ORGANIZATIONAL IMPLEMENTATION OF INFORMATION SYSTEMS INNOVATIONS: CASE UNIVERSITY IN KENYA

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DECLARATION

I declare that this thesis is my original work and has not been presented for a degree in any other university

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This thesis has been submitted with our permission as supervisors.

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Abstract

The Higher Education Sector in Kenya has taken efforts to adopt and use Information Communication Technologies (ICT) innovations to support its core functions, especially for the purposes of improving service delivery. The perception of Information Systems (IS) use in the higher education learning institutions as a way to ease decision-making and improve quality of services, especially to students, has led to increased experimentation with IS-based innovations. This has provided opportunities for IS researchers to examine the adoption, implementation and use of IS in these institutions. This research aims at contributing to the body of knowledge on organizational implementation of IS in higher education institutions by adopting an innovation-diffusion perspective to examine the implementation of IS.

Using the innovation-diffusion perspective that recognizes the organizational context within which the implementation process occurs facilitates the illustration of factors in the context of implementation, thereby providing a relevant and interesting perspective to study the implementation process of IS. By adopting a hybrid theoretical framework that is process-oriented with an organizational learning view and incorporating critical factors in the implementation context that include change management approaches enables a total understanding of the implementation process of IS. The hybrid framework is then used as the theoretical lens to study the implementation of a student management system in a university setting. Using an in-depth case study approach, this thesis details how the interpretive qualitative case study was designed and conducted with the data collected presented as a descriptive case tracing the implementation process of a student information system from secondary adoption to organizational assimilation intertwined with organizational learning.

The data collected is then used applied to the hybrid framework and analysed and interpreted using an interpretive approach. The analysis and interpretation approach that is used provides multiple levels of analysis-the unit levels and the organizational level, to make sense of the implementation process. The analysis of the data is then followed by the interpretation of the emerging observations achieved by analysing

relationships of the context and outcomes with the implementation process at unit and organizational levels. The factors perspective of the hybrid framework is largely used to interpret the contextual factors that are identified to have an impact on the implementation process. The factors either enabled or constrained the implementation process varyingly in the different units. The process perspective is used to explain the relationship between the consequences of the implementation process and the process of implementation, coupled with the intertwined organizational learning process.

The analysis showed that the implementation process was both a managerial process that required continuous change management actions and interventions that were shaped by the organizational context whilst as the same time an organizational learning process.

The results of the study offered insights on two key relationships, the context-process relationship and process-outcomes relationship. These insights include culture and power systems, leadership and organizational computing history as factors that influenced the implementation process, while the same context enabled and constrained managerial actions during the implementation process. Using consequences of the process as tools for motivating assimilation and organizational learning enhanced success of IS innovation implementations.

The study revealed that both the presence of a favourable implementation context and appropriate managerial interventions are critical to organizational implementation of IS. This suggests that IS project plans must be aligned to the context and be realistic with the organization's accumulating experience to inform future IS implementation projects.

Keywords: Hybrid frameworks, IS innovations, organizational IS implementation, organization context, interpretive case study, Higher Education Institutions (HIEs)

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List of Abbreviations

CE	Chief Executive
ESLTD	Enterprise Services Limited
FDDI	Fibre Distributed Data Interface
GB	Gigabyte
HEIs	Higher Education Institutions
ICT	Information and Communications Technology
IS	Information Systems
IT	Information Technology
Kbps	Kilobits per second
LAN	Local Area Network
MB	Megabyte
MIS	Management Information Systems
PC	Personal Computer
RAM	Random Access Memory
RBM	Results Based Management
SHS	Student Housing Unit
SPGS	School of Postgraduate Studies
STS	Social-Technical Systems
WAN	Wide Area Network

1 Introduction

1.1 Introduction

This chapter provides the foundation for this thesis by outlining our research problem and objectives. The main aim of the study is to explore the process of implementing information systems (IS) innovations and to examine how emerging challenges are mitigated, in addition to identifying consequences of the process within organizational contexts.

In addition to justifying the research, the chapter presents motivational issues that led to the choice of the topic. The research methodology, definitions and perspectives of IS phenomena adopted in the thesis are outlined. The chapter concludes by providing an outline for the rest of the thesis.

1.2 Research Background

The field of IS concerns itself with computer-based systems for delivering Information and Communication Technology (ICT) services within an organization and inter-organizational context. Activities that have been associated with IS include planning, designing, developing, and implementing ICT-related solutions in organizations. Inevitably, these activities and their management, whether performed by an internal IS function or outsourced, are key areas of IS research. Therefore, results of IS research aim at not only creating knowledge but also target the development of efficient methods and concepts that practitioners can use to strategically manage successful implementation of IS in organizations. Consequently, the introduction of new ICT-based solutions, especially IS in organizations—a phenomenon frequently labelled IS implementation—is a core activity of the IS function as well as a substantive research area.

With the rapid evolution of ICT applications, Cadle and Yeates (2004) observe that the implementation of IS in organizations has become a complex process often involving several dimensions that include technological and organizational processes. Therefore, the introduction of IS within organizations almost invariably results in a

wide variety of consequences that span from technological to organizational, that need to be explicitly reviewed and proactively managed. However, as Orlikowski and Hofman (1997) noted, effectively implementing organizational changes associated with the implementation of IS remains difficult.

None the less, world-wide, organizations are still involved in acquiring and developing IS to cope with the demanding environments that they operate in. One such category of organizations is universities, often referred to as Higher Education Institutions (HEIs) in the literature.

Globally, there are tremendous changes in the higher education sector, resulting in increased pressure to operate as commercial entities as a result of diminishing government funding, escalating costs, increasing student numbers, growing demand for accountability and quality, and increasing competition (Seng and Churilov, 2003). Students are also joining universities with more demanding expectations, in terms of information and communication technologies and administrative efficiency. As a result of this, HEIs are moving away from traditional ways of managing towards new managerial styles. The emerging managerial styles are characterized by high staff student ratios; introduction of stringent financial planning and spending; increased focus on efficiency and effectiveness of individuals' and departments' research and teaching standards; and above all introduction of information support systems to gain a competitive edge (Seng and Churilov, 2003).

From the foregoing, the role of IS in the 21st century is undisputable in an organization. In a university environment, typical IS include timetabling systems, library management systems, finance systems, student records systems, payroll and personnel systems, and facilities management systems. These systems are geared towards providing a university with effective, efficient administrative and academic processes, thereby enabling and facilitating sound management and control of the university.

Universities as organizations encounter similar challenges to commercial enterprises such as human and material resources planning constraints. Further, universities have also been noted to have distinctive features such as unique culture of the academy,

institutional status, multiple power and authority structures, professional and administrative values (Kezar, 2001), thereby giving a unique context. This unique context is likely to have interesting implications for IS implementation, the subject for this study.

1.3 Problem Statement

As Pollock (2002) notes, though worldwide changes to higher education as a result of new ICTs are increasingly researched and reported, we still understand very little of the particular dynamics associated with the implementation and use of mundane IS. While it is agreeable that the implementation of IS involves significant change management problems and that the use and adoption of these systems have both organizational and individual implications at present, there is little research evidence about how to effectively implement IS in non-commercial settings such as universities, and in particular universities in the developing countries.

Kenya is a developing country that has seven public universities, geographically distributed in the country, and seventeen private universities. The Government of Kenya, using taxpayer funds, sponsors the public universities. All universities in Kenya, like any other university in the world, have been mandated to teaching, research, and life-long learning.

Universities, driven by their core objectives identified above, need timely and useful information on which to base decision-making. Additionally, with the global changes in the ICT sector that has made access to technology and information more readily available implies that the kind of students that the universities now serve are more exposed to technology and need prompt and accurate information, which affect their stay in and outside the universities. Globally, and in Kenya especially, universities are undergoing tremendous changes occasioned by diminishing funding from the government, external pressure from government ministries, project donors, stiff competition from external HEIs, and the ever-increasing demand for higher education. In tandem with the "new" styles of managing universities, the management of these institutions are adopting integrated IS to improve service provision and management of the universities.

The implementation of IS is critical to universities due to the following reasons:

a) The investments in IS infrastructure and tools in universities is high and, given the budgetary constraints of these institutions, IS projects should be managed effectively to realize gains.

b) The reliance on IS in universities is growing. This is especially so, as universities aim to provide world-class education standards and services, that is a step towards "modernization."

c) Prior studies have concentrated on IS implementation in commercial organizations, and therefore it is not entirely clear from these studies what factors are more critical to the success of IS implementation in academic environments especially in a developing country like Kenya.

Indeed, the challenge of organizational implementation of ICTs and its related services as observed by Walsham and Sahay (2006) is in tackling and resolving the difficulties during implementation. These challenges, and specifically the challenge of IS implementation, neither have been studied in the context of Kenyan universities nor has the interplay between academic managers, non-academic managers and the implementation process of the IS been studied. By recognizing that IS implementation is an organizational process and the challenges of IS implementation led to the formulation of our research interest, *Organizational Implementation of IS in the Kenyan Universities.*

In this thesis, we set out to address *how a case university implemented IS and consequently how IS-initiated change was managed with the view of improving the implementation of IS in the higher education sector.*

The research concern therefore calls for the exploration, understanding and analysis of the implementation process in the universities. Key objectives are the demonstration of how contextual factors manifest themselves in the implementation process and the management of the implementation process, and how the two issues have an effect on the implementation outcome. Subsequently, the key research questions that guide the thesis are:

a) How does the context of the university affect the implementation process of IS in the university?

b) How were changes associated with the IS implementation process in the university managed?

1.4 Justification for the Research

Research carried out in the IS field is of importance to both the academic and the practitioner, hence it is envisaged that this study will contribute to both in terms of theoretical and practical outcomes. Today, the diffusion of ICTs to diverse industries offers important opportunities for the IS field to develop its knowledge and broaden its relevance, Chiasson and Davidson (2005). Heeks (2002) says that most IS projects in developing countries fail totally or partially and suggests that IS cases from developing countries indeed provide fertile ground for understanding the complex interplay of action and context that underlies all organizational change. We contribute to the understanding of IS implementation in developing countries by underscoring interactions of the various actors on the process of the implementation and the use of IS.

This thesis undertakes a study of IS in a rarely studied environment, HEIs in Kenya. IS in these institutions is a relatively recent phenomenon, and by exploring and understanding IS in these HEIs, we draw strategic implications for implementers in these institutions. Also, the implementation of computer-based IS in developing countries has been a key research issue in working group 9.4 of the International Federation for Information Processing. We contribute to the current debate about IS in developing countries in general and in HEIs in Kenya in particular, a sector that has lagged behind in use of ICTs. In addition the implications drawn from this work may be used in inform the larger implementation efforts in public institutions.

1.5 Methodology

IS research is classified as *positivist, interpretive, or critical research*. As outlined in section 1.2, the focus of the thesis is organizational and thus the application of

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qualitative research methods is appropriate. The thesis applies interpretive qualitative research using a case study approach.

Qualitative research involves the use of qualitative data, and the case study applies the use of interviews and documents, and participant observation data, to understand and explain social phenomena (Myers, 2005).

The case study approach consists of a detailed investigation of phenomena under study within their context, (Hartley, 2004). Case study research has been used to study varied IS phenomena, particularly in system development and implementation (Shakir, 2002). Indeed, our topic of interest, being organizational and context driven makes the case study approach appropriate.

