey questionnaire and semi-structured interviews respectively were analysed and the findings presented. The data analysis was done in the following order:

- characteristics (attributes on employment and personal data) of the survey population were investigated and presented in section 5.2 to describe the profile of the BMS users
- relationships between the attributes of employment and personal data were examined and described in section 5.3, and
- items on BMS success evaluation were analysed and relationships between attributes of BMS users and BMS evaluation constructs were scrutinised and discussed in section 5.4.

Accordingly, the data analysis suggested that extensions and changes should be made to the proposed theoretical model (cf. Figure 2.19). These changes included the addition of four underlying constructs and the reduction of two constructs. The constructs data quality (*dataq*) and output quality (*outpq*) were added to the construct information quality (infq); the constructs ease of functioning (*eof*) and ease of access (*eoa*) were added to the construct systems quality (*sysq*); and finally the five underlying constructs of end-user computing satisfaction (*eucs*) were reduced to three, namely, ease of use (*eou*), content (con) and format (for).

Consequently, the proposed theoretical model (cf. Figure 2.19) has been adjusted and the final conceptual model for this study was presented in section 5.5.

The next chapter will provide syntheses of the findings, discussion, conclusions, limitations and recommendations for this study.

CHAPTER 6

SYNTHESES OF FINDINGS, DISCUSSION, CONCLUSIONS, LIMITATIONS AND RECOMMENDATIONS

6.1 INTRODUCTION

Based on the information provided in the preceding chapters, which will be synthesised in this chapter, the main research question has successfully been addressed by investigating the sub-research questions (cf. Chapter 1, section 1.2.2). Table 6.1 provides information on the chapter(s) in which the different research questions were addressed and the sections in which the different outputs were provided.

Table 6.1: Chapters in which the relevant research questions were addressed

Question number	Research question	Addressed in:	Output in section:
Main research question	*What is necessary in designing an evaluation tool to assist in the evaluation of MISs' success at public FET colleges in South Africa?*	Chapter 2-5	Sections 2.7, 2.9, 2.10, 2.11, 3.7, 3.8, 5.4, 5.5
Sub-research question 1	*What types of evaluation models and tools exist for MISs?*	Chapters 2 and 5	Section 2.7: Models found in literature. Section 2.11: Proposed theoretical model for this study. Section 5.5: Conceptual model of this study.
Sub-research question 2	*What types of information systems exist at public FET colleges?*	Chapter 3	Section 3.7: State of ICT and MISs at public FET colleges in SA. Section 3.8: Rational for case selection.
Sub-research question 3	*Which variables need to be included in an evaluation tool to enable effective measurement of success of the MIS at public FET colleges?*	Chapters 2 and 5	Section 2.9: Constructs and effectiveness measures. Section 2.10: Instrument development. Section 5.4: Validation of success evaluation constructs.

The research objectives of the study, as stated in chapter 1, section 1.2.3, were achieved by addressing the three sub-research questions as follows:

The first sub-research question concerns the types of evaluation models (graphical representations of evaluation constructs) and tools (instruments or questionnaires) that exist for MIS. Subsequently, the usefulness of existing evaluation models and tools for evaluating MIS

success in the literature was reviewed and interrogated. Eight of the models that were found in the literature were explained and evaluated for their suitability for the selected public FET college (cf. Chapter 2, section 2.7). The proposed theoretical and conceptual model for this study comprised of a combination of three such models, namely the original D&M IS Success Model, the updated D&M IS Success Model and the End-User Computing Satisfaction Model. Accordingly, the initial conceptual model for this study was proposed on the basis of these three models (cf. Chapter 2, section 2.11).

The second sub-research question pertains to the types of information system that exist at public FET colleges and was addressed as follows: Literature reviews were conducted on documents related to FET colleges and semi-structured interviews were held with key stakeholders. The literature reviews included the following documents: policies and legislation that influenced transformation in the FET sector, business plans of the Department of Education, and strategies for the implementation of the MIS, as well as user manuals and user requirement statements. The state of ICT and MISs at public FET colleges was investigated and this revealed that there are enormous differences in the types and sophistication levels of ICT and MISs between public FET colleges. In addition, there has been no standardisation in terms of the type of system implemented, many of the FET colleges were using more than one system for different purposes and the systems were not integrated (cf. Chapter 3, section 3.7).

The third sub-research question, pertaining to the variables that need to be included in an evaluation tool to enable effective measurement of success of the MIS at public FET colleges, was addressed as follows. Based on the proposed theoretical model (cf. Chapter 2, section 2.11), four survey instruments (found in the literature) were used to develop the evaluation tool (cf. Appendix 2, Chapter 2, sections 2.9 and 2.10) for evaluating the MIS at the selected college. Furthermore, the literature review on IS success models facilitated the evaluation of existing survey instruments in order to select the variables for inclusion in the evaluation tool (questionnaire development and design) administered at the college. Subsequently, the proposed success evaluation tool was empirically tested by means of a survey of all MIS users at the college and the results showed that it is possible to evaluate the success of the system by using the evaluation tool (cf. Chapter 5) that was developed and designed for the purpose.

The findings from the three sub-research questions were combined to answer the main research question. Hence, the evaluation model and the accompanying tool for evaluating the MIS at the selected public FET college (developed and tested in this study) are presented in response to the main question. It is therefore concluded that the main research question, namely: *What is necessary in designing an evaluation tool to assist in the evaluation of MISs' success at public FET colleges in South Africa?* has been adequately addressed and the purpose and objectives of the study have been achieved successfully.

Section 6.2 will provide a summary of the research design.

6.2 SUMMARY OF THE RESEARCH DESIGN

This study has (according to the researcher's knowledge) pioneered the use of existing IS success evaluation models in the development and design of an appropriate model and instrument for evaluating MIS success at public FET colleges in South Africa.

From a pragmatic, interpretive and post-positive philosophical paradigm, a mixed-method framework (QUAN+qual) was implemented to investigate whether it is possible to develop a tool to evaluate the success of MISs at public FET colleges in South Africa. A concurrent triangulation design model was implemented in terms of which quantitative and qualitative data were concurrently gathered and analysed. Subsequently, the findings of the qualitative and quantitative data analyses were triangulated and were reported in Chapter 5. A synthesis of the findings from the quantitative and qualitative data analyses will be presented in section 6.3.

The study made use of two research strategies, namely, a case study and a survey. The quantitative data was gathered through a survey strategy using the newly designed and developed evaluation tool (cf. Appendix 2 for a copy of the questionnaire). One of the sections of the questionnaire, that on success evaluation of the MIS, comprising 42 questions, consists of questions that were retrieved from four existing questionnaires found in the literature and which were previously empirically tested. The MIS at the selected public FET college served as the case study. Qualitative data, on the other hand, was gathered using semi-structured interviews. These semi-structured interviews were conducted with four key people (BMS

manager, IT manager, DHET official, and the developer and owner of COLTECH) and three end users (senior lecturer, academic assistant and administrator) of the system (cf. Appendix 4).

Two sampling frames were involved in the study, namely the population of all public FET colleges (50 in total) and the population of MIS users at the selected public FET college. A non-probability sampling technique was employed on the first sampling frame for the selection of the public FET college. Accordingly, one public FET college was purposively sampled (cf. Chapter 3, section 3.8 for the rationale for the selected FET college). The entire population of the second sampling frame, the total number of MIS users (N = 163 participants) at the selected public FET college participated in the survey, hence a 100% response rate was achieved. After the survey instrument had been administered, semi-structured interviews were held with randomly selected BMS users from the second sampling frame.

It was initially planned to conduct the survey via Computer Assisted Telephonic Interviewing (CATI) methodology, but during the initial meeting with the selected public FET college, the BMS manager proposed that the questionnaire should be administered internally. The reason for this decision was based on the confidentiality of the contact details of the participants. Hence, the college administered the questionnaire through the office of the CEO.

The quantitative data was captured on a form that was designed using MS Access 2007 software. Preliminary data cleaning and some of the exploratory data analysis were also done using this program. Further in-depth exploratory and inferential data analyses, which entailed the application of statistical techniques and procedures, were conducted with SPSS version 19 and verified with AMOS Graphics version 19. Additional mathematical calculations and graphical representations of the data were done using spreadsheet software, MS Excel 2007. The following statistical techniques and tests were applied to the data: frequency tables, graphs, PCA, WAI, Pearson's chi-square tests of statistical significance, Pearson's , Spearman's rho and Kendall's tau_b correlation coefficients, Cramer's V value, Cronbach's alpha value, GLM, and Bonferroni comparison of means tests.

Qualitative data obtained from two interviews was captured with a digital audio tape recorder. The other semi-structured interviews were recorded by means of the researcher's notes.

Summaries of the qualitative data were reported in narratives (cf. Chapter 5). In addition, a copy of the consent form which was signed by the interviewees is attached in Appendix 3.

Ethical clearance for the research was granted by the research ethical clearance committees of the University of South Africa (UNISA) (cf. Appendix 6) and the Human Sciences Research Council (HSRC) (cf. Appendix 5). A copy of the request made by the researcher to the selected public FET college to visit and conduct the research is attached in Appendix 7 and a copy of the email in which said permission was granted is attached in Appendix 8.

6.3 SYNTHESIS OF THE FINDINGS

The findings of the research can be categorised into four categories:

- Biographical characteristics of the BMS users
- Statistically significant relationships between the various biographical characteristics of the BMS users
- Measurements of the different IS success evaluation constructs (indicators) in the evaluation model
- Statistically significant relationships between the IS success evaluation constructs and the various biographical characteristics of the BMS users

The first two categories concerning the biographical characteristics of the BMS users provide important background information on the interpretation of the calculated measurements of the IS success evaluation constructs in the last two categories. Each of these categories of findings will be discussed in the following sections.