Two data collection methods used are semi-structured interviews and documentation review. The semi-structured interviews are designed to elicit information on the IS implementation process as experienced and perceived by various actors in an organization. The documentation review was done to provide additional data and as a mechanism to corroborate data obtained through the interviews.

The research uses a factor-process hybrid theory (Gallivan, 2001) to analyse data and interpret the case study by explaining and interpreting process outcomes through relationships between the context and the process. The theoretical perspective of the research is discussed in chapter two.

1.6 Definitions

It is important to be clear about the key definitions of our understanding of what IS, IS implementation, and IS Implementation outcomes are before going further.

1.6.1 Information System (IS)

IS has generally been defined in terms from a technical viewpoint. IS is an organized set of components for collecting, transmitting, storing, and processing data to deliver information for action (Zwass, 1998), thus serving some organizational purpose. The

normal view of organizations as entities seeking to achieve specific objectives, which are further guided by rational decision makers, leads to this functional view of IS. The basis of this perspective mainly stems from the view of an organized, non-chaotic environment that uses IS in its support for analytical processes. Thus, IS are viewed as an organized set of components (hardware, communication infrastructure, applications) for collecting, transmitting, storing and processing data in support of specific functional aspects of an organization. Although people are part of this perspective, they are included as part of service providers and recipients of the IS.

A second vied of IS is the social-technical perspective that does not object to the notion of an organization as a goal-seeking entity, but emphasises the role of people as human beings in a social sphere. The perspective advances people as thinking, knowing and emotive individuals with various social and personal intentions and behaviours as they engage in various interdependencies with IT, organization, and each other. The main argument in regard to this tenet is that people, as the users of the IS, should be involved in the design of IS due to the fact that the technology affects their work and there are several alternatives to incorporate technology into work design (Davis, 2000). Therefore, people should be involved in deciding the best alternative to be used for incorporating technology in their work practices.

However, a third perspective of IS is the broader perspective of IS that depicts IS as a social system. This perspective acknowledges the existence of several subsystems, all playing part in the IS. These subsystems include the organizational subsystem (management structures, political systems, and cultural systems) and technological subsystems (Walsham, 1993; Walsham, 2001; Heeks, 2000; Rodrigues and Waema, 1992). The continuous interaction of these subsystems in the design, implementation and use of IS tends to have effect on both the subsystems and the IS applications. We adopt this perspective for our thesis which is in line with our objective of understanding an organizational phenomenon.

1.6.2 IS Implementation

The keyword, "implementation," is defined in Cambridge Advanced Learners Dictionary as, to put a plan or system into operation. Merriam-Webster Dictionary

defines "implementation" as, to carry out, accomplish; especially: to give practical effect to and ensure of actual fulfilment by concrete measures. Thus implementation carries the perception of fulfilment, completion and operation.

In the IS field "implementation" can mean several things depending on the audience. To a programmer , implementation means taking the design specifications and writing programmes while to a systems analyst the same term implies taking the programmes and other components such as the computers and setting them to work in the real world. Thus, the word "implementation" as a technical definition signifies the development of IS as per the user requirements. A social perspective of the word "implementation" implies that the IS has been accepted and is put to use and relied upon by users.

Extant literature has no common definition of IS implementation. Sarker (2000) defines IS "implementation" as, "All that must be done by a specific organization for it to be able to harness the capabilities of a particular information technology (IT) as envisioned"; while Larsen (2003) defines it as, "An organizational effort to diffuse an appropriate technology within a user community." Walsham (1993) sees IS implementation as encompassing human and social aspects of the organization and defines "implementation" as organizational IS implementation, which is a process of social change.

The view of IS development as comprising analysis, design, technical implementation and testing often marginalizes organizational implementation, which is a key activity. Organizational implementation consists of all the activities that prepare the organization, users, and the application system from the transitional period during which new systems and artefacts take over from previous systems and artefacts. We are in agreement with Walsham (1993), and therefore our perspective of IS implementation will lean towards the organizational view of implementation. This perspective is relevant as introducing IS solutions into organizations entails strategic decisions concerning the allocation of organizational resources and, possibly, changes in work processes carried out by people in an organization. Thus, IS implementation is inevitably linked to IS strategy and the view of strategy taken.

1.6.3 IS Implementation Outcome

From the foregoing, a consequence of the organizational IS implementation is an outcome, which could be perceived as either a success or a failure. Further, consensus among researchers is that there is a high rate of IS failure. However, there is no consensus on the definition of failure, which is usually subjective and depends on one's perspective.

In the IS literature, failure is a relative term, and in the worst scenario it can mean that the entire IS implementation is abandoned. Failure can also mean that when the IS is "fully implemented and operational" its various users find that they are no better off than they were with the previous systems and procedures.

Likewise, the definition of IS implementation success is problematic since success can be measured on different dimensions, Walsham (1993). These dimensions include meeting objectives and expectations of organizational management and different interest groups, IS project being completed on time and within the agreed costs. Heeks (2002), while reviewing IS case studies in developing countries as either successes or failures, introduces a third possible outcome of an implementation outcome "partial failure." In this category, only subsets of the major goals are achieved, or there are significant undesirable outcomes.

IS implementation success imperatively carries the notion of acceptance by users in an organization, utilisation by users and generally accruing benefits in terms of improved processes that had been targeted in its implementation. In summary, IS implementation success includes the use of the system, satisfaction of user requirements, organizational benefits in terms of effective working procedures and adequate return on the resources employed.

However, the subject of our thesis is not to measures the success or the failure of the IS. We thus adopt a wider definition of outcomes that takes into consideration the intermediate consequences, outputs, and benefits as perceived by participants of an organization.

1.7 Thesis Outline

The chapter, which forms the first chapter of the thesis, chapter one, has presented the overall introduction of the thesis. An introduction of the background to the research phenomenon of IS in organizations was described. This was followed by discussing the research question and justifying the motivation for the research. A discussion on the research design and key definitions adopted in the thesis was also presented.

The thesis is made up of six chapters. The outline for the rest of the chapters in the thesis is described below.

Chapter two introduces the IS field as an academic subject and the different thematic areas are outlined. The relevant research on organizational implementation process is reviewed, followed by the final section, which presents our synthesized research approach.

Chapter three details the research strategy and methodology that was adopted and used to capture and analyse our case data.

Chapters four and five form the case study of the implementation of IS in one university, detailing the case description in chapter four, while the analysis and interpretation is discussed in chapter five.

Chapter four describes the organizational context and the implementation process, which are two key fundamental units to our research. The chapter describes the implementation of a computer-based application, SMS, at a typical university setting by adopting a descriptive approach to the events of the process in various units within the case site.

Chapter five discusses the analysis and synthesizes of the case data based on the theoretical lenses adopted in chapter two, and analyses the implementation process at unit and organizational levels, detailing the enabling factors, managerial actions and consequences of the process. The chapter further elaborates the understanding of the

implementation of IS in the case university and highlights the interpretation of the process.

The final chapter of the thesis, chapter six provides an overview of the research and how the research questions have been addressed. Additionally, the chapter outlines specific conclusions that are drawn from the case. Emerging implications, as key issues that IS practitioners in the higher education sector in Kenya ought to consider, are discussed. Research contributions are summarized and the research is evaluated, using criteria for valid research (Whetten, 1989). The chapter concludes by outlining the research limitations and suggestions for further research work.

2 Theoretical Foundations

2.1 Introduction

Information as a strategic resource in organizations has increasingly been recognized and the ease of availability and accuracy of information linked to organization's performance. Information and communication technologies and services such as IS have continued to provide mechanisms through which this vital resource of information can be channelled to enhance operational efficiency and strategic advantage to organizations. Therefore, the management of processes related to IS becomes crucial in an organization as a means of realizing intended accrued benefits from the IS. One such process is the implementation process of an IS in organizations. Practitioners have continued to bemoan the efficiency of IS project implementations with organizations continuing to spend more, taking more time to complete and reaping benefits from such projects (Cadle and Yeates, 2004). It is for this reason that improving IS implementation success continues to be a key challenge to IS practitioners and hence the emergence of systems implementation and management as a focus in the system development research stream of IS research. Academic research is thus an important avenue for the development and testing of theories/frameworks/methodologies to guide practitioners in improving the practice.

2.2 IS Field

The origin of the academic field of IS can be traced to the 1960s, as comprising of applied computer studies, with the aim of streamlining the design of data processing applications in organizations (Avgerou, 2000). Since then the field has continually grown and broadened to study the use and management of IT by users and organizations but also the societal impacts of technology. This is illustrated in the literature by various definitions of the IS field which converge to the core areas of IT use and management. Two definitions elaborated by Davis (2000) and Khazanchi and Munkvold (2000) suffice for this study.

Davis (2000) outlines two broad areas as the core of the IS field: the delivery of information and communications services in an organization coupled with the

activities and management of the IS function in planning, designing, developing, implementing and operating the systems. Similarly, Khazanchi and Munkvold (2000), in addressing the concern of IS as a scientific discipline, describe the field as the study of the effective use of information and the potential impact of software systems and enabling information technologies on the human, organizational and social world.

These two perspectives illustrate the broad focus of IS research ranging from technology development, organizational impacts and influences, user behavioural patterns and management concerns such as how people interpret information, use technologies, and evaluate benefits of the technology in the organization. As such, due to the multi-faced nature of the issues in the IS field, concerning people, technology, organizations and societies, theories from other disciplines such as computer science, organization science, management science, sociology and anthropology are referenced to inform the IS field. Figure 2-1 illustrates the IS field as being informed by other disciplines, while studies from IS may inform other disciplines (Khazanchi and Munkvold, 2000).

Primary reference disciplines		Secondary reference disciplines
Computer science		Sociology
Organization science	IS Field	Anthropology
Management science		Information science
Cognitive science		Ergonomics
Economics		Linguistics
		Systems science
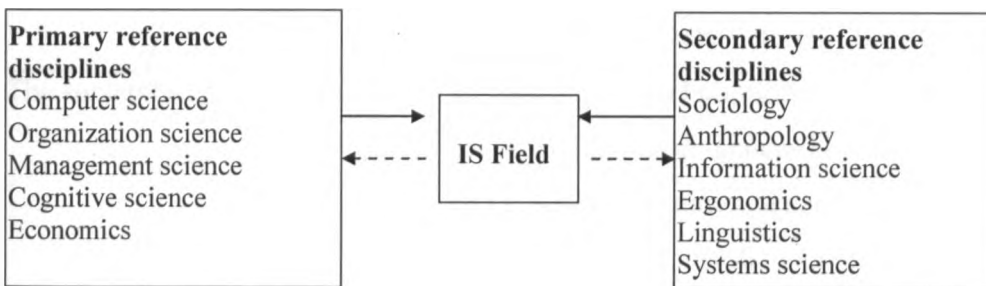
Figure 2-1 : IS Field in Relation to Reference Disciplines (Khazanchi and Munkvold, 2000)

Despite the indisputably broad scope of the IS field (Khazanchi and Munkvold, 2000), Avgerou (2000) establishes five main thematic areas of IS research as shown in Table 2-1.

Thematic Areas	Focus
Applications of IT to support the functioning of an organization	To understand the domains of applications and to develop frameworks that provide the basic logic for combining sophisticated technical components to form a useful application.
The process of systems development	The engineering perspective is dedicated to the development of robust software applications in cost-effective ways leading to the software engineering track. The social perspective of the development process seeks to offer social and managerial accounts of the software development process leading to the IS track that is more concerned with getting value from information and telecommunication technologies in organizations.
IS management	IS management is concerned with issues such as the formation of strategy, using IT to achieve desirable organizational change and using IT to manage multinational corporations in the emerging global economy
The organizational value of IS	Evaluation of IS in terms of criteria (what effects should be assessed), methods (how to assess potential or perceived effects), and the very nature of the evaluation process
The societal impact of IS	Impact of new technologies on wealth creation, working life, and social life more generally and broader social implications of IT, such as on national socio-economic development, work, privacy, identity, and democracy

Table 2-1 : IS Thematic Issues Adopted from Avgerou (2000)

The shift of focus to implementation and management issues in the systems development research theme signifies the organizational implementation of IS as a key agenda in the systems development process which is the focus of our study.

2.3 Social Perspective of IS in Organizations

Effective IS in organizations are crucial and hence established with the intention of serving or supporting a purpose within organizations. IS cannot exist in isolation of the organization and has fundamentally been viewed to have components (IT, people, processes, and data) assembled for the purposes of achieving objectives within the organization and actualised through the processes of planning, evaluation, design and implementation in the organization. Social theory has played a substantial part in the development of the discipline of IS, particularly in the application of social theories as theoretical lens to understand interaction of the societal, organizational and personal contexts with technology, Rose and Scheepers(2001).

In a search of appropriate theoretical perspective of IS, research advanced from the traditional technical deterministic perceptions of IS to social-technical systems (STS) view of IS. STS was first introduced in the early 1960s at the Tavistock Institute of Human Relations, London. The core principle of STS is the emphasis on the reciprocal interrelationship between the organization members and the technology to foster the optimal shaping of the technical and the social systems. This core principle of STS was driven by the need to retain the available human resource in an era that was experiencing labour shortages. However, interest in STS design began to decline due to cost-cutting initiatives in the various industries , the perceived risk and costly nature of approaches to STS, and accelerated by the increase of human resources (Mumford, 2006). Despite the decline in the use of STS as a general design principle, a key issue that has continued to be of importance in the IS field is that of user participation.

STS approaches that have been linked to IS research include the development of ETHICS,[1] as an approach to foster genuine participation in IS development, (Mumford, 1993, 1995, 2006). This approach requires that democratic and participatory communication and decision-making mechanisms are available for success. While STS approaches promote user participation, they do not address

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[1] ETHICS is a problem solving methodology developed to assist the introduction of organizational systems incorporating new technology based on the principal objective to maximise successfully the integration of company objectives with the needs of employees and customers.

situations where consensus is not achievable, especially where power and politics form a major component (Waema, 1990), thereby rendering democratic decision making in the process unachievable. Further, participants are assumed to be knowledgeable and committed to the development of the IS, an unlikely situation especially when changes will affect participants negatively.

The assumption of STS on consensus by members is unrealistic, prompting researchers to use other social perspectives of IS. One such perspective is the view of IS as a social system. The social system perspective acknowledges the formal (rules and procedures) and informal (politics, norms and culture) subsystems of the organization coupled with wider environmental factors (Walsham, 1993; Walsham, 2001; Heeks, 2000). Structuration theory, associated with the work of Anthony Giddens (1979, 1984) , has attracted interest a lot of interest to IS researchers, Jones and Karsten (2008). Structuration theory may be seen as an attempt to resolve a fundamental division within the social science between *functionalism*, which holds that social structures are independent of people, existing in institutions, organizations or other entities, and can directly influence human behaviour, and *interprevitism*, which sees social structures existing only in the minds of people and holding no meaning outside the social constructions that people create. Giddens bridges these views with the concept of "duality of structure", that structure, which includes both rules and resources, is both "the medium and the outcome of the conduct it recursively organizes: the structural properties of social systems do not exist outside of action but are chronically implicated in its production and reproduction" Giddens (1984). This may be restated to mean that structures exist as actors apply them, and they are the medium and outcome of human interaction. In so doing, structuration theory proposes that both subjective human actors and institutional properties together constitute social reality. Social systems are therefore produced and reproduced by human actors employing structure (rules and resources) in interaction.

Structuration theory describes structure in the three dimensions of signification, domination and legitimation, interacting with human action of communication, power and sanctions through the three modalities of, respectively, interpretive schemes, resources and norms. Human action involves the use of interpretive schemes which are stocks of knowledge that human actors draw upon in order to make sense of their

actions and those of others. They thereby produce and reproduce structures of meaning, which are termed as structures of signification. Further, actors utilise power in interaction by drawing on facilities. In so doing they create, reinforce or change structures of domination. Actors sanction their actions by drawing on norms or standards of morality, and thus maintain or modify social structures of legitimation. This is illustrated in Figure 2-2.
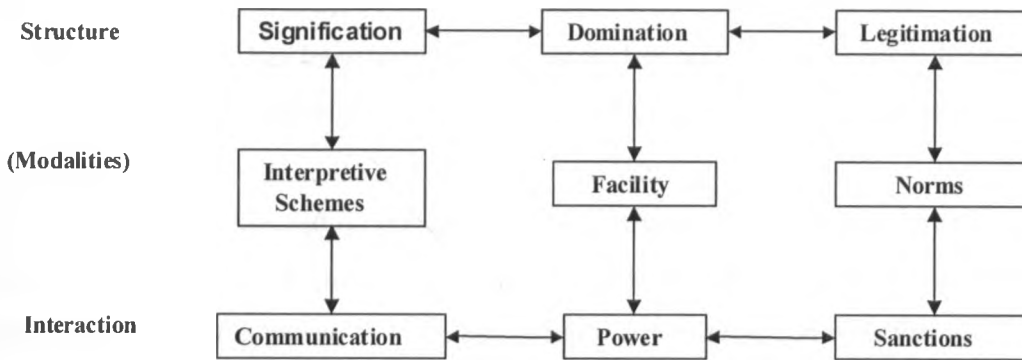
Figure 2-2: Dimensions of the Duality of Structure (Giddens 1984)

Giddens' Structuration Theory and the duality of structure are both a theory in itself and a framework for analysis, and IS researchers have used Structuration Theory for theory development and analysis of empirical case studies, Kouroubali (2002) despite its neglect for technological artefacts and its abstract non-propositional character, (Jones and Karsten (2008); Orlokowski (1992)).

Orlokowski (1992) theorises the Structuration theory to accommodate technology, and came up with the duality of technology approach to understanding the role of technology in structurational processes. The duality of technology is derived from the definition of technology as "material artefacts"- various configurations of hardware and software, and conceptualised as the outcome of coordinated human action created and changed by human action, but also used by humans to accomplish some action. The duality of technology framework has further been used in other IS Studies to explore the relationship between organizations and Information Technology. Chu and Smithson (2003) use the framework of technology to explain the emergence of

organization changes in two large organizations as they adapted electronic-business technology.

DeSanctis and Poole (1994) add the ' to formulate adaptive Structuration to explain the interactions of teams in Group Decision Support Systems usage. DeSanctis and Poole (1994) sought to modify structuration theory to accommodate the mutual influence of technology and social processes, and developed the Adaptive Structuration Theory (AST), by incorporating the concepts of 'spirit' and 'appropriation. AST has been used by various studies on Group Decision Support Systems implementation studies (DeSanctis and Poole (1994); Miller et. al. (2000)).

Other studies have focused on the application of structuration concepts to explore IS development and implementation processes. Montealegre (1997) uses Structuration Theory to discuss the nature of IT implementation, its interaction with the organization and social setting of a Guatemalan Sugar producer. In this study Structuration Theory was used to show how structural rules and resources within the environmental, organizational, and IT contexts were produced, reproduced and changed during IT implementation. Significant contribution to the use of Structuration Theory in IS research has come from Walsham and his colleagues, where the theory has been used in various case studies to analyse the linkage between context and the process of IS Strategy design and implementation, and more recently on cross-cultural use and appropriation of ICT. (Walsham 1993; Walsham & Waema, 1994; Barrett & Walsham, 1995, Walsham 2001)

Indeed, research adopting the wider social systems view in IS has used Giddens' theory of structuration (Giddens, 1984), particularly the concept of the duality of structure that refers to the recursive and dynamic interactions of social structures and technologys illustrating the technology's potential to change the social and organizational structures while simultaneously the technology is affected by these social and organizational structures in its design, implementation, and use. (Walsham and Waema, 1994; Rodrigues and Waema, 1992; DeSanctis and Poole, 1994)..

2.4 Organizational IS Implementation

2.4.1 Organizational Learning Perspective

Studies that use the organizational learning perspective view the implementation process as an episode of organizational learning (Ang et al., 1997). This observation is based on theories of organizational learning that draw on behavioural studies of organizations, and concerned with understanding how organizations learn from direct experience (Berkhout et al. 2006). For example, Robey et al., (2000) reported that organizations appeared to adapt technologies during brief periods following their introduction or in response to later breakdowns or disruptions, terming the periods as "windows of opportunity."

Central to the organizational learning perspective is the consideration of organizations as cognitive entities, capable of observing their own actions, experimenting to discover the effects of alternative actions, and modifying their actions to improve performance (Fiol and Lyles, 1985). A general phenomena used in organizational behavioural studies is that of routines around which organizations are built and through which they operate, and include rules, procedures, cultures and technology (Berkhout et al. 2006). Organization routines are also referred to as organizational memory in extant literature and perceived to require communication and exchange among members, resulting in common frames of meaning within the organization. Organizational memory resides in several repositories and include individuals (memories, files); culture (shared language, symbols, stories); rules and procedures; structures; ecology (physical workplace characteristics); and external archives (Robey et al., 1995).

In his seminal paper, Attewel (1992) re-conceptualises diffusion of technology as learning and argues that barriers to technology adoption are brought about by a lack of technology know-how. Thus, in the process of acquiring the technical knowledge needed to use the new technology, individuals have to shift from what they know in terms of procedures, policies and structures and gain new knowledge which is then embedded as new procedures, policies and structures. Attewel presumes that individual learning involves refining acquired knowledge through an individual's experiences regarding a technology gained by using the technology while an

organization learns only insofar as individual insights and skills become embodied in the organization memory.

To overcome knowledge barriers for effective implementation, organizations have to intervene in the process of acquiring sufficient knowledge. Robey et al. (2000) suggest two strategies: learning from other organizations and from intermediaries such as consultants and service providers such that over time, organizations develop their own capabilities. Related to these strategies is the provision of an environment conducive for effective organizational learning to occur (Robey et al., 2002;Ang et al., 1997).

Learning in the organization and hence improvement in performance is thus considered to result in the revision of organizational memory thereby providing direction to organization action (Robey et. al 2000). However the process of revising organization memory requires effort and capabilities in the organization (Berkhout et al. 2006). Organizational dynamic capabilities has been defined by (Zollo and Winter 2002) as "a learned and stable pattern of collective activity through which an organization systematically generates and modifies operating routines in pursuit of improved effectiveness".

The organizational learning perspective explains organizational change associated with implementation of technology as change achieved, learned, and codified in the new rules, procedures, and structures. These new rules, procedures and structures are "frozen" when the learning stops and are reflected in the organizational memory. The aspect of freezing the new organizational memory is very similar to Lewin's proposal of organizations returning to the stability mode by refreezing the changes in his three-stage planned change management framework[2]. However, this freezing of new organizational memory may also be interpreted as the routinization of the adopted changed procedures, which become institutionalized as the 'way things are done'.