6.3.1 Findings on the biographical characteristics of the BMS users

A total of 163 BMS users participated in the survey. This meant that there was a 100% response rate, since responses were received from all users of the system. The gender distribution of the respondents was almost equal with 58% (or 94 participants) being female and 42% (or 69 participants) male. The majority of the participants (80%) belonged to the African population group, while just one in every five (18%) participants was white and the Indian and coloured

participants together comprised 2% of the population. Fifty-two percent of the participants were lecturing staff, 37% support staff and 11% management staff.

The mean age of all participants was 35, with just over half the participants being younger than 35 years (56%). The data suggests that support staff tends to be the youngest group and that management staff is more likely to be the oldest group. The average ages of support, lecturing and management staff were 31, 36 and 44 years respectively.

More than half of the participants (57%) had a diploma or occupational certificate on NQF[4] level 5 as their highest academic qualification. This is not surprising, since FET colleges focus primarily on offering vocational education. Furthermore, almost a third of the participants (31%) had a first degree or higher diploma on NQF level 6, 4% had matric (NQF level 4), 7% an honours or master's degree (NQF level 7) and 1% had a doctoral degree (NQF level 8) as their highest academic qualification.

Training of BMS users on the system seemed to be an important issue for the selected FET college (*FET college X*) since 141 or 87% of all participants had received training either internally from the FET college's training provider or externally from the BMS service provider. More than a quarter of the BMS users (27% or 38 participants) received training from both the internal and external training providers. It was also reported that a network of support among BMS users had developed in terms of which college staff members who are familiar with the BMS assist other staff members who are in the initial learning process, that is, on-the-job or in-house training.

Functionalities facilitated by the BMS include: student administration, academic administration, financial administration, human resource management and development, asset management, technical administration and maintenance. The majority of BMS users do not use the system extensively, as 63% (or 103 participants) were using only one component of the system, for example the student administration component. Moreover, in excess of one in every four BMS

[4] A new Higher Education Qualifications Framework (HEQF) with more differentiated higher education levels was signed into effect as of 1 January 2009, resulting in 10, instead of the previous 8, national qualification levels − GOVERNMENT 2007. The Higher Education Qualifications Framework HIGHER EDUCATION ACT, 1997 (Act No. 101 of 1997). *No. 928*. Government printers: Cape Town.
The structure used by the FET college to describe the qualifications corresponds with the previous NQF structure, where an NQF level 4 is equivalent to Grade 12, NQF level 5 refers to pre-degree certificates or diplomas, and the highest higher education qualification possible is level 8 (doctoral degrees).

users (27%) was using only two components of the system. It was reported that support staff uses the BMS more extensively than the other groups of staff specifically for the following activities: creating class lists, registering students (capture student information), linking lecturers to students, creating timetables, logging queries, and so on. Lecturing staff is responsible for capturing their students' test marks and management staff mainly makes use of the report-generation functionality. It was also reported by all staff types that the output reports generated by the BMS are very valuable and useful for monitoring and evaluating student registration, absenteeism rates and performance indicators such as pass rates.

One of the distinct findings of the study was that the majority (81%) of BMS users at public *FET college X* had above average to excellent computer proficiency skills. Further in-depth statistical analysis showed that *training* and high *computer proficiency* skills had a highly positive statistically significant effect on almost all BMS success evaluation constructs.

6.3.2 Findings on statistically significant relationships within the different biographical characteristics of the BMS users

Tests for statistically significant relationships among attributes of the BMS users revealed just two statistically significant relationships:

- A negative statistically significant relationship exists between *age* and the *computer proficiency* levels of participants, which means that a slight decrease in computer proficiency is observed with an increase in age.
- A statistically significant relationship exists between *position or rank* and the *age* of BMS users, which means that support staff is more likely to be younger than lecturing staff and lecturing staff is more likely to be younger than management staff.

The following two categories will consider findings related to the composite BMS success evaluation variables or constructs (i.e. *information quality, systems quality, service quality, end-user computing satisfaction, individual impact, organisational impact* and *overall BMS success*). It is therefore important to remind the reader of how these BMS success evaluation constructs were calculated. The BMS success evaluation constructs were derived from the 42 items (one was dropped) presented in the questionnaire (cf. items in question 15, Appendix 2). These items

were presented in a *frequency-of-use Likert rating scale* format in terms of which participants had to rate each item on a scale of 1 to 5, where 1 equals *almost never*; 2 equals *some of the time*; 3 equals *about half of the time*; 4 equals *most of the time*; and 5 equals *almost always.* Each BMS success evaluation construct was generated by calculating the mean of the underlying items for each participant.

Chapter 5, section 5.4 provides an in-depth explanation of the statistical techniques utilised to establish the validity, internal consistency and unidimensionality of each of these constructs.

Testing for the internal consistency, reliability and unidimensionality of the six main success evaluation constructs that were proposed in the theoretical MIS success evaluation model (cf. Chapter 2, section 2.11, Figure 2.19), revealed changes to the theoretical model. These changes were implemented and have been illustrated in the conceptual model for this study (cf. Figure 5.16).

The six main success constructs used to evaluate the MIS at *FET college X* include: *individual impact, information quality, systems quality, service quality, organisational impact,* and *end-user computing satisfaction* and the seven underlying success evaluation constructs include: *data quality, output quality, ease of access, ease of functioning, ease of use, content and format* (cf. Figure 5.14).

The six main constructs, together with the seven underlying evaluation constructs, provide a comprehensive evaluation model that evaluates the success of all dimensions of a MIS. An additional construct, the overall BMS success evaluation (*bmseval*), incorporates the six constructs already mentioned and was calculated for each user by calculating the mean of all ratings provided by users on all the other BMS evaluation items. The construction of the MIS success evaluation constructs or indicators has been exhaustively described in Chapter 5, section 5.4.2 and illustrated in Figure 5.14. Section 6.3.3 summarises findings on the success evaluation constructs.

6.3.3 Findings on the measurements of the different IS success evaluation constructs (indicators) in the evaluation model

Table 6.2 below is derived from Table 5.16 in Chapter 5 and provides the means (success evaluation measurements) calculated for each construct in the conceptual model (Chapter 5, Section 5.5, Figure 5.16). The main BMS success evaluation constructs have been shaded in Table 6.2; the other variables, which have not been shaded, are constructs that underlie the main constructs. The main constructs are sorted in descending order according to the mean scores.

The overall mean of the *BMS success evaluation* (*bmseval*) was calculated at 3.61, suggesting that BMS users were satisfied with the BMS between half of the time and almost always. This is an indication that there is room for improvement in the overall performance of the BMS. The scores of the other success evaluation indicators provide more detail on the specific aspects of the BMS that need improvement.

Table 6.2: BMS success evaluation construct measurements

Success evaluation indicator/construct	Mean	Standard deviation	N
serq (Service quality)	3.76	0.88987	148
infq (Information quality)	3.71	0.82062	159
outpq (Output quality)	3.75	0.82489	158
dataq (Data quality)	3.67	0.92921	159
eucs (End-user computing satisfaction)	3.68	0.76684	162
for (Format)	3.75	0.82489	158
con (Content)	3.65	0.9181	160
eou (Ease of use)	3.64	0.91022	160
bmseval (Overall BMS evaluation)	3.61	0.75981	163
orgi (Organisational impact)	3.59	0.96102	156
sysq (System quality)	3.58	0.80093	161
eoa (Ease of access)	3.71	0.93213	158
eof (Ease of functioning)	3.52	0.83043	160
indi (Individual impact)	3.44	1.00656	161

Service quality had the highest mean (3.76) of the main constructs, showing that BMS users were almost always satisfied with the services rendered by the internal and external service providers. They felt that the service providers were reliable, had up-to-date facilities, were experienced, and provided quality training.

Information quality (with a mean score of 3.71) received the second highest score compared to the other main constructs and comprises two underlying constructs, namely, *data quality* (3.67) and *output quality* (3.75). Although BMS users were satisfied with the quality of both underlying constructs, higher scores were achieved for *output quality* (3.75) than for *data quality* (3.67). Respondents believed that the BMS contained important key information and data which were not always accurate and might often need to be updated. The survey revealed that the respondents perceived the output from the BMS to be readily usable, easy to understand, clear and well formatted. During the semi-structured interviews, interviewees also emphasised the importance and value of the output reports generated by the system, especially for monitoring and evaluation purposes.

It is evident from the data that the format (mean score of 3.75) of the outputs from the BMS contributed most to end-user computer satisfaction (*eucs* with mean score of 3.68) of the BMS users.

The research furthermore revealed that BMS users at *FET college X* were of the opinion that the BMS had the lowest impact (compared to the other success construct measures) on the development, productivity, efficiency and effectiveness of the users (*indi* with mean score of 3.44), meaning that the presence of the BMS did not have a great effect on the development of individual users' capabilities and effectiveness in terms of the way they do their job on behalf of the organisation. One could speculate that the users of the BMS, as a result of their high computer proficiency levels and the ease of use of the system, did not find the operation of the BMS a challenge and therefore reported a low individual impact.

The IS success evaluation measure perceived as the third weakest of the main constructs was *organisational impact* (mean of 3.59). This means that the respondents felt that the BMS did not contribute greatly to organisational benefits such as improvement in overall productivity; increased capacity to manage a growing volume of activity; improved communication and relationships with external organisations; and reduced staff costs. In addition, the BMS was perceived as being not particularly cost effective.