The limitation of the organizational learning perspective to IS implementation is that it does not address politics and power issues (Ang et al., 1997 , Robey et al., 2000)

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[2] Kurt Lewin created a change management framework in the 1950s that represents three stages of change as unfreeze-change-refreeze. This model shall be referred to as Lewin's model of change

which are contextual factors that may impact the implementation process. Further, an inadequacy of the perspective is its weakness to explain the dynamic changing interactions between the context and the process of adoption, and to explain that change is a continuous process. We consider this perspective as limited for our purposes of the study.

2.4.2 The Organizational Innovation Perspective

Research on IS implementation and organizational innovation appears to converge to some extent (Galliers and Swan, 1999) in three broad areas of diffusion research, factor research, and process research.

Diffusion research aims at understanding the dissemination of innovations through communities of potential adopters. Classical research in this stream includes the development of frameworks that enable central suppliers of innovations to promote rapid diffusion and frameworks such as the widely used Diffusion of Innovations (DOI) advanced by Rogers (2003) . Rogers's diffusion of innovations theory offers a broad focus seeking to explain how communication and early adopters shape the future adoption of a technology; it is thus applicable to most innovation adoptions. The theory is applied to studies that explain how, why and at what rate new ideas and technology spread through a social system or cultures.

Davis developed the Technology Adoption Model —based on the Theory of Reasoned Action—specifically to explain how users accept and use an IS (Davis et al., 1989; Davis, 1989). Unlike diffusion of innovations theory that identifies five attributes (relative advantage, compatibility, complexity, trial-ability, and observability) of an innovation that influence its adoption, the technology adoption framework perceives only two frameworks (usefulness and ease-of-use) as being relevant to IT adoption. These frameworks contribute to understanding and predicting diffusion rates of an innovation based on factors such as characteristics of the innovation, potential adopters' attitudes and innovation-related behaviours of adopters. Applications of this stream in IS has highly been used in analyzing adoption of IT such as software development tools, client-server environments, open-source technologies and Enterprise Resource Planning Systems ,Jeyaraj et al. (2006).

Diffusion research is appropriate for informing suppliers of innovations and explaining individual behavioural attitudes intentions to adopt innovations. However, diffusion research under-emphases on the processes that users undergo to use the adopted innovation renders it unsuitable for organizational implementation research. We review in the next section, the factors and process research perspective of IS implementation, that adapt the diffusion perception and also take into account the organization context.

The two streams of research on IS implementation—factors and process—view implementation from a technological diffusion perspective, but they differ in their purposes as we illustrate next.

Factors research focuses on both barriers to implementation of IS arising from an organizational context and managerial interventions required in overcoming those barriers. The implementation of IS is conceptualised as a sequence of stages, with each stage having events that need mediation by certain managerial conditions, with specific conditions becoming crucial in the implementation, referred to as critical success factors. The factors span individual behavioural factors to cover organizational, technological and the wider environmental factors. Examples of these factors include the support of top management, project management techniques, the presence of a champion, training, technical support, rewards, and sanctions.

Despite the contribution factor studies have had to our understanding of implementation of IS, they can however be criticized for two inadequacies. First, different studies have given contradictory results concerning factors considered critical to IS implementation (Švrivihok, 1999). These contradictions further confuse practitioners who try to follow prescriptive guidelines associated with identified factors. Second, the factors studies do not address how or why the factors included in these frameworks interact with each other during the implementation process, thereby offering little theoretical explanation of the relationships between the various factors.

In regard to *process research*, Sabherwal and Robey (1995) argue that the process view of IS implementation examines 'a sequence of actions occurring during IS

development and seeks to "explain" outcome states as the result of a preceding sequence of actions. We review stage frameworks, a subtype of process research frameworks. Gallivan (2001), asserts that like other process frameworks, stage frameworks are valuable in describing how implementation processes unfold, with a focus on time ordering of events and identifying the events and conditions for certain outcomes to occur. Gallivan (2001) continues that process and stage frameworks are valuable in identifying the context in which events occur and show causal linkages and temporal relationships between context, behavioural processes, and outcomes.

Stage process frameworks include the stages of initiation, adoption, and implementation, which adopt Lewin's organization change framework. The frameworks, based on the innovation diffusion theory, define organizational IS implementation as an organizational effort directed towards diffusing appropriate IT within a user community (Cooper and Zmud, 1990). Implementation is thus understood as a process that begins with initiation, is followed by adoption and ends with the use and the incorporation in an organization. The initiation stage is associated with Lewin's unfreezing stage; the adoption and the adaptation stages are associated with change; and acceptance, routinization and infusion are associated with refreezing, Cooper and Zmud(1990). Although implementation is presented as a linear process, and criticized for not reflecting iterations between stages of development, Cooper and Zmud (1990) argue that the linear relationships need not be taken too literally and that the stages can be thought of as activities, some of which may occur at the same time. Another inherent inadequacy of stage frameworks arises from the limited perspective to organizational change of the traditional change framework that tends to represent organizational change as discrete events.

By integrating prior research on IT implementation, Kwon and Zmud,(1987) and Cooper and Zmud(1990) developed a six-stage framework of IT implementation, which aimed at circumventing the earlier limitations of stage frameworks mentioned above. The framework distinguishes between implementation in the early stages of adaptation and acceptance and the later stages of routinization and infusion associated with organizational change. Further, Cooper and Zmud (1990) propose that the framework can encompass the variety of IT applications and implementation processes observed in most organizations by conceptualising the stages into activities.

Critiques to stage frameworks cite the emphasis of use as the dominant outcome. Studies adopting organizational level constructs have shown that technology use or user adoption is not a central theme but assimilation of technology is. Assimilation is the extent to which an organization uses technology and alters processes, structures, and organizational culture, hence enabling change. Another critique is that the process framework assumes that organizational changes follow, rather than precedes implementation, even though either sequence appears to be possible in dynamic organizations.

2.4.3 Hybrid Factor-Process Frameworks

Hybrid frameworks are a combination of process and factors frameworks and have been advocated for IS implementation studies, especially for understanding events as they occur and factors that promote or constrain implementation outcomes in a given context.

Zaltman et al. (1973), after examining organizational adoption of innovations concluded that the adoption process occurs in two stages: the first stage is the decision making process to adopt the innovation (primary adoption) and the second stage is the actual implementation which includes individual adoption by targeted users (secondary adoption). Consequently, the individual innovation process is part of the organizational implementation process.

Traditional technology adoption-use frameworks[3] are based on the assumption that users of a technology have a choice about the extent to which they use the technology (voluntary adoption and use). However, as organizations increasingly rely on technology-based solutions, such as IT, employees are being mandated to use technologies adopted by the organizations. Jeyaraj et al. (2006) observe that studies rarely examine how individuals within an organization adopt innovations acquired. Gallivan (2001) proposes a hybrid framework for linking individual adoption to the organizational adoption process, which we next describe.

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[3] For example, the technology acceptance model (Davis 1989) and the Diffusion of Innovations Theory (Rogers, 2003) discussed in section 2.4.2.

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Based on existing research on individual adoption and organizational level frameworks, Gallivan (2001) proposes a hybrid framework to cater for multilevel analysis of the implementation process at an organizational level. The core assumption of the framework is that primary adoption at a higher level of authority has occurred, and focuses on the implementation process. Further, after the primary adoption has occurred, the management may pursue any of the following three different strategies to ensure secondary adoption:

a) Mandate that the innovation be adopted throughout an organization at once (total commitment implementation strategy),

b) Provide the necessary infrastructure and support users require to adopt the innovation (support strategy), and

c) Target specific pilot projects within the organization, observe the processes and outcomes that unfold and then decide whether to implement the technological innovation later on (Advocacy strategy)

Based on the strength of process frameworks for explaining the implementation process, and factors associated with implementation, Gallivan (2001) integrated the six-stage process framework developed by Zmud etal. (Kwon and Zmud, 1987;Cooper and Zmud, 1990) with specific adoption behavioural constructs to bridge the primary adoption and secondary adoption process and developed a framework for understanding contingent adoption and implementation, as shown in Figure 2-2. Hence, Gallivan (2001) integrates factors and process frameworks creating a hybrid framework that .incorporates processes and factors related to organizational innovation adoption. Gallivan (2001) illustrates the application of the framework using a case study implementation of client server development.
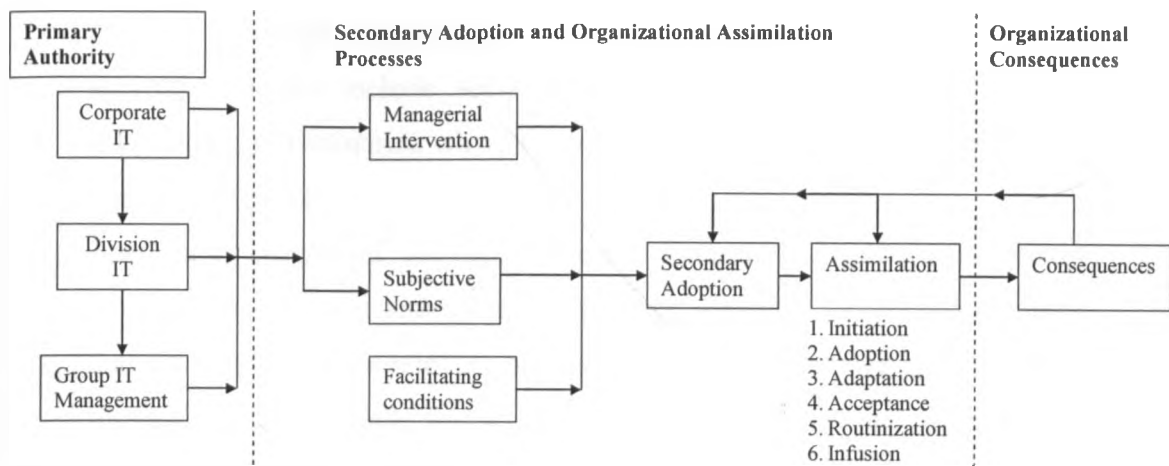
Figure 2-3 : Gallivan's Hybrid Framework (Gallivan, 2001)

The key constructs are defined as follows:

a) *Managerial interventions* describe actions taken and resources made available by managers to expedite secondary adoption including mandating use and offering training and resource support. According to Klein and Sorra (1996), a strong climate for implementation of an innovation fosters use of the innovation by ensuring that an employee is skilled, providing incentives for innovation use and disincentives for avoidance and removing obstacles to innovation use. We consider these activities as actions of creating a favourable implementation climate and hence consider them as managerial interventions. Further, we contend that managerial interventions required are essentially change management interventions as IS implementation implies organizational change, often substantial change. Therefore users need to be trained and motivated to adopt the new working practices brought about by the technological changes in the organization. As such, management interventions are important for re-conceptualizing work processes and for changing existing routines and processes.

b) *Subjective norms* describe individuals' beliefs about the expectations of relevant others (superiors) regarding their own secondary adoption behaviour. The potential adopters' beliefs about when and why to adopt an innovation, how much effort to undertake on their own to learn it, and when to abandon the technology for an even-newer innovation are influenced by subjective

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norms. Although this construct is limited to individuals, we argue that subjective norms include social pressures from the environment of the adopting unit in scenarios where the implementation spans more than one unit in an organization.

c) *Facilitating conditions*[4] are other factors that can make implementation *more-or less-likely* to occur and include innovation attributes, organization context, culture, and any other relevant objective factor. Further, we contend that an implementation climate for a given IS innovation is one of the major facilitating conditions for secondary adoption. In Klein and Sorra (1996), an organization's climate for the implementation of an innovation is a result of employees' shared experiences and observations of, and their discussions about the organization's implementation policies and practices.

d) *Secondary adoption* is adoption at the individual level, specifically in relation to when and how one adopts, through what experiences and the adoption at this level influence organization assimilation.

e) *Assimilation stage* describes the implementation degree within the adopting unit.

f) *Consequences-* capture the possible implementation outcomes. Although the framework does not mention any specific outcome, we believe that motivation to achieve envisaged organizational benefits is a key input to all implementation efforts, irrespective of whether or not the process achieves the benefits. The motivation to achieve benefits, Klein and Sorra (1996) argue, can be achieved through effective implementation while they further elaborate that effective implementation does not guarantee benefits. However, effective implementation defined as the consistency and quality of targeted organizational members' use, whereby the members are individual users who use the technology directly or indirectly (those who use products of the innovation such as management reports), although implicitly implied is core to the implementation process. Thus effective implementation happens when users are committed to, skilled in and consistent in the use of the innovation. This description is similar to the outcome of the assimilation process that suggests that the innovation becomes effective in the organization when the

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[4] Facilitating conditions are both enabling and constraining factors.

use of technology in an organization is deeply infused and entrenched. We therefore argue that effective implementation is a key link between the implementation process and the organization achieving envisaged outcomes.

The framework, by having feedback loops, signifies that implementation is a dynamic process and learning that occurs in the adopting unit can influence future behaviour in an organization in relation to adoption and assimilation of the technology under implementation.

The advantages of the framework are as follows:

a) The provision of multiple levels of analysis at individual, unit and organizational levels

b) The ability to identify and explain change events over time and factors that either promote or constrain the events (the implementation process).

c) The incorporation of the learning that occurs at the different levels (individual, unit and organizational) back into an organization by use of feedback loops, thus signifying organizational learning as part of the implementation process.

As is with any framework, limitations abound; in Gallivan's framework these limitations include:

a) the generality of the consequences construct which is a result of the non-deterministic character of process frameworks and

b) the absence of a clear role of IS implementation strategy in the framework which can be assumed as part of managerial interventions.

c) The lack of feedback from the consequences to the managerial intervention, subjective norms and facilitating conditions. This lack of feedback assumes that the process and the consequences thereof do not have impact on the managerial actions, perceptions of user to the IS application and the facilitating conditions of the organization.

2.4.4 The Implementation Process-Organization Change Relationship

Ackerman (1997) categorizes organizational change into developmental, transitional, and transformational. Developmental change enhances or corrects existing aspects of an organization, often focusing on the improvement of a skill or process through practices such as team building and introducing new technology. Transitional change seeks to achieve a known desired state that is different from the existing state, by an implementation of new structures or methods through a reorganization or introduction of new techniques, methods, procedures, products, or services. In contrast, transformational change is radical, requiring a shift in assumptions made by the organization and its members and normally resulting in an organization that significantly changes its structure, processes, culture, and strategy.

An implementation of information technologies, depending on the magnitude of the envisaged outcomes in an organization, is developmental or transitional, or both. An implementation of a new technology in an organization is a change, affecting the organization and individuals—hence the intertwined relationship between the implementation process and change needs consideration in implementation studies. McKersie and Walton (1991) maintain that it is necessary to manage changes actively during the implementation of IT and that the effective implementation of IT is, at its core, a task of managing change.

The planned, emergent, and contingency approaches advanced in management sciences studies are perspectives on how to manage change. Lewin's three-phase framework of planned change described earlier has been widely applied in IS research using stage frameworks, but its limitations in the perception of change as an event criticized. Orlikowski and Hofman (1997) propose an alternative approach to managing change during technology implementation that may enable organizations to adapt and take advantage of the evolving implementation context.

Orlikowski and Hofman (1997), basing their framework on the emerging improvisational theory of organizations (Cunha et al., 1999; Kamoche et al., 2003) develop a change management framework for IT-related implementation, specifically groupware technologies. Cunha et al. (1999) define improvisation in organizations as

"the conception of action as it unfolds by an organization and/or its members, drawing on available material, cognitive, affective and social resources."
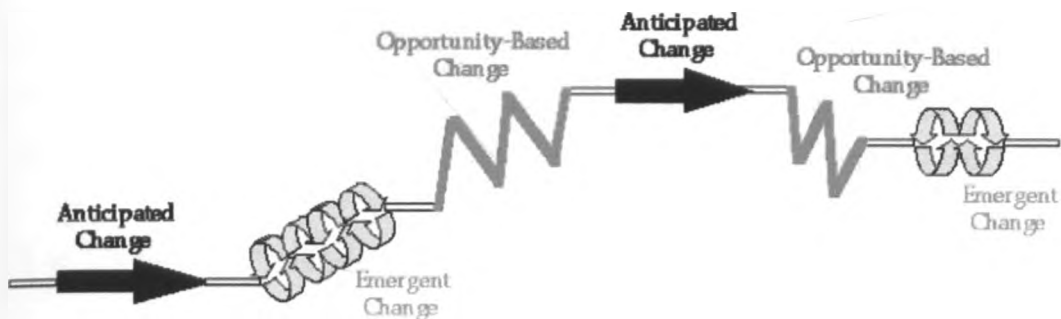
Figure 2-4 : (Orlikowski and Hofman, 1997) Improvisational Framework of Change

The starting point of (Orlikowski and Hofman, 1997) is the focus on the objective of technology with a plan as a guide rather than a blueprint of activities that must be adhered to, providing a situation where technology implementers may deviate from and act on an ad-hoc basis towards the objective. This viewpoint, they argue, is based on two premises:

a) Changes associated with technology implementation constitute an ongoing process.
b) All technological and organizational changes cannot be anticipated far ahead of time.

Three types of changes, anticipated, emergent, and opportunistic, are identified and defined as follows:

a) Anticipated: change planned far ahead of time and occurs as intended.
b) Emergent: change arising spontaneously from an innovation, although it is not planned for
c) Opportunity-based: change not anticipated ahead of time but introduced purposefully and intentionally during the implementation process.

To effectively manage these changes, two conditions are attached to the framework. First, the continuous alignment of the technology with the organizational change and

the change-management approach adopted; this calls for continuously examining the technology and the context and making adjustments where appropriate. Second, there must be resources allocated to support the ongoing change efforts. We view these two conditions as continuous strategic change management actions towards creating an enabling environment for the implementation process. Further, the continuous alignment of the technology and the context are a result of the immediate outputs or impacts, or both, of the implementation process, signifying a learning loop.

Two limitations of this framework are:

a) Its applicability to open-ended customizable technologies or for complex unprecedented change.

b) Its improvisation may not be acceptable in cultures that do not support experimentation and learning.

2.5 Research Theory

Gregor (2006) distinguishes five different types of theory in the discipline of IS: *the theory for analysing, the theory for explaining, the theory for predicting, the theory for explaining and predicting,* and *the theory for design and action.* Theories describe and explain IS implementation outcomes and give a basis for intervention and action through use of differing levels of analysis. Markus and Robey (1988) identify the level of analysis as an entity which the theory poses concepts and relationships about and which could either be "macro-level" (for example, organizations, populations, or societies) or "micro-level" (for example, individuals or small groups).

Our objective, to explore IS implementation and its management, delineates the focus of the study, secondary adoption and consequences of IS implementation—of course while recognizing the difficulty in ignoring the influences of primary adoption processes on secondary adoption processes. Based on this, we adopt a theory for explaining in addition to describing the implementation process and its consequences and choose the process of implementation as our main activity for analysis. To achieve a greater understanding of secondary adoption within organizations, an

analysis of the relationships between the process level, the individual and unit level of adoption, and the organizational context are paramount.

2.5.1 Synthesized Theoretical Approach

The implementation of IS in an organization is not only an intervention to change the technical means and information available to people's work (Avgerou, 2000) but also an ongoing social process. Hence, the importance of understanding the social dynamics that accompany the adopting of IS and the organizational change related to the development of such IS systems.

Drawing on the innovation implementation framework (Gallivan, 2001) and the IT-change management framework (Orlikowski and Hofman, 1997), we present our approach to the IS implementation process, illustrated in Figure 2-3 . We conceptualise the *organizational implementation process as consisting of a secondary adoption process, an organizational assimilation process and a continuous organizational learning process requiring continuous change management interventions.*

The organizational implementation process happens in an organizational context and the context influences the process. The notion of implementation contexts for IS concerns an identification of various systems and structures in an organization that influence the implementation process (Walsham, 1993). Research, for example (Heeks, 2002;Avgerou, 2001; Walsham and Waema, 1994;Walsham, 1993) has shown that context influences the shaping of technology use in an organization. The context influences the implementation process by enabling and constraining the implementation process. The context is not constant and is influenced by the implementation process. Therefore the context illustrates systems such as power, cultural, technical , economical, human resources and management structures within which the implementation process occurs which form an important basis for an interpretation of the process. The concept of context is thus wide, and in operationalizing the implementation context, we focus on actions and interpretations of events by people involved in facilitating the process. Further, not only do aspects

of the context viewed as constraining or enabling the process need to be identified but also are illustrations of their influences deemed necessary in understanding the implementation process.
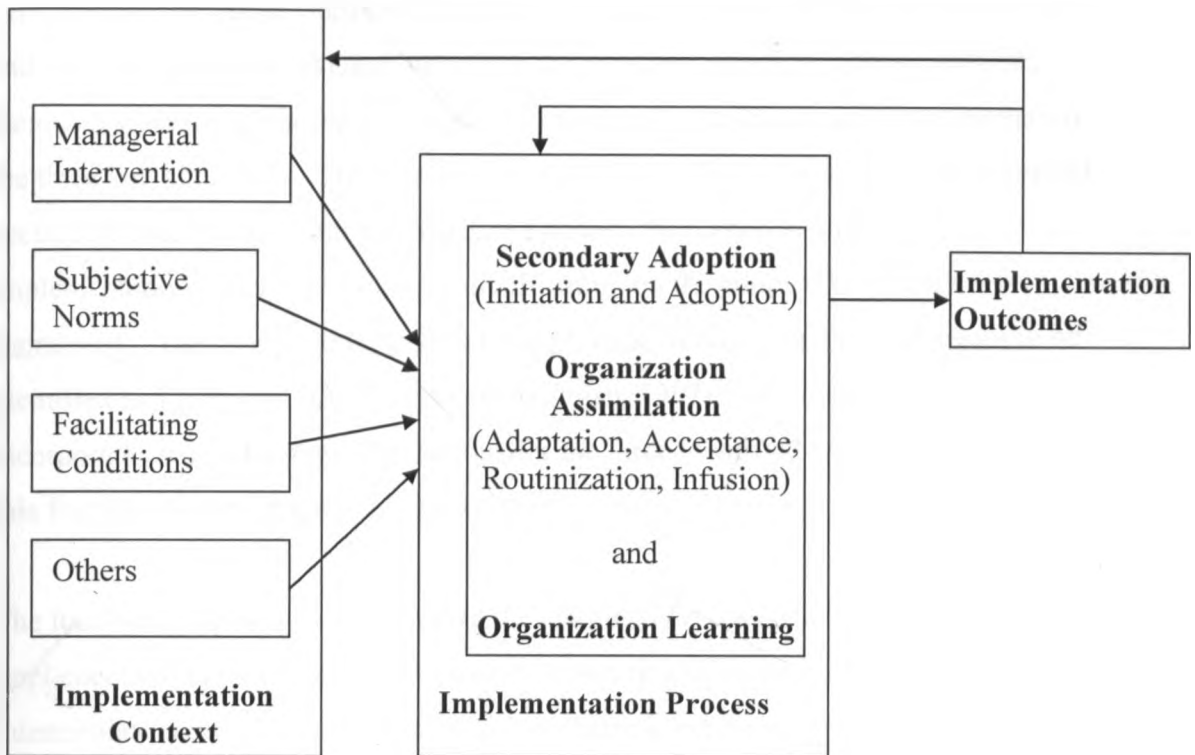
Figure 2-5: Theoretical Framework: Implementation Context, Process and Outcomes