The second weakest of the main constructs was *systems quality* (mean of 3.58). This construct included items such as: *It is not difficult to get access to information that is in the BMS; All data*

within the BMS is fully integrated and consistent; The BMS includes necessary features and functions; The BMS always does what it should; The BMS is always up-and-running as necessary; etc. In addition to this finding, one interviewee reported that she initially perceived the MIS as being too lengthy, that is, she felt that she had to go through too many screens and options to be able to achieve a task, but after she became familiar with the system, the flow of options and processes felt quicker and easier to manage.

In summary, Figure 6.1 depicts the evaluation profile of *FET college X* on all success evaluation constructs that were measured.

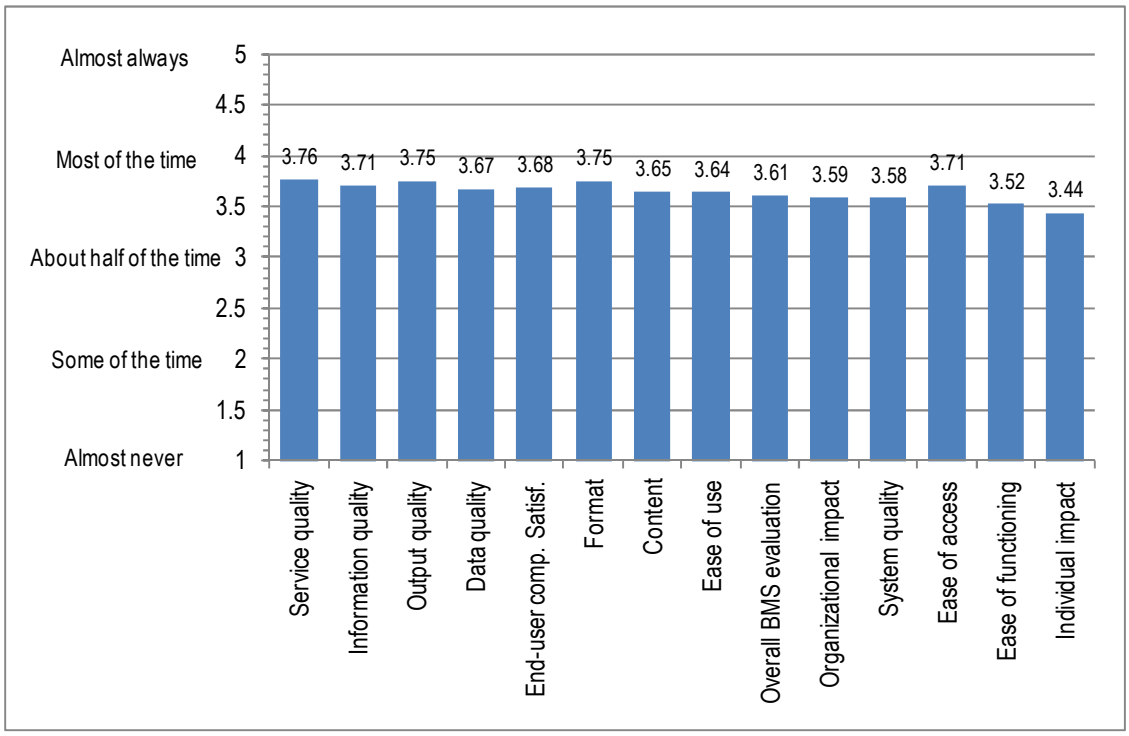


Figure 6.1: Success evaluation profile of the BMS at public *FET college X*

As can be seen from Figure 6.1, all constructs (indicators) of the BMS have been rated between 3.76 – the highest value – and 3.44 – the lowest value; showing a relatively similar standard of performance on all aspects of the BMS. This is a positive trend which shows that performance is balanced across all aspects of the system. It also shows that attention should be given to all aspects in order to move the performance of the system to the next level where the BMS performs well *most of the time* in all aspects or dimensions tested.

6.3.4 Findings on statistically significant relationships between the IS success evaluation constructs and the different biographical characteristics of the BMS users

The question that arises from the deductions of perceptions presented in Table 6.1 is whether more insight can be gained and more information extracted from the data on BMS users' evaluation of the constructs of the BMS evaluation tool. To this end, further analysis was carried out to investigate the nature of the effect that different biographical characteristics might have had on each of the satisfaction ratings of the BMS success evaluation constructs.

Analysis of variances using GLM and multiple comparisons of means tests (Bonferroni tests) were conducted in this investigation. Each main BMS success evaluation construct served as a dependent variable and the biographical characteristics of the BMS users as the independent variables. In Table 6.3, derived from Table 5.24 in Chapter 5, the shaded blocks depict the biographical characteristics that were established as having had a statistically significant effect on the dependent variables (main BMS success evaluation constructs).

It is evident from Table 6.3 that the biographical characteristic of received training (yes/no) has had a statistically significant effect on all BMS success evaluation constructs.

Another biographical characteristic of BMS users that had a statistically significant effect on all BMS success evaluation constructs except for *individual impact* and *service quality* is *computer proficiency*. The combined effects of *training* and *computer proficiency* (*Train*Comp proficiency*) followed the same pattern as *computer proficiency* on its own.

The results further revealed that

- *age* affected the ratings of *systems quality*, *service quality* and *organisational impact*
- *position* in the institution affected *service quality* and *organisational impact*
- the *extent* of BMS use affected *individual impact* and the *overall BMS success evaluation* construct.

Table 6.3: Findings of analyses of variance on biographical variables and BMS success evaluation constructs

						Combined effects		
BMS success evaluation constructs	**Age**	**Training**	**Computer proficiency**	**Position**	**Extent of use**	**Train*Comp proficiency**	**Train*Age**	**Age*Comp proficiency**
Individual impact		■			■			
Information quality		■	■			■		
Systems quality	■	■	■			■	■	
Service quality	■	■		■			■	
Organisational impact	■	■	■	■		■		■
End-user computing satisfaction		■	■			■		
Overall BMS evaluation		■	■		■	■		

Further investigation into the categories within the different biographical characteristics using multiple comparisons of means tests (Bonferroni tests) revealed that

- receiving *training* (option: *yes*) had a positive effect on perceptions of *individual* and *organisational* impact
- the construct of *individual* impact was positively affected by users who used more than one component of the system (extent of use) compared to those who used only one component of the system
- BMS users with high levels of *computer proficiency* positively affected ratings on *systems quality*
- support staff is more likely to perceive service quality more positively than teaching staff.

Chapter 5, section 5.4.3 contains more information on the combined effects of the biographical variables on the BMS success evaluation constructs.

6.4 STUDY CONTRIBUTIONS

This research has both theoretical and practical significance which are tightly interwoven as will now be explained. On a practical level, the findings are significant for the Department of Higher Education and Training (DHET) in South Africa, which oversees the FET college sector. The researcher intends to provide the relevant authority with a copy of this research (on completion of the study).

On a theoretical level, in this study a MIS success evaluation model and an evaluation tool (survey questionnaire) were designed and developed which can be reused to evaluate MIS success at the other public FET colleges in South Africa. This evaluation system could lead to an index of MIS success at public FET colleges, which would be another practical contribution by this research.

This study furthermore empirically tested the newly designed evaluation tool at one public FET college. Seven different dimensions of the MIS were evaluated, namely, information quality, systems quality, service quality, end-user computing satisfaction, individual impact, organisational impact and overall BMS evaluation. In addition, the study established that three biographical characteristics of BMS users positively affected the success of the BMS at public *FET college X* namely:

- training of BMS users
- high computer proficiency levels of BMS users
- extent of use of the BMS – higher levels of use lead to higher levels of satisfaction.

The data analysis revealed that certain adjustments had to be made to the theoretical model. These adjustments were made and the final conceptual model for this study is presented in Chapter 5, Figure 5.16.

In light of the syntheses of the findings presented in section 6.3, the main research question has been addressed. The study also showed *what is necessary in designing an evaluation tool to assist in the evaluation of MISs' success at public FET colleges in South Africa.*

6.5 RECOMMENDATIONS

The following recommendations based on what was learnt in the research study can be made to *FET college X*:

- Measures should be taken to evaluate and assure the quality and accuracy of the data and information contained in the system's database and new validation rules could be implemented to ensure the accuracy of future data inputs.

- Since the output reports from the MIS are perceived as being very valuable, wider distribution within the college is recommended.
- Training on the system should be continued since knowledge about the system's functionality contributes to perceived satisfaction with the system. This could lead to increased use of the system which will, in turn, contribute to higher levels of satisfaction with the system.
- Although most of the staff has above-average levels of computer proficiency, it is recommended that *FET college X* encourages staff with low levels of computer proficiency to upgrade their computer proficiency skills.

6.6 STUDY LIMITATIONS

The proposed theoretical model and evaluation tool have only been empirically tested at one public FET college; therefore, the findings can only be generalised to the population of BMS users in the specific institution and not to all public FET colleges.

6.7 FURTHER RESEARCH

The following research topics could be investigated in future to broaden the collective understanding of this specific knowledge domain:

- Extension of this study to include all other public FET colleges where the BMS has been implemented to establish an index of MIS success at public FET colleges
- An impact evaluation of the presence of the MIS, in terms of the actions taken in response to output reports that monitor and evaluate FET college success indicators
- Construction of FET college success indicators that could be incorporated into the system
- Effects of the BMS on business practices at FET colleges

6.8 REFLECTION

In this section the researcher reflects on what has been learnt from undertaking this research. The research process, methodology and personal experiences will be reflected upon in terms of the following guidelines (Moon, 1999; Richmond, 2011):

- reflection is focused thought, focusing on the ways in which one responds to, understands, develops and applies one's learning in new situations
- reflection is a way of learning from one's direct experiences, rather than from the second-hand experiences of others
- this is known as 'experiential learning' – real activity with real consequences.