Although in Gallivan's framework the secondary adoption construct is used to refer to the individual level, as stated earlier, the advantage of the framework is its applicability to multiple levels of analysis. Hence, our notion of the secondary adoption is at the adopting unit level rather than at the individual level, thereby focusing on initiation and adoption decisions and actions at the unit level. The organizational assimilation is then conceptualised as the cumulative organizational adaptation and acceptance of the IS, with continued use and reliance resulting to routinization and infusion of the IS. The fact that we acknowledge and are informed by extant literature on the role of organizational learning to the implementation process, we enhance the view of organizational implementation by adding

organizational learning to the implementation signifying the role of reflective actions by actors involved in the implementation process.

To analyse this multi-level process (secondary adoption and organizational assimilation), we adopt Gallivan's contextual factors (managerial, subjective norms and facilitating conditions) and introduce the construct *others*, aimed at capturing factors or issues that may emerge from the case studies and have not been covered by the three key constructs. This construct may capture other factors for example trusted social relations, power from expertise, and history from successful IS implementations, thereby marking a modification on the adopted Gallivan's framework. The change to the context and process, as has been outlined, needs to be identified and managed (Orlikowski and Hofman, 1997), and, therefore, we incorporate change management actions for the three identified types of changes in this framework as management interventions.

The feedback loop serves to recognize the learning curve associated with the implementation process and that outcomes consisting of immediate outputs, intermediate consequences and the wider organizational impacts of the process continually inform the ongoing implementation process and trigger adjustments to the context, thereby creating knowledge and change. Unlike Gallivian's framework which does not have feedbacl back to the factors aspect of the framework, our modification to this acknowledges that outcomes from the process may have an impact on the actions of the managers, which may in turn have an impact on the other contextual factors, such as computing facilities.

A summary of the constructs adopted in the study is captured in Table 2-2. The framework is used to guide the research methodology especially in the creation of the coding strategy shown in appendix I.

We next describe our research methodology that was adopted and that enabled the collection of data and the analysis of the context, process, and outcomes of an organizational implementation of IS.

Framework Constructs	Construct Categories	Explanation	Operational Definitions
Implementation Context	Managerial interventions	a) Managerial actions that are geared to creating an enabling environment	Actions and events that • Indicate the provision, acquisition, allocation and enhancements of human and computing resources. These involve financial resources implicitly • Indicate actions towards mandating, motivating or negotiating use of computerised application systems • Infer to monitoring and evaluation of process
		b) Change management strategies and actions taken to counter resistance and enhance the adoption and assimilation of computerised application system at unit and organizational level	Strategies and actions taken by implementers and the organization • To enhance anticipated changes in response to the implementation process • To respond to user experiences from use of the computer application system • To respond to opportunities provided by the implementation process
	Subjective norms	The social influence to adopting computerised application systems	• Perceived beliefs of users about peers, supervisors, clients and subordinates concerning their behaviour towards adoption and use of the computerised application systems • Imitation, mutual discovery and conformance social influences on adopting units

Framework Constructs	Construct Categories	Explanation	Operational Definitions
	Facilitating Conditions	Factors that may enhance or hinder the implementation process	Factors that include • Computer application attributes such as quality • Organizational aspects such as history, culture, leadership, top management, information flow, policies and procedures of an organization
	Others	Aimed at capturing factors or issues that may emerge from the case studies	• Other factors or issues that may emerge from the case studies and have not been covered by the three key constructs
Implementation Process	Secondary adoption	Events at the unit level that lead to the adoption of the computer application system	Activities and actions that indicate the initiation and decisions to adopt and use the computer application system at the unit level
	Organizational assimilation	The degree of the penetration and use of the IS in the various units within an organization	Activities and events that lead to adaptation, acceptance , routinization and use of computer application system; they include • Actions to install/customize IS innovation, train members and facilitate use of IS innovation • Actions that point to inducing user to commit to use IS innovation • Indication of routine use • Continued and emergent use to increase effectiveness

Framework Constructs	Construct Categories	Explanation	Operational Definitions
	Organizational learning	Key experiences of the implementation process that inform the process and the context of implementation.	Reflection of experiences from process that lead to • Alternative and/or modifications of the implementation context such as policies, procedures, capabilities and structures to improve performance of computer application system
Outcomes	Outcomes and impacts	Planned and unplanned intermediate consequences and results of the implementation process	Consequences of the process • Anticipated outcomes at unit and organizational levels. These are Expected outcomes planned for ahead of time • Unanticipated outcomes at the unit and the organizational levels. These are unexpected outcomes that are not planned for, or foreseen ahead of time

Table 2-2 : Theory Constructs

3 Research Methodology

3.1 Introduction

Research methodology aims at linking the theory and the data for the purposes of analysis thereby gaining insights into the research problem. The research foci and the philosophical stance on knowledge are key inputs into the methodology. Further, the methodology adopts a strategy and methods that are well aligned for the research study.

Our topic, organizational implementation of IS as innovations and the adoption of an interpretive qualitative research, define our research perspective. The interpretive perspective, having its root in social science, is based on the ontological assumption that reality and our knowledge thereof are social constructions incapable of being studied independent of the social actors that construct and make sense of this reality (Khazanchi and Munkvold, 2000). Individuals' perceptions about the world are influenced by experiences they have had. Knowledge of reality is gained only through social constructions such as language, shared meanings, documents, and other artefacts (Klein and Myers, 1999). Thus, the interpretive approach tries to understand the phenomenon under study in a holistic way by offering explanations for observations made, thereby producing an understanding of the IS context and the processes by which actors draw on and interpret elements of the context.

Our research strategy is qualitative and involves the use of qualitative data, such as interviews and project documents, to understand and explain an organizational implementation of IS. A social setting is not controllable and continuously changes and we had no prior declared hypothesis to test and measure, we therefore found the case study approach suitable for our topic.

A case study consists of a detailed investigation, often with data collection over a specified time period, of phenomena under study within their context (Hartley, 2004). Case study research has been used to study varied IS phenomena, particularly in system development and implementation (Paré, 2002; Pollock, 2003; Rodrigues and Govinda, 2003; Walsham and Waema, 1994). While the general aim of the case

study approach is to understand phenomena in terms of issues in the original problem context, its advantage is that it allows the researcher to concentrate on specific instances in their natural setting and thereby attempt to identify the interacting perceptions, issues, and processes at work, ultimately resulting in in-depth understanding (Dalcher, 2004). Within the case, our focal level of analysis was multi-level since the organizational implementation process of IS as a construct is conceptualised as a process consisting of secondary adoption (the unit level) and organizational assimilation. We present our research perspective in Figure 3-1 that is based on Walsham (1993).
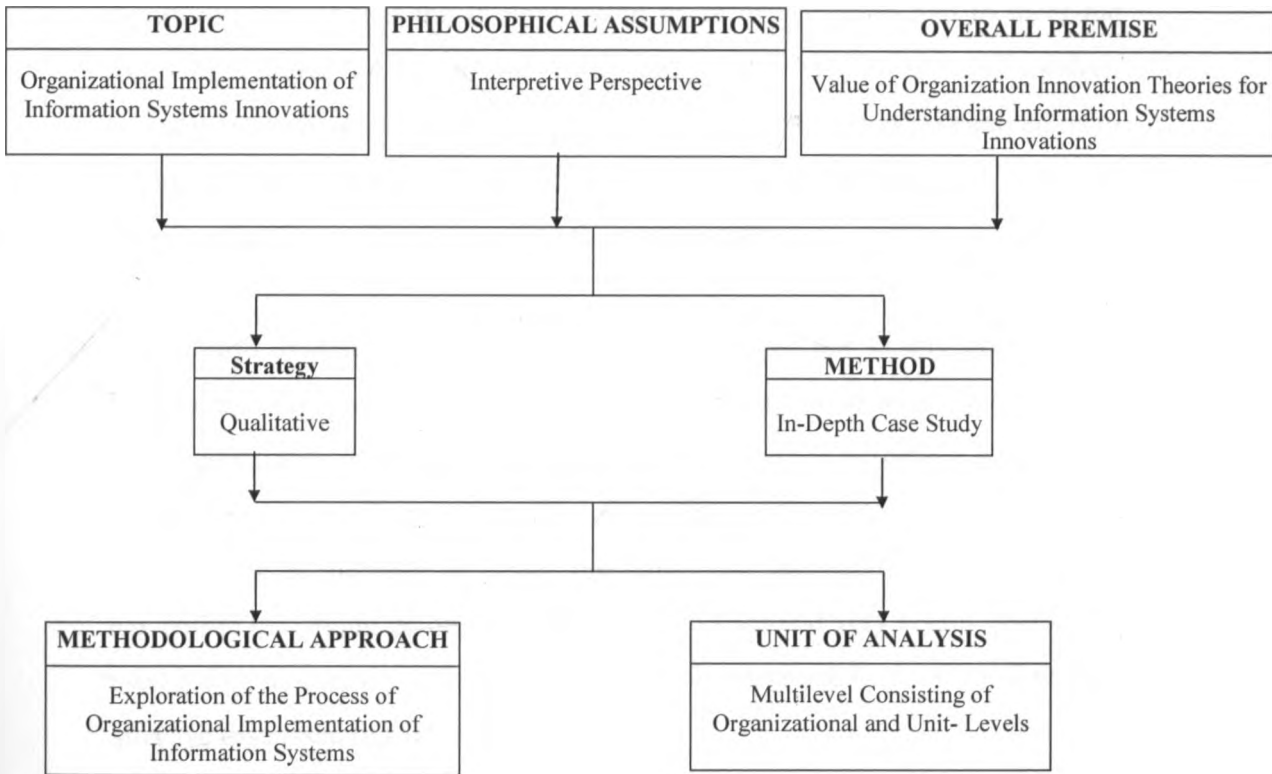
Figure 3-1 : Research Perspective Based on Walsham (1993)

3.2 Research Design

Research design is the argument for the logical steps, taken to link the research question(s) and issues to data collection, analysis, and interpretation in a coherent way. The research questions, the theoretical framework defined in chapter 2 and the research perspective guided our approach to an identification of organizations and a

selection of cases, designing data capture tools and performing data analysis as we describe in the sections below.