Figure 6.2 graphically illustrates the activities, processes and characteristics or attributes of the person involved in the critical-thinking process until a point (bottom of the upside down pyramid) has been reached where one can reflect on what has been learnt and experienced (Moon, 1999, Richmond, 2011, University of New South Wales, 2008).

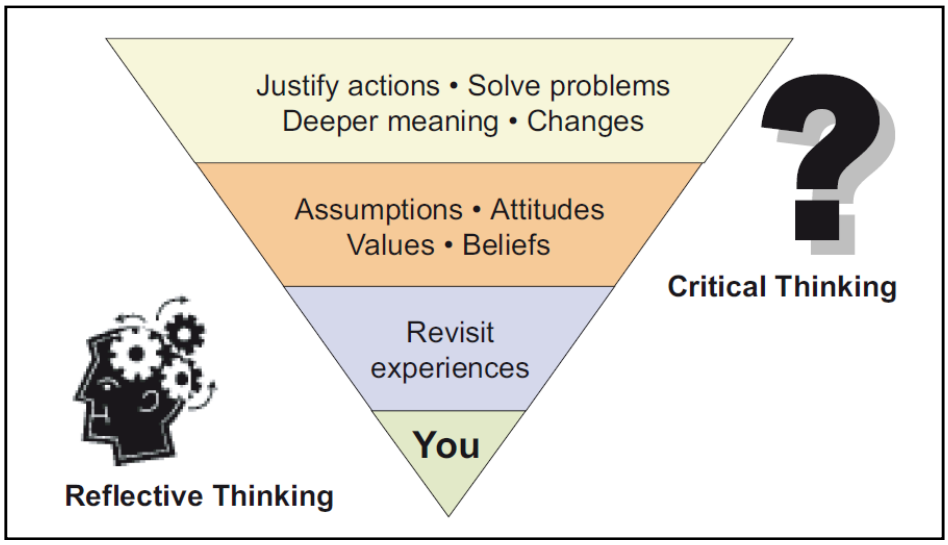


Figure 6.2: The thinking process (University of New South Wales, 2008)

In retrospect, the researcher acknowledges that the successful completion of a research project relies, firstly, on a clearly formulated, stated and focused research problem; secondly, on a realistic study plan with specific objectives linked to specific due dates; and thirdly, on the motivation and work ethics of the researcher. In all these aspects the guidance of skilled and experienced supervisors is crucial.

The importance of ethical behaviour of a researcher is vital in all communications. In this research, the researcher found that by approaching and addressing all prospective participants respectfully, none of those approached refused to participate in the research.

The researcher, furthermore, believes that the decision to use two strategies in this research, namely, a case study and a survey based on a mixed methods framework, QUAN+qual (quantitative dominant), to investigate the specific problem was ideal, because everything fell so neatly into place in the process of triangulation, when the qualitative information from the semi-structured interviews confirmed and provided more insight into the quantitative information that was obtained from the statistical analyses. For example, the statistical analyses showed that most of the users of the BMS have high levels of computer proficiency skills and the semi-structured interviews confirmed that the college management places great emphasis on computer skills and encourages staff to enrol in courses such as the International Computer Driver's License (ICDL).

Although the researcher already had above-average statistical analysis skills, this study enhanced and expanded the researcher's statistical knowledge. The researcher had to learn, and do further reading on, statistical procedures such as Bonferroni multiple comparisons of means testing. Moreover, she also chose to learn how to work with statistical software programs such as AMOS version 19.

After completing this study, the researcher feels enthusiastic, equipped and committed to embark on further literature reviews and research in this very interesting and relevant field of study. The researcher is keen to apply the newly developed theoretical model and evaluation tool to other public FET colleges so as to compare the outcomes and verify the proposed model and tool.

This research study has been experienced as a wonderful expedition in which leaps in growth in terms of research capacity and statistical skills were experienced. The final concluding remarks will follow in section 6.9.

6.9 CONCLUDING REMARKS

The foci of this dissertation were, firstly, on the development of a theoretical, conceptual *Information System's Success Evaluation Model* (graphical representation of the main IS success evaluation constructs); secondly, on the development of an *evaluation tool* (survey instrument) based on the developed theoretical Information System's Success Evaluation Model; and thirdly, on the empirical testing of the evaluation tool.

The research was contextualised by the evaluation of a MIS employed in an educational environment, a public FET college in South Africa. This predominantly quantitative study (mixed-method: concurrent triangulation design) is characterised by research where the implemented MIS served as the case being studied. Accordingly, the research accessed multiple data sources within the identified case. In addition, quantitative and qualitative data were collected during the process of testing the developed evaluation tool empirically by applying a survey and case study strategy. The study has demonstrated, through the conceptual model and tool that were developed and the empirical testing of the evaluation tool, what is necessary in designing an evaluation tool to assist in the evaluation of MISs' success at public FET colleges in South Africa.

In Greek mythology, the blind giant Orion carries his servant Cedalion on his shoulders. From this legend the saying, *Dwarfs standing on the shoulders of giants,* originated which is so applicable to this study. The researcher developed further intellectual pursuits by understanding the research and works created by notable thinkers of the past (Merton, 1965).

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APPENDIX 1: RESEARCH PLANNING

RESEARCH PLANNING

The research framework and data collection schedules (Phases, instruments and time line) are presented in the table below.

Table A1: Research planning: Phases, instruments and time line

Phase	Activities	Parties involved	Instrument applied	Time line																		
				April 2010	May 2010	June 2010	July 2010	Aug 2010	Sept 2010	Oct 2010	Nov 2010	Dec 2010	Jan 2011	Feb 2011	March 2011	April 2011	May 2011	June 2011	July 2011	Aug 2011	Sept 2011	Oct 2011
Phase 1: Scoping phase to formulate study title and focus	Critical literature review and unstructured personal interviews with various stakeholders to provide insight to narrow the focus of the study	Research conductor, Study Leaders, Provincial Department of Education officials responsible for FET colleges, FET College specialists, National Board of FET Colleges	Literature review Personal interviews																			
Phase 2: Proposal writing (Chapter 1)	Start writing draft project proposal with revisions	Research conductor Review: Study Leaders	Report																			
Phase 3: Methodology (Chapter 4)	Start writing draft methodology chapter with revisions	Research conductor Review: Study Leaders	Report																			
Phase 4: Literature chapters	Start working on the design and structure of the literature chapters 2 and 3 with revisions.	Research conductor Review: Study Leaders	Report																			
Phase 5: Design interview schedules	Design first draft of interview schedule for IS manager and IS software designer at FET colleges	Research conductor Review: Study Leaders	Literature review Interview material																			
Phase 6: Questionnaire design	Design first draft of structured questionnaires for IS users at FET colleges	Research conductor Review: Study Leaders	Literature review Interview material																			
Phase 7: Sample selection	Sample selection (purposive sampling) Ethical clearance – start preparing and submit application forms (HSRC, UNISA).	Research conductor	Sampling																			

Table A1: Research planning: Phases, instruments and time line

Phase	Activities	Parties involved	Instrument applied	Time line																		
				April 2010	May 2010	June 2010	July 2010	Aug 2010	Sept 2010	Oct 2010	Nov 2010	Dec 2010	Jan 2011	Feb 2011	March 2011	April 2011	May 2011	June 2011	July 2011	Aug 2011	Sept 2011	Oct 2011
Phase 8: CATI tool and pilot instruments	Convert the final questionnaire to a computer assisted telephonic interviewing system (CATI) and test all the instruments on a sample of the staff of the selected FET college	Research conductor	MS Access Pre-testing Validating of questionnaires																			
Phase 9: Finalisation of instruments	Refine and finalise the questionnaire and interview schedules according to the comments and improvements suggested by the pilot	Research conductor	Structured questionnaire, interview schedule																			
Phase 10: Literature chapters	Finalisation of literature chapters 2 and 3.	Research conductor	Report																			
Phase 11: Conduct full survey	Roll survey out to the population of the selected FET college - empirical research	Research conductor	CATI, fieldwork, observations																			
Phase 12: Data analysis	Analyse and interpret the data (Chapter 5)	Research conductor	MS Access 2007, SPSS version 19, AMOS version 19, MS Excel 2007																			
Phase 13: Report writing on survey findings (Chapter 5)	Write report on the results of the survey (Chapter 5)	Research conductor Statistician (checking statistical procedures and implementation)	Report																			
Phase 14: Report writing	Write and revise chapters on literature review and conclusion (Chapters 2, 3, 6)	Research conductor Review: Study Leaders	Report																			

APPENDIX 2: SURVEY INSTRUMENT: QUESTIONNAIRE

BUSINESS MANAGEMENT SYSTEM (BMS) EVALUATION QUESTIONNAIRE

2011

IDENTIFICATION AND CONSENT

UniqueID: Staff member code: OFFICIAL USE ONLY

Good day, my name is Margaretha Visser and I was given your name and phone number by XXX FET College. They have indicated that you are using the FET College's BMS system in your daily tasks at the FET College. Is your name XXX and are you using the information system as part of your daily tasks?

1. Use the BMS? Yes | No

The first column provides the contact details as on the database; please enter updated contact details in the second column if applicable.

Staff member name:		**Tel Num 1:**		
Middle name:		**Tel Num 2:**		
Surname:		**Cell Num:**		

I am a masters' student at the University of South Africa (UNISA) and a researcher at the Human Sciences Research Council (HSRC). This study is about the evaluation of the information system that you are using at your FET College. Would you be prepared to answer some questions about the BMS that you are using at your FET College?

1. Please understand that your participation is voluntary,

2. Your answers remain confidential and

3. The interview /questionnaire will take about 10-15 minutes.

2. Consent: Yes | No

EMPLOYMENT INFORMATION

3. Please provide your position / post description? (e.g. Clerk, IT Manager, Administrator, Lecturer, etc.)

4. Were you appointed by the Education Department (DoE / DHET) or by the College Council?
   Department [1]
   College Council [2]

5. Are you appointed Part-time or Full-time?
   Part time [1]
   Full time [2]

6. Are you a:
   End-user [1]
   Key-user [2]

7. Please provide the nature of your employment?
   Contract / temporary (with fixed end date) [1]
   Permanent (no end date) [2]
   Casual (daily) [3]

8. How long have you been working at this FET College? (In full years)

9. How long have you been using this BMS? (For work or other purposes.) (In full years)

10. Have you had training on the BMS system?
    Yes [1]
    No [2]

11. If 'Yes', was it in-house training by the FET College or external training by the BMS service provider or both?
    In-house [1]
    External [2]
    Both [3]

12. How would you rate your competencies in:
(On a scale of 1 to 5, where 1 = poor and 5 = excellent.)

	Poor				Excellent
Technical skills [1]	1	2	3	4	5
Computer skills [1]	1	2	3	4	5
MS Word	1	2	3	4	5
MS Excel	1	2	3	4	5
Software for emailing	1	2	3	4	5

([1] Please refer to page 5 for definitions of the two terms.)

13. Please indicate with an 'X' which one of the statements below suits your Web/Internet proficiency the best: (Please select only one option.)
    I have never used the Web [1]
    I have read pages on the Web [2]
    I have entered addresses (URLs) and/or used bookmarks [3]
    I can use a search engine to find information [4]
    I know my way around and have done Web transactions like e-banking, blog, online presence (twitter, facebook) [5]

14. Please select the appropriate business processes for which you are/(have been) using the system? For what purposes do/(did) you use the Business Management System (BMS)? (More than one option may be selected.)

Student administration [1]

e.g. Student registration, Administration of students biographical and enrolment information, Student finance, Attendance, Student cards, Alumni, Time Tabling, etc.

Academic administration [2]

e.g. Study programmes and qualifications, Examination enrolment, Examination administration, Academic records (assessments, examinations results etc.)

Financial administration [3]

e.g. Budget management, Procurement, Expenditure records, Accounting package, etc.

Human Resource management and development [4]

e.g. Appointments System, Leave System, Recruitment System, Evaluation System, Skills Development System, Disciplinary / Grievance System, Personnel iEnabler, Payroll management, Personnel records, Personnel utilization information, etc.

Asset management [5]

e.g. Stock registers, Stock control, Physical infrastructure, Venue reservations, Vehicle reservations, etc.

Technical Administration / Maintenance of the BMS [6]

e.g. Batch Processing, Printing, Contact Management, Enquiries, Web updates, etc.

BUSINESS MANAGEMENT SYSTEM (BMS) EVALUATION

15. For each question below, please select the rate that best describes your satisfaction with the Business Management System (BMS), where

1 = almost never;
2 = some of the time;
3 = about half of the time;
4 = most of the time;
5 = almost always and
6 = not applicable / don't know.

Category A: INDIVIDUAL-IMPACT is concerned with how the BMS has influenced your individual capabilities and effectiveness on behalf of the organization.

I have learnt much through the presence of the BMS	1	2	3	4	5	6
The BMS enhances my awareness of job related information	1	2	3	4	5	6
The BMS enhances my recall of job related information	1	2	3	4	5	6
The BMS enhances my effectiveness in the job	1	2	3	4	5	6
The BMS increases my productivity	1	2	3	4	5	6

Category B: INFORMATION-QUALITY is concerned with the quality of the BMS outputs: namely, the quality of the information the system produces in reports and on-screen.

Information available from the BMS is important	1	2	3	4	5	6
The BMS contains all the key data that is needed	1	2	3	4	5	6
Information available from the BMS is always accurate (does not often need correction)	1	2	3	4	5	6
Information from the BMS is always updated and current	1	2	3	4	5	6
The BMS provides output that seems to be exactly what is needed	1	2	3	4	5	6
Information needed from the BMS is always available	1	2	3	4	5	6
Information from the BMS is in a format that is readily usable	1	2	3	4	5	6
Information from the BMS is easy to understand	1	2	3	4	5	6
Information from the BMS appears readable, clear and well formatted	1	2	3	4	5	6
Information from the BMS is concise	1	2	3	4	5	6
Information from the BMS is always timely	1	2	3	4	5	6
Information from the BMS is unavailable elsewhere	1	2	3	4	5	6

Category C: SYSTEM-QUALITY of the BMS is a multifaceted construct designed to capture how the system performs from a technical and design perspective.

The BMS is easy to use	1	2	3	4	5	6
The BMS is easy to learn	1	2	3	4	5	6
It is not difficult to get access to information that is in the BMS	1	2	3	4	5	6
All data within the BMS is fully integrated and consistent	1	2	3	4	5	6
The BMS meets (the FET college's) information requirements	1	2	3	4	5	6
The BMS includes necessary features and functions	1	2	3	4	5	6
The BMS always does what it should	1	2	3	4	5	6
The BMS user interface (screen) can be easily adapted to one's personal approach (customize)	1	2	3	4	5	6
The BMS is always up-and-running as necessary (It has good connectivity, e.g. to network, server access, etc.)	1	2	3	4	5	6
The BMS programme speed is quickly enough (responds quickly)	1	2	3	4	5	6
The BMS requires only the minimum number of fields and screens to achieve a task	1	2	3	4	5	6
Modifications to the functionality of the BMS can easily be done (modified, corrected and improved)	1	2	3	4	5	6
The BMS's service provider[2] is reliable	1	2	3	4	5	6
The BMS's service provider[2] has up-to-date facilities	1	2	3	4	5	6
The BMS's service provider[2] is experienced	1	2	3	4	5	6
The BMS's service provider[2] provides quality training	1	2	3	4	5	6
The BMS's service provider[2] provides quality services	1	2	3	4	5	6

([2] For End-users the term 'service provider' refers to the college's ITS unit, for key-users it refers to the external BMS service provider.)

Category D: ORGANIZATIONAL-IMPACT refers to impacts of the BMS at the organizational level; namely improved organizational results and capabilities.

The BMS has resulted in overall productivity improvement	1	2	3	4	5	6
The BMS has resulted in improved outcomes or outputs	1	2	3	4	5	6
The BMS has resulted in an increased capacity to manage a growing volume of activity (e.g. transactions, population growth, etc.)	1	2	3	4	5	6
The BMS has resulted in improved business processes	1	2	3	4	5	6
The BMS has helped to improve communication and relationships with partners such as DHET, SETAs, government, private companies, etc.	1	2	3	4	5	6
The BMS is cost effective	1	2	3	4	5	6
The BMS has resulted in reduced staff costs	1	2	3	4	5	6
The BMS has resulted in cost reductions (e.g. inventory holding costs, administration expenses, etc.)	1	2	3	4	5	6

PERSONAL INFORMATION

Please tick the appropriate boxes where applicable?

16. Race:
- African [1]
- Coloured [2]
- Indian [3]
- White [4]
- Other [5]

17. Gender:
- Male [1]
- Female [2]

18. Date of Birth: yyyy/mm/dd

19. Are you a person living with a disability?
- None [1]
- Sight (blind / severe visual limitation) [2]
- Hearing (deaf, profoundly hard of hearing) [3]
- Communication (speech impairment) [4]
- Physical (e.g. needs wheelchair, crutches or prosthesis) [5]
- Intellectual (serious difficulties in learning) [6]
- Emotional (behavioural, psychological) [7]

20. Please provide your highest academic qualification?
- Not applicable [1]
- Std 1 / Gr 3 (NQF 0 (ABET 1)) [2]
- Std 3 / Gr 5 (NQF 0 (ABET 2)) [3]
- Std 5 / Gr 7 (NQF 0 (ABET 3)) [4]
- Std 7 / Gr 9 (NQF 1 (ABET 4)) [5]
- N1 (NQF 2) [6]
- Std 8 / Gr 10 (NQF 2) [7]
- N2 (NQF 3) [8]
- Std 9 / Gr 11 (NQF 3) [9]
- Matric (NQF 4) [10]
- N3 (NQF 4) [11]
- Diplomas / Occupational certificate (NQF 5) [12]
- First degrees / Higher diplomas (NQF 6) [13]
- Honours / Master's degree (NQF 7) [14]
- Doctorates (NQF 8) [15]

21. Which ONE of the following languages do you speak the most at home?
- Afrikaans [1]
- English [2]
- IsiNdebele [3]
- Sepedi (Northern Sotho) [4]
- Sesotho (Southern Sotho) [5]
- Seswati [6]
- Setswana [7]
- Tshivenda [8]
- IsiXhosa [9]
- IsiZulu [10]
- Xitsonga [11]
- Other [12]

THANK YOU FOR YOUR CO-OPERATION

Definitions:

Computer skills: Level of familiarity with the basic hardware and software (and now Internet) concepts that allows one to use personal computers for data entry, word processing, spreadsheets, and electronic communications.