3.2.1 Identification of Organizations and Gaining Access

a) *Organization Selection Criteria:* Our case study approach required a selection of sites within the higher education sector because our problem was investigating IS implementation phenomena in HEIs. The selection of the IS innovation in the organizations had to be done carefully to bring out a detailed understanding of the IS implementation in a typical HEI context. This therefore required that the IS application in an organization had to meet the following criteria: be on *roll-out phase, had just been rolled-out and involved as many units as possible within the organization.* This criterion enabled us to reconstruct the history of the case, thereby circumventing the risks of "memory loss" of critical events by the participants.

b) *Negotiation of Access*: Factors crucial in gaining access to any organization for research purposes are the availability of informal contacts, the sensitivity or confidentiality of the phenomena under study and the perceived gain or loss that the "gatekeeper" approached for access has on the results of the study. A further issue is the relative power the individual approached to grant access has within the organization. To gain access to sites and very senior people, we used informal contacts, who gave a favourable response to the formal request after we discussed our intention with them.

Our interest being on the implementation process, we sought to interview project team members of the implementation team, heads of departments, users of the IS selected to be cases, and the management staff of the institutions.

Three HEIs were identified as possible research sites and the access for research sought. Two institutions granted access while one institution was in the process of creating a research policy and hence access to the institution was pegged to the implementation of the policy. Time limitations on our study and delays of the policy implementation resulted in the disqualification of the institution as a case site.

However once access to the one of the remaining two universities was officially granted, the "gatekeeper" approached was uncooperative, where being cooperative required creation of time, effort and willingness to help the cause of the research, despite having been consulted earlier informally and agreeing to be cooperative. Tactics used by the "gatekeeper" that hindered data collection from the site included shielding access to institutional staff for interviews, asking for other information in addition to the interview guide and inappropriate delegation in his absence. These actions of the "gatekeeper" delayed data collection. Once all the requirements of the "gatekeeper" were met, he further shielded any opportunity for the researcher to contact the participants directly, by assuming the role of distributing and collecting the questionnaires from the participants. Once more, this action by the "gatekeeper" was detrimental to the research process as we were not certain how many questionnaires were distributed because only one for each category of staff was returned. Because of lack of adequate information that could inform an in-depth case study as was designed in the research approach, the institution was disqualified from the research.

With access to only one research site, our earlier envisaged multiple case study approach was redesigned to embedded single case study, involving data collection at the organizational and unit levels. The embedded case study implied multiple sub-cases within one case. The sub-cases were purposively selected to represent a variety of units within the case. The use of sub-cases ensured that the analysis was robust and explanations developed were applicable to the wider numbers of units across the organization. The use of the embedded case study approach ensured a wider coverage of the organizational and specific unit-level aspects and hence multiple units of analysis.

The rationale for redesigning the case study approach follows. Firstly, a single case study is methodologically viable. Secondly, when no other cases are available for replication, the researcher is limited to a single case study. Thirdly, the high number of the units in the case study provided an avenue for increased rigour of the study, thereby strengthening the stability of findings and providing a comprehensive understanding of the implementation process in the particular context. This is

because each of the adopting unit was semi-autonomous within the organization, and most were larger than most private universities[5]. The IS innovation selected had several major modules for different units which made the IS application look like several systems, thereby enriching the case. Fourthly, the case study was perceived as representative (Yin, 2003) in the higher education sector in Kenya, and thus lessons learnt from the case are informative to similar institutions. Fifthly, the redesigned approach was indeed aligned to the adopted research theory and research perspective outlined in chapter 2 and 3, respectively.

3.3 Data Collection

3.3.1 Data Sources

The study applied three data collection methods, interviews, qualitative questionnaire, and document analysis.

The adopted theoretical framework formed the basis for the development of data collection *interview guides, qualitative questionnaires* and *document summary form*. Designing the data capture instruments was done iteratively to ensure that they would provide the required data. The interview guide, a sample qualitative questionnaire and the document summary form are shown in appendix III.

a) *Interviews*: A key data collection approach adopted was the face-to-face semi-structured in-depth interviews with key and primary participants. Interview sessions provided an opportunity for the participants, based on personal experiences, to give accounts of the implementation process. An interview guide was used for the data collection with the core topics, and qualitative questionnaires, based on the interview guide, for the various categories of interviewees were emailed to participants prior to the interviews. The questionnaires enabled the participants to familiarise themselves with the questions and give more elaborate responses during the interview sessions. An open discussion at the end of each session was encouraged to capture

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[5] In the case organization presented, for example School A has undergraduate student population of 5,247 compared to one private university with undergraduate student population of 1,193 in 2006.

interviewees' comments and emphasise on issues that interviewees deemed important.   Discussion sessions where applicable were used to clarify information found in documentary evidence.   Each interview session on average lasted between thirty to forty-five minutes, and all the interviews were tape-recorded.

b) *Documentation*: The other key source of data was primary documentary evidence.   Fifty documents that included minutes of relevant meetings, internal correspondence on the case and written reports were collected.   The documents provided not only a mechanism for constructing a chronology of key events but also extra data that participants interviewed had omitted.   In addition, the documentation enabled us to validate and crosscheck what participants had expressed during interviews, thereby using it as a means of triangulation.

3.4 Data Management and Early Steps in Analysis

Before analysis could proceed, all the data collected had to be prepared and managed. A research database was created and was used to store all documents deemed appropriate for storing.   These included document summaries and coded texts which eased reference to data.   The database was created by use of MS-Access and MS-Excel packages.   Although commercial software exists for analysis of qualitative research, these were not used in our research and the database provided similar basic functionality, especially for managing text excerpts to the associated codes.

Three analysis techniques were used in the early analysis phase; these were *coding, document summary form*, and a *critical incident time-line*.

The voice data collected during the interview sessions was listened to repeatedly and transcribed to textual data (transcripts).   Each transcript was then read repetitively to familiarise the researcher with the contents before being analysed.   Despite the interview transcripts producing large amounts of textual data; data reduction was

achieved by the use of a *coding strategy*. Guided by the adopted framework and the interview guides, a set of codes was developed prior to data collection. This set of codes was modified as the analysis progressed, and the final list of codes is presented in appendix I. Codes are symbols or abbreviations applied to a segment of words and assign meaning to the descriptive words. For each code, a definition and the associated theoretical constructs were spelled out. This was deemed necessary to structure data collected and eased further analysis.

Coding, according to Miles and Huberman (1994), is analysis and forms the first steps to an analysis of qualitative data. To perform coding, we used the codes developed to segment data collected as each transcript was read, and texts that represented categories outlined in the coding strategy were hived and captured into the MS-Access database.

Concepts that were frequently emerging in the texts were interpreted as key issues. These various categories facilitated insights, the comparison and the development of thematic analysis as outlined in chapter five.

	A	B	C
	Document No	1	2, 2a,2b (Various version of same with corrections)
	Name or description of document:	Allocation schedule of PCs	Summary of on-line Student Registration: (2002)
	Event or contact, if, any, the document is associated	Support of SMIS in various colleges	Post-mortem meeting of first yr registration
	Significance or importance of document	Gives schedule of allocation of PCs used for 2002 registration to different campuses	Gives summary of issues that arose during the event . Actions that were taken on the fly and future Recommendations related to the particular item
	Brief Summary of contents	i) Schedule of faculty, college, and number of PCs allocated for the specific purposes outlined. ii) Facilities allocation were to directly enable data capture and update of SMIS	A) Registration Data capture i) Activity detailed either because some of the persons trained were not deployed for data capture or deployed were not adequate ii) Training was inadequate especilly for people who had little exposure to computers iii) Poor coordination in some centers resulting in long queues iv) Errors due to lack of confidence in data entry (Most of these issues were solved on the 'run')
	MY REFLECTIONS	Sharing of available computing resources to facilitate data capture	Recomendations of Meeting:- Confirm that they implemented

Figure 3-2 : Data Entry Screen Showing Sample Data Captured from Documents

Similarly, for the documents collected, each was read and the contents were summarised using the *document summary format*, presented in appendix III and adopted from Miles and Huberman, (1994) to capture essential data that included the description of the document, the event the document was associated with, the significance of the document and a brief summary of the contents. These details and additional reflective notes by the researcher about the documents' contents were then posted to the MS-Excel spreadsheet (Figure 3-2 illustrates a snapshot of the MS-Excel interface) for further analysis and ease of reference. In addition, all documents collected were scanned and archived in the Portable Document Format (pdf) file format for ease of access and future reference.

The use of *critical incident timeline* was important, especially when applied to the registration event, which occurred annually, and was seen as critical, influential and decisive by the interviewees on the implementation process at the case site. The chart that emerged, as shown in appendix IV, and as suggested by (Miles and Huberman, 1994), made it easier to examine and compare the activities over the study period, and the dates for events facilitated a temporal ordering of actions.

These three techniques and additional handwritten notes were used separately and in combination to identify key themes and emerging relationships in the data that formed the basis for the second phase of data analysis.

3.4.1 Data Analysis

The second phase of data analysis involved data transformation of the collected data and working with it to create an "authoritative written account" of the case. Data analysis occurred simultaneously with data collection and was an iterative process.

Each sub-case was analysed by identifying evaluative elements in the case. These elements were informed by the broad theoretical constructs defined in Table 2-2 while the constructs did not confine the data analysis. This required an in-depth analysis of interviewees' transcripts and documents collected for each sub-case and a continuous

reflection on what the data was representing. A sub-case analysis formed an analysis at the individual unit level.

The next level of analysis entailed the organizational level. The analysis at the organizational level was achieved by comparing the analysis performed at the unit level, in addition to in-depth analysis of the interviewees' transcripts (already coded) that pointed to organizational level issues, and categorising the identified elements based on the theoretical constructs defined, and again not constrained by the defined constructs. Additionally, the use of visual illustrations, such as Figure 5-1 and Table 5-1 were used to illustrate our understanding.

Thus, the second phase of the analysis provided an elaborate analysis in addition to demonstrating the logical chain of evidence (Yin, 2003) that provided the basis for the interpretation of the case findings and conclusions from the case.

Finally, a case narrative presenting the case information in a readable, informative form was presented, and is detailed in chapter four. We used fictitious names in the case description, to mask the organization and interviewees' identity, thus providing confidentiality. In presenting the case information, we detailed out chronological events while explaining facts and offering alternative explanations where it was applicable. However, as earlier stated, the data collection, case analysis, and case writing were not done in strictly sequential phases but iteratively, moving from data collection, analysis to writing as the case progressed.

4 Case Study

4.1 Introduction

In this chapter we introduce universities as organizations and describe key characteristics that portray the uniqueness of universities as contexts for IS implementation. Based on this setting, we continue in this chapter to describe a case study of the implementation process of IS application, a Student Management System (SMS), at the Hekima University[6] , over a ten-year period from 1996 to 2006. Although Hekima has other IS applications, SMS was particularly chosen as it met our case selection criteria outlined in chapter three.

We begin the chapter with an overview of the wider university context, describing the general management structures for the case organization. In the first section of the case study, the general management, structural changes and technological changes are described. The description of the functionality of the case IS application, SMS, is outlined and, lastly, the adoption and use of SMS by several units in Hekima are described.