Technical skills: Knowledge and proficiencies required in the accomplishment of engineering, scientific, or any specific task. The knowledge and abilities needed to accomplish mathematical, engineering, scientific or computer-related duties, as well as other specific tasks. Those with technical skills are often referred to as "technicians" in their chosen field, i.e. audio technicians, electronics technicians, engineering technicians, etc. Microsoft Corporation even offers accreditation as a Microsoft Certified Desktop Support Technician (MCDST).

APPENDIX 3: CONSENT FORM

CONSENT FORM

Hello, my name is Mariette Visser. I am a researcher, working at the Human Sciences Research Council (HSRC). I am also a registered student at the University of South Africa (UNISA). As part of the requirements of my qualification I would like to gather information about the success of the Business Management Information System (BMIS) that your organization is using to conduct your day-to-day business activities. I am asking people from your organization to answer some questions about the BMIS, which I hope will benefit your organization and possibly other similar organizations in the future.

Your organization has been selected for a case study and I am hoping that all staff members who are using the BMIS in one or another way would participate in the survey by answering the questions presented in the attached questionnaire. I am also hoping to interview a small number of the staff members who completed the questionnaire in case more information about certain issues covered in the questionnaire is needed. That will only happen sometime after this survey has taken place. If it happens that you are one of the staff members selected for the interview, I would like to, with your permission, to audiotape record the interview. After combining all staff members' answers, I hope to learn more about the success of the BMIS your organisation is using which will help me make useful recommendations to the relevant authorities and organisations.

Please understand that you are not being forced to take part in this study and the choice whether to participate or not is yours alone. However, I would really appreciate it if you do share your thoughts with me. If you choose to not take part in answering these questions, you will not be affected in any way. If you agree to participate, you may stop me at any time and tell me that you don't want to go on with the questionnaire or interview. If you do this there will also be no penalties and you will NOT be prejudiced in ANY way.

I will not be recording your name anywhere on the questionnaire and no one will be able to link you to the answers you give. Only the researchers will have access to the unlinked information. The information will remain confidential and there will be no "come-backs" from the answers you give.

The questionnaire will take about 10-15 minutes to complete and the interview will last no longer than one hour. During the interview, I will be asking you questions and ask that you are as open as possible in answering these questions. Some questions may be of a personal and/or sensitive nature. I will be asking some questions that you may not have thought about before, and which also involve thinking about the past or the future. We know that you cannot be absolutely certain about the answers to these questions but we ask that you try to think about these questions. When it comes to answering questions there are no right and wrong answers.

1

Who to contact if you have been harmed or have any concerns

This research has been approved by the HSRC Research Ethics Committee. If you have any complaints about ethical aspects of the research or feel that you have been harmed in any way by participating in this study, please call the HSRC's tollfree ethics hotline 0800 212 123 (when phoned from a landline from within South Africa) or the REC Administrator, Jurina Botha, at the Human Sciences Research Council on 012 302 2006.

If you have concerns or questions about the research you may call any one of my supervisors Prof JA van Biljon (012 429-6873) or Prof ME Herselman (012 841-3081).

CONSENT

I hereby agree to participate in research regarding the BMIS that my organization uses. I understand that I am participating freely and without being forced in any way to do so. I also understand that I can stop answering the questions at any point should I not want to continue and that this decision will not in any way affect me negatively.

I understand that this is a research project whose purpose is not necessarily to benefit me personally.

I have received the telephone number of a person to contact should I need to speak about any issues which may arise in this interview.

I understand that this consent form will not be linked to the questionnaire, and that my answers will remain confidential.

I understand that, feedback will be given to my organisation on the results of the completed research.

……..

Signature of participant **Date:**……..

I hereby agree to the tape recording of my participation in the study

……..

Signature of participant **Date:**……..

1

APPENDIX 4: SEMI-STRUCTURED INTERVIEW SCHEDULE

INTERVIEW SCHEDULE

Questions:

1. Which staff members use the BMS system? For what purposes are you using the system?
2. Tell me about the training that you received on the system (type, training provider, etc.).
3. Do you receive continuous training on the BMS system?
4. How would you describe the following aspects of the system?
   - Information quality
   - Service quality
   - Systems quality
   - Individual impact
   - Organizational impact
   - End-user computing satisfaction
5. How would you describe the computer proficiency level of an average staff member at *FET college X*?

APPENDIX 5: ETHICAL APPROVAL BY HSRC ETHICAL CLEARANCE COMMITTEE

Jurina Botha /Hsrc
2011/01/20 10:15 AM

To Mariette Visser/Hsrc@HSRC
cc Khutso Sithole/Hsrc@HSRC
bcc
Subject Re: Response to HSRC REC of 17 December 2010

History: This message has been forwarded.

Dear Mariette

The Chairperson has responded that the changes are all satisfactory. He indicated that the study is approved BUT may only commence once we have received UNISA's approval or a letter stating that UNISA has waived the review requirement based on the HSRC's ethics approval of the study.

Please advise how I may assist you with meeting this stipulation?

With kind regards,
Jurina

Mariette Visser/Hsrc

Mariette Visser /Hsrc
01/03/2011 10:08 AM

To Jurina Botha/Hsrc@HSRC
cc
Subject Response to HSRC REC of 17 December 2010

Dear Jurina

I hope you had a wonderful vacation and I wish you all of the best for 2011.

Attached please find the amendments to my application and related documents for final research ethical clearance.

[attachment "REC_17Dec2010_Response for final clearance.zip" deleted by Jurina Botha/Hsrc]

With kind regards
Mariette

Research Programme on Education and Skills Development
Human Sciences Research Council
Tel. (012) 302-2939
Fax. (012) 302-2901
E-mail: mmvisser@hsrc.ac.za

APPENDIX 6: ETHICAL APPROVAL BY UNISA ETHICAL CLEARANCE COMMITTEE

UNISA college of science, engineering and technology

Ms MM Visser (34747788) 5 April 2011
School of Computing (Student), UNISA, Pretoria

Dear Ms Visser

Permission to conduct MSC (IS) research project

Ref: 012/MMV/2011

The request for ethical approval for your MSc (IS) research project entitled "Towards developing an evaluation tool for Business Management Information Systems' success at Public Further Education and Training (FET) Colleges in South Africa" refers.

The College of Science, Engineering and Technology's (CSET) Research and Ethics Committee (CREC) has considered the relevant parts of the studies relating to the abovementioned research project and research methodology and is pleased to inform you that ethical clearance is granted for your study as set out in your proposal and application for ethical clearance.

Therefore, involved parties may also consider ethics approval as granted. However, the permission granted must not be misconstrued as constituting an instruction from the CSET Executive or the CSET CREC that sampled interviewees (if applicable) are compelled to take part in the research project. All interviewees retain their individual right to decide whether to participate or not.

We trust that the research will be undertaken in a manner that is respectful of the rights and integrity of those who volunteer to participate, as stipulated in the UNISA Research Ethics policy. The policy can be found at the following URL:
http://cm.unisa.ac.za/contents/departments/res_policies/docs/ResearchEthicsPolicy_apprvCounc_21Sept07.pdf

Please note that if you subsequently do a follow-up study that requires the use of a different research instrument, you will have to submit an addendum to this application, explaining the purpose of the follow-up study and attach the new instrument along with a comprehensive information document and consent form.

Yours sincerely

Prof JH Kroeze
Chair: School of Computing Ethics Sub-Committee

University of South Africa
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Preller Street, Muckleneuk Ridge, City of Tshwane
PO Box 392 UNISA 0003 South Africa
Telephone + 27 12 429 6122 Facsimile + 27 12 429 6848
www.unisa.ac.za/cset

APPENDIX 7: LETTER OF REQUEST FOR PERMISSION TO VISIT FET COLLEGE X

P.O. Box 102
Wierda Park
0149

22 March 2011

Chief Executive Officer (CEO)
[redacted]

Re.: Permission to visit [redacted] College to gather information about the Business Management Information System(s) employed at your College as part of a Masters Research programme

Dear [redacted]

I am a student at UNISA enrolled for a Masters Research programme. The title of the research programme which has been approved by UNISA is:

'Towards developing an evaluation tool for Business Management Information Systems' success at Public Further Education and Training Colleges in South Africa.'

The reason for this letter is to request for permission to visit [redacted] College during May 2011 to gather information about your business management information system(s).

The research proposal has been evaluated by the Research Ethical Clearance Committee of the Human Sciences Research Council (HSRC) and received ethical clearance. The data will be used for research purposes only.

We hope to extend the study in future to include the other public FET Colleges and then use [redacted] College as a benchmark for the FET sector.

I include my supervisors' and my own contact details in the event of any requests for further information.

Yours sincerely

Mrs MM Visser
Cell: 072 607 5009
Tel: (012) 302 2939
Email: mmvisser@hsrc.ac.za

Note: Name of *FET college X* obscured in accordance to confidentiality agreement.

Student number: 34747788
Supervisor: Prof JA van Biljon – (012) 429 6873 (UNISA)
Co-Supervisor: Prof ME Herselman – (012) 841 3081 (CSIR – MERAKA)

1

APPENDIX 8: PERMISSION FROM FET COLLEGE X

[redacted]
2011/03/23 09:52 AM

To <mmvisser@hsrc.ac.za>
cc
bcc
Subject RE: Permission

History: This message has been replied to and forwarded.

3 March 2011

Ms M Visser
Research Programme on Education and Skills Development
HSRC

Ms Visser

Your request to visit [redacted] College has been approved.

Will you kindly inform us of the date of your intended visit, who you want to see and what information the person you wish to see should have available.

Kind regards

[redacted]

From: mmvisser@hsrc.ac.za [mailto:mmvisser@hsrc.ac.za]
Sent: 22 March 2011 03:38 PM
To: [redacted]
Subject: Permission

Dear [redacted]

Our telephone conversation earlier today has reference.

Attached please find a letter requesting permission to visit [redacted] with the aim of gathering information for a Masters Research Programme.

With kind regards
Mariette Visser

Research Programme on Education and Skills Development
Human Sciences Research Council
Tel. (012) 302-2939
Fax. (012) 302-2901
E-mail: mmvisser@hsrc.ac.za

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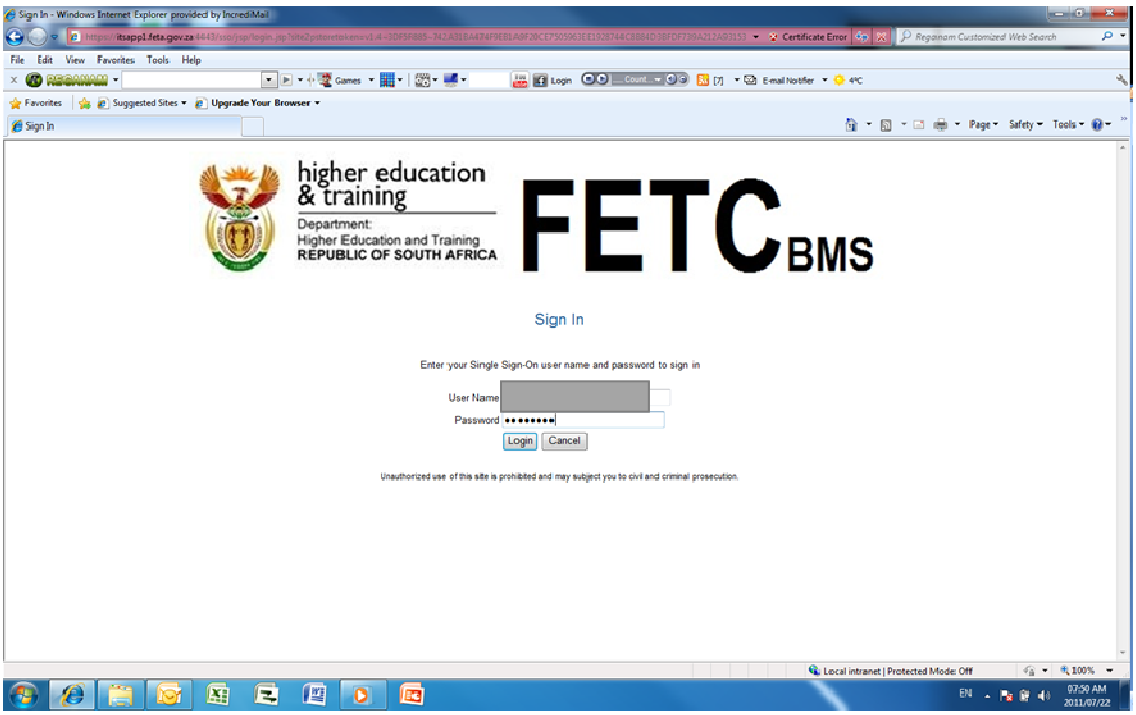
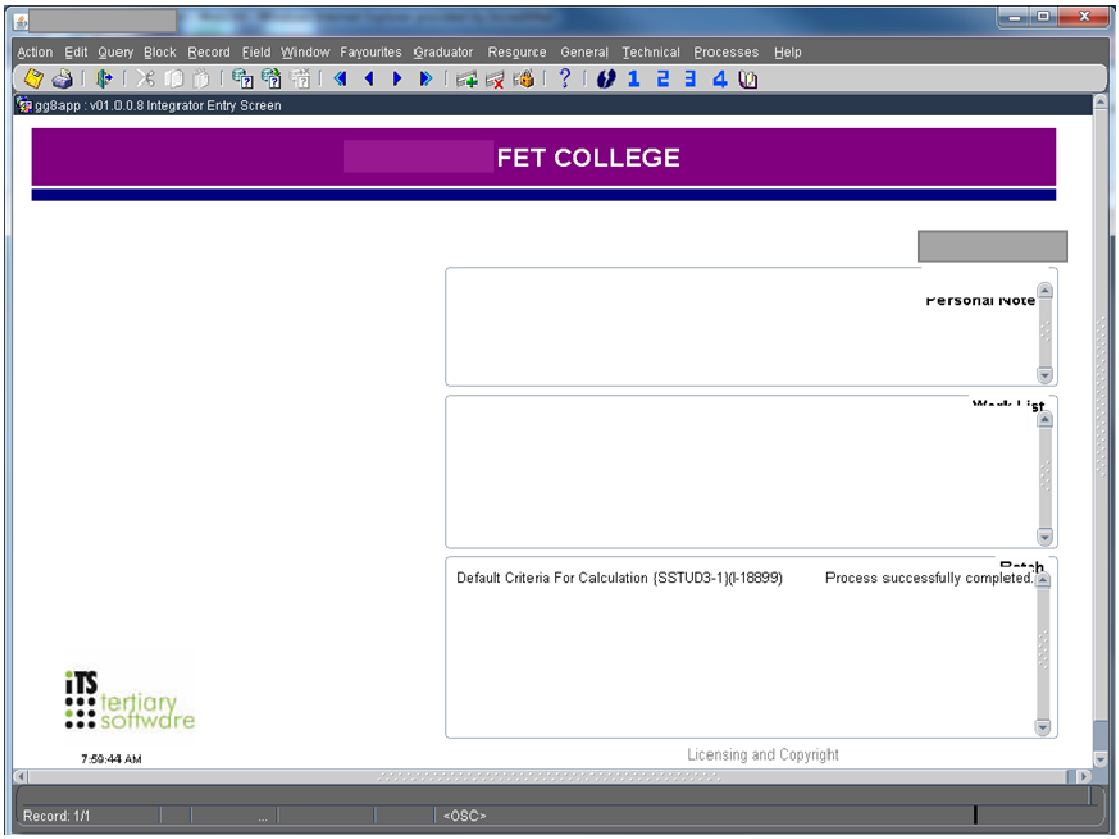
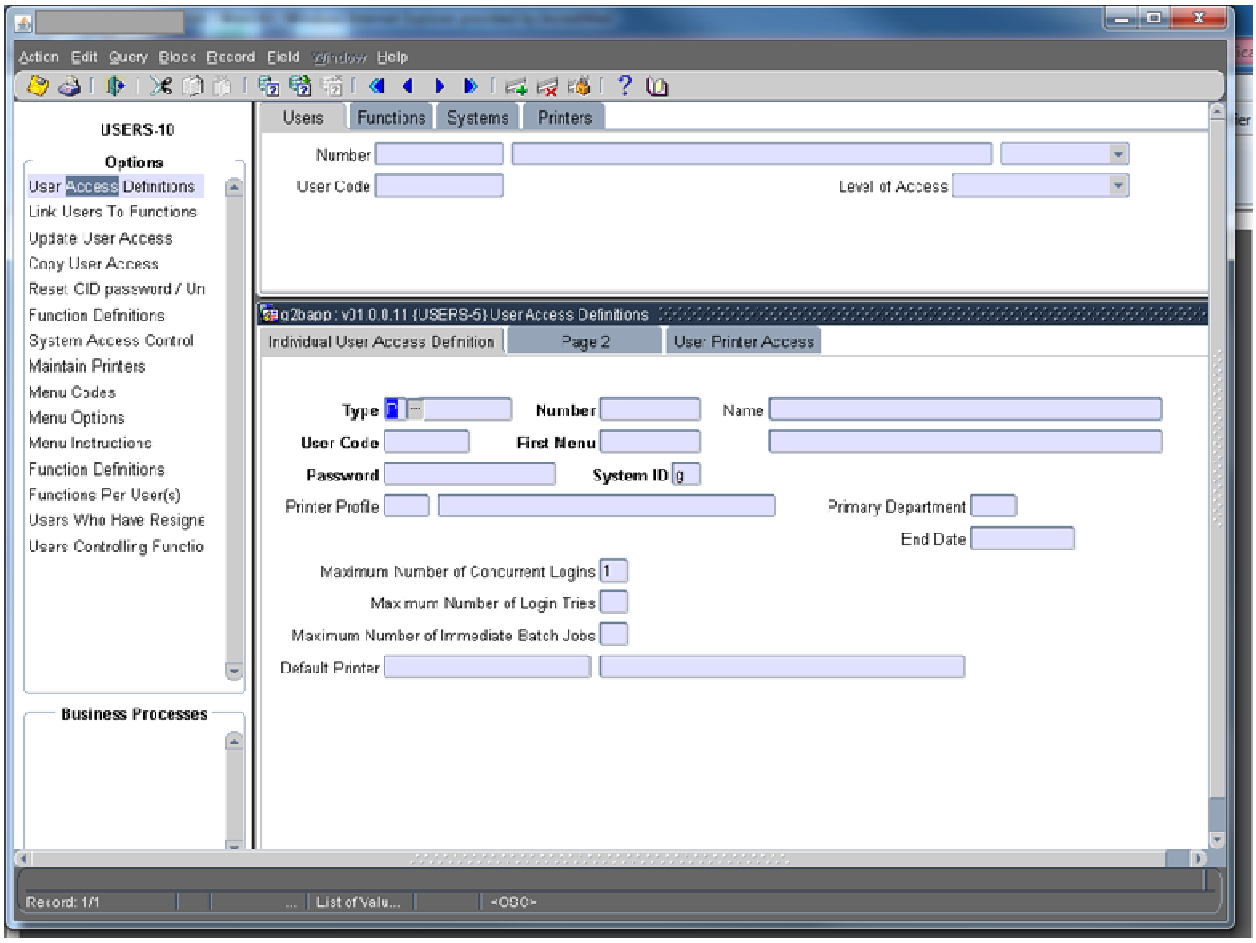
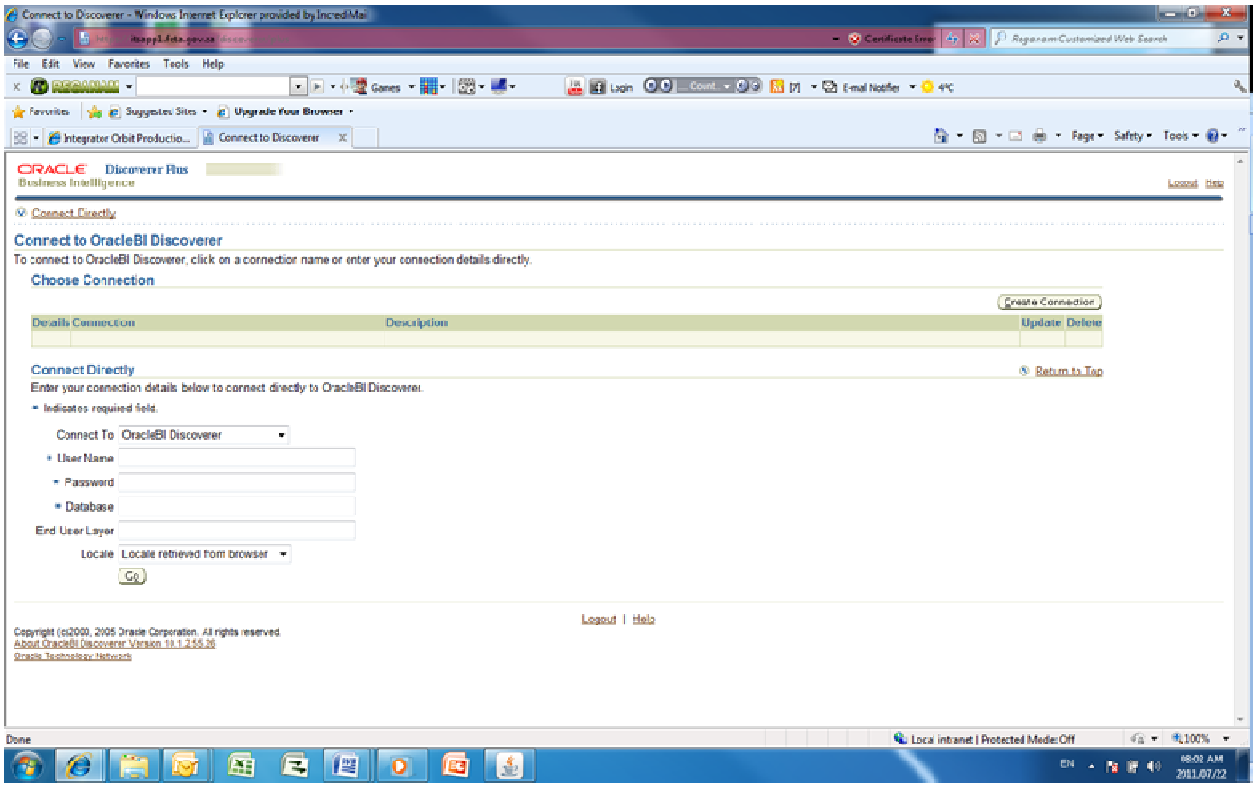
This email and its contents are subject to HSRC's e-mail legal notice which can be viewed at:
http://www.hsrc.ac.za/Corporate_Information-10.phtml

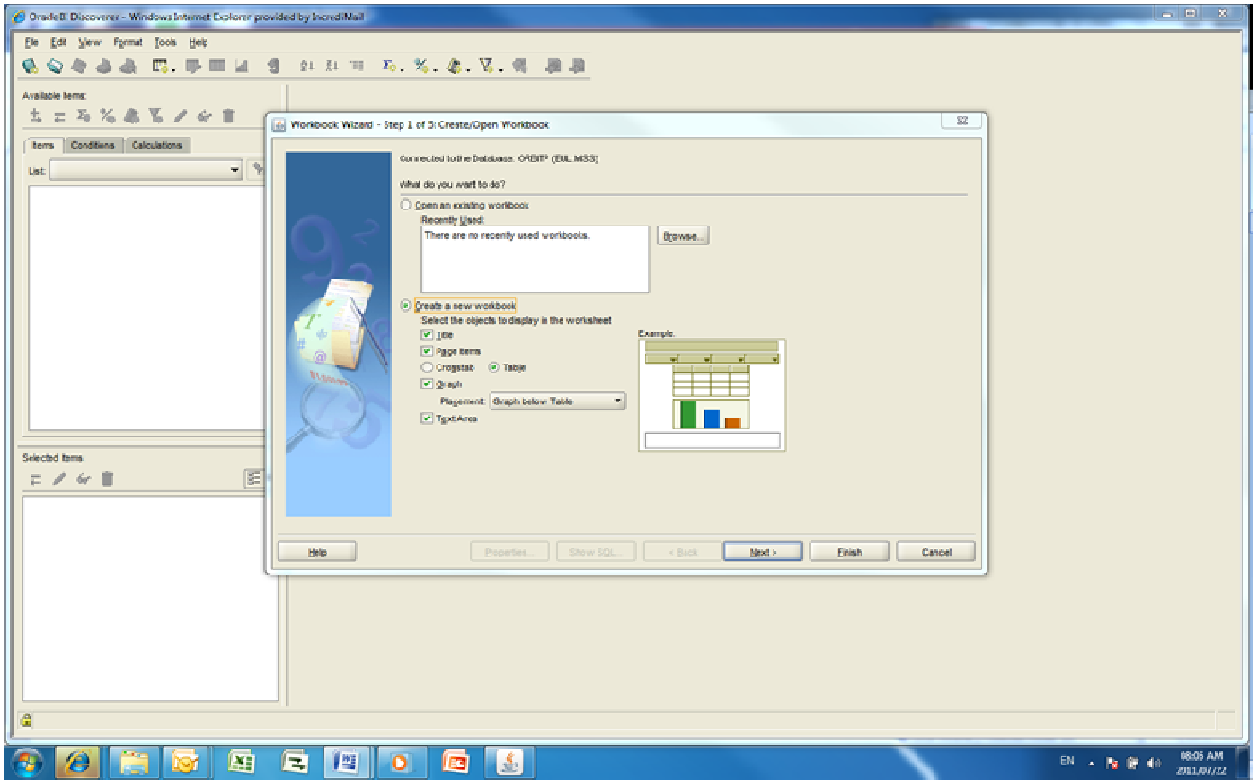
APPENDIX 9: BMS SCREEN DISPLAYS






Action Edit Query Block Record Field Window Help
USERS-10
Options
User Access Definitions
Link Users To Functions
Update User Access
Copy User Access
Reset CID password / Un
Function Definitions
System Access Control
Maintain Printers
Menu Codes
Menu Options
Menu Instructions
Function Definitions
Functions Per User(s)
Users Who Have Resigne
Users Controlling Functio
Business Processes
Users
Functions
Systems
Printers
Number
User Code
Level of Access
o2bapp : v01.0.0.11 (USERS-5) User Access Definitions
Individual User Access Definition
Page 2
User Printer Access
Type
Number
Name
User Code
First Menu
Password
System ID
Printer Profile
Primary Department
End Date
Maximum Number of Concurrent Logins
Maximum Number of Login Tries
Maximum Number of Immediate Batch Jobs
Default Printer
Record: 1/1
List of Valu...
<OSC>


Connect to Discoverer - Windows Internet Explorer provided by IncrediMail
ORACLE Discoverer Plus
Business Intelligence
Connect Directly
Connect to OracleBI Discoverer
To connect to OracleBI Discoverer, click on a connection name or enter your connection details directly.
Choose Connection
Create Connection
Details Connection
Description
Update
Delete
Connect Directly
Return to Top
Enter your connection details below to connect directly to OracleBI Discoverer.
* Indicates required field.
Connect To
OracleBI Discoverer
* User Name
* Password
* Database
End User Layer
Locale
Locale retrieved from browser
Go
Logout | Help
Copyright (c) 2000, 2005 Oracle Corporation. All rights reserved.
About OracleBI Discoverer Version 10.1.2.55.36
Oracle Technology Network
Done
Local intranet | Protected Mode: Off
100%


OracleBI Discoverer - Windows Internet Explorer provided by IncrediMail
File Edit View Format Tools Help
Available Items
Items
Conditions
Calculations
List:
Selected Items
Workbook Wizard - Step 1 of 3: Create/Open Workbook
What do you want to do?
Open an existing workbook
Recently Used:
There are no recently used workbooks.
Browse...
Create a new workbook
Select the objects to display in the worksheet
Title
Page Items
Crosstab
Table
Graph
Placement:
Graph below Table
TextArea
Example
Help
Properties...
Show SQL...
< Back
Next >
Finish
Cancel
EN