4.2 The University Context

Globally, HEIs in a country are a mixture of private and public universities. The private universities are self-sustaining organizations often through fully-fee paying students, while public universities are sponsored by governments and may charge minimal fees. Despite this key difference, the mission of universities globally is common: teaching, research, and community service. The provision of higher education and creation of knowledge by universities has given HEIs "institutional status" in societies, leading to HEIs operating under regulatory bodies and differing authority structures developed by governments. Although globally different universities vary in the degree to which they are insulated from market, social, economic and political pressures, in the recent past the same forces are pushing universities to adopt for-profit business frameworks (Kezar, 2001), thus threatening this long standing "institutional status" tradition. For example, in 2006/2007 financial

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[6] Here-in referred to as Hekima.

year, Hekima got 60% of its budget from income-generating activities such as fees collected from self-sponsored programmes.

In Kenya, the government has a central position in the governance and control of higher education through a variety of mechanisms. These include legislative regulations and operating guidelines formulated by various arms of the government, the parliament, the Ministry of Education and the Higher Education regulator, the Commission for Higher Education (CHE) and through the budgetary processes of the Ministry of Education.

Kenya has two categories of universities, the private universities and public universities.

The first category of universities is the private institutions, which number to twenty three in total and are further categorized as private universities with a charter (fully accredited), private universities with a letter of Interim Authority, and private institutions with a certificate of registration. They raise funds from their own sources, mainly the tuition fees and do not receive any grants from the government.

The second category, the public universities, are seven in number and have been established by Acts of Parliament, and are categorized as government parastatals (some of them with constituent colleges). The pubic universities' administrative functions are independently managed through University Councils. Though autonomous, public universities receive funding from the Ministry of Education, and have been involved in public reforms undertaken by the government during various periods. For example, the Universities Investment Project (UIP), supported by World Bank during trhe period 1990-1999 under the general structural adjustment programs that were taking place in Kenya and in most African countries. The UIP project included equipment, library materials, and staff development for the public universities; strengthening the Commission for Higher Education; and reforming the Student Loan Scheme. The outcomes of the project resulted to enhancements of the CHE and the replacement of the student loan scheme with Higher Education Loans Board and the introduction of cost sharing mechanism in the public universities. Two key impacts of these reforms were the reduced government financing to public

universities, and the improvements of teaching and research where delivered laboratory equipment, library books and the acquisition of computers and implementation of Local Areas Networks. Although the UIP had a requirement for all the public universities to have a ten-year development plan, most universities did not implement the development plans fully.

Another reform program that the public universities were involved in the 1994-2001, was the parastatal reforms whose objective was to reduce the Government's role in the economy by

  a)   enhancing the efficiency of the public enterprises sector;
  b)   reducing the financial burden of public enterprises on the public sector budget; and
  c)   enabling public enterprises to operate on the basis of market principles, promoting operational autonomy, and enhancing accountability.

Under this program, the public universities retrenched a total of 3, 203 non-academic staff in the lower cadres.

It was also during this period that public universities, started in 1999, to admitted fully fee paying students, i.e. self sponsored students (SSS), as a revenue diversification program to supplement the inadequate government funding. Prior to the admission of self sponsored students, public universities admitted only government sponsored students (SGS), who were either fully or partially supported through some form of cost-sharing by the government. This was based on the historical context of university education in Kenya, which was totally free, with the government covering both tuition and living allowances, and the graduates bound to work in the public sector, thereby create highly trained manpower that could replace the departing colonial administrators. However, over time, due to several factors, amongst them economic difficulties and the public reforms, the financing framework has since changed adopting cost-sharing with availability of student loans through the Higher Education Loans Board.

More recently, during the period 2004-2008, the public universities were involved in the public service reform and development program that sought to transform public enterprises from a culture of process orientation to a results management culture in addition to building institutional and leadership capacity for a results based management culture in the public service. These reforms were managed by a secretariat, The Public Service Reform and Development Secretariat (PSR&DS) was established in the Cabinet Office, Office of President in September 2004 with the mandate to coordinate all public sector reforms and mainstream Results Based Management (RBM) in the public service. The RBM is a management approach that institutionalizes values, good governance, leadership code and competencies, and embeds a culture of continuous learning and performance improvement in a framework of management accountability for the achievement of targeted results. One tool that was used to institutionalize RBM was the Performance Contracting, aimed at improving efficiency and effectiveness in the management of the public service. Hekima's CE3 indeed noted the university's participation in these reforms in his speech during one graduation ceremony saying:

> "Hekima has been at the forefront of initiating reforms in accordance with the government public sector reform programme. The reforms we have instituted over the last three years are geared towards achieving our vision and mission as spelt out in our strategic plan. In that regard, the University has adopted results based management as a tool for effective management"

Reviewing extant literature brings out two major distinctive characteristics of universities, governance structures and distribution of authority, and culture. A brief overview of each follows, and its relation to our research is illustrated.

4.2.1 Governance and Authority Structures

Trustees, a board, a council, or a court, making major decisions such as policies and budgets, is the supreme authority board in a university. The university chief executive is in charge of the day-to-day management of the institution, with the faculty (academic staff) and administrators being involved in the various committees and task forces, as part of the decision-making process. The process of decision-

making is characterized by consensus building and collective mutual agreement among different professionals, thereby strongly diffusing power in decision-making, (Gornitzka, 1999). In the case of universities in Kenya, this characteristic is visible in the various management boards created through legislation while internally several committees are created to handle particular tasks from time to time.

Hekima's management structure, as is characteristic of universities, is governed by a council, which is the supreme organ charged with governance, control, and administration, while the senate is the supreme authority on all academic matters in the university.

The Chancellor, as the head of Hekima, advises the council, and confers degrees and grants diplomas. The Vice-chancellor is the Chief Executive (CE)—the accounting officer and the academic and administrative head of the university. There are deputy Vice Chancellors (Deputy-CE), heading various arms such as the administration and finance division and the academic affairs division. The Deputy CEs assist the CE in the day-to-day management of Hekima. A Management Board is responsible for the coordination of Hekima's development plans, for the efficient management of resources and for making proposals to the council and senate on policies that have university-wide application. Administratively, the university has a central administration for the coordination of various matters. Hekima has several campuses geographically distributed, with each headed by a Principal. The campuses have has administrative structures that enable each campus to operate in a semi-autonomous manner in terms of administrative and academic functions. However, these functions are centrally coordinated by the central administration. A campus is organized into various schools. Schools are headed by a Director appointed by the CE, and at the lower level of the school are departments, headed by Chairpersons.

The university provides catering and accommodation services to students, mainly the government sponsored students, through the Students Housing Unit (SHU). The SHU is headed by a Director. The Director of the Students' Housing Unit is responsible for the day-to-day management of the unit's operations.

Hekima has a centralized information computing centre [7](IT function) headed by a Director. The Director, IT, reports to the CE. Prior to structural changes undertaken in 2002 at Hekima and described in section 4.3.2, the IT function was part of the computer science institute, a teaching department, whereby in matters relating to the IT function, the Director of the computer science institute reported to the Deputy-CE in charge of administration and financial matters.

The mandate of the IT function is to:

a) Develop and implement an evolutionary ICT policy and strategy that is sensitive to emerging technologies and responds to changing needs and practices

b) Guarantee the security of ICT resources and the safety of people working in ICT environments

c) Enhance skills to develop, implement, support and exploit ICT resources more effectively and efficiently

d) Provide quality network infrastructure and improve student & staff access to ICT in line with University priorities

e) Ensure that business systems accommodate and facilitate changes in business practice that reflect changing institutional, staff and student needs

f) Lobby for an adequate and sustainable ICT funding within the University

4.2.2 Culture and Power Structures

All organizations have belief systems, with universities cited as having complex and contrasting belief systems that guide and shape their structure (Kezar, 2001). A key contributor for differing belief systems is that university employees encompass academic personnel and administrative staff at different levels and operating in differentiated units. Schein (2004) observes the existence of professional subcultures within an organization. Professional cultures are distinctive for each discipline (disciplinary subcultures), thus creating differentiation within an institution. Unlike bureaucratic organizations, in which power and authority are clearly established, in universities, power is particularly masked. Two prominent levels of power found in these institutions, as described by Kezar (2001), are administrative and professional

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[7] Here-in referred to as IT function /unit /department.

authority power systems. Hierarchical values, bureaucratic norms and structures, power and influence, rationality, control and coordination of activities form the basis for administrative power. The basis of professional authority power is knowledge and emphasizes dialogue, shared power, autonomy, and peer review, thus giving professionals a high degree of authority and autonomy with the understanding that they are accountable to each other.

Hekima, like other universities broadly has two types of employees, the academic and administrative/support staff. The top management such as the CE, Deputy-CE's, campus Principlas', who although academics and emanating from the professional authority category, hold positions that are responsible for both academic and professional managers, and possess administrative power and authority, thereby possessing both the professional authority and the administrative authority power. At the school level, Directors of schools, who are academic managers in charge of the school's academic personnel and academic programmes, and in charge of operations of the schools widely posses professional authority, and use the administrative authority in the day to day operations of the schools. The administrative units at Hekima, such as the finance and central administration units are headed by line function professional managers, whose power authority is essentially administrative.

The distinctive characteristics outlined above provide a unique context to implement IS and are explored in our understanding and explaining the implementation process.

4.3 The Hekima Case

4.3.1 General Information

Founded to provide education and develop necessary work force for the various sectors in Kenya, Hekima has seen growth through expansion of infrastructures and student population. For example over the period 2001-2006, the total student population for the undergraduate grew by 17% in the 2002/2003 academic year, and continued to grow marginally in thefollowing academic years, as illustrated in Table 4-1.

Academic Year	2002/2003	2003/2004	2004/2005	2005/2006
Government Sponsored	10%	9%	-6%	5%
Self-Sponsored	24%	11%	18%	1%
Total	17%	8%	6%	3%

Table 4-1 : Percentage Growth of Undergraduate Student Population (Source SMS)

Over the periods covered by the case study, Hekima has had three CEs who we shall refer to as CE1, CE2, and CE3, respectively. CE1's tenure lasted for over ten years, ranging from late 1991 up to early 2002, after which CE2 took over up to late 2004. Hekima has been undergoing changes to adopt processes and practices that support results based management (RBM) systems. While recognising the management changes in Hekima, the effects of these changes in our study are confined to their impact on the implementation of the student management system.

4.3.2 Structural Changes

Over the 1980s and the early 1990s, due to World Bank conditions that affected various sectors in Kenya, the government drastically reduced its financial support to all universities despite the increasing social demand for higher education leading to difficult financial environment at Hekima. The lack of adequate financial resources led to the introduction of several cost-sharing measures in public universities amongst them the direct payment of fees for various services such as student catering.

The difficult financial environment within which the university found itself during the structural adjustments reforms period (1990- 1999), especially reducing the financial burden of parastals on the public sector budget, resulted in the creation of entrepreneurialism in Hekima through self-induced and market reforms. One such effort was the creation of wholly-owned companies such as the Hekima Enterprise Services,[8] (ESLTD) to raise funds to supplement government funding by harnessing

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[8] We shall refer to the company as ESLTD.

the available human resources and other resources at Hekima. ESTLD is headed by a managing Director, with the mandate to:

a) Identify the resources within the University that can profitably be used for commercial activities.

b) Apply those recourses in the development of commercial ventures where competitive advantage can be gained.

c) Formulate and popularize strategies that will allow the development of a high degree of productivity among the Hekima community.

d) Help, create, encourage and offer support for group initiatives in competence areas of Hekima that focuses on the broader objectives of the company.

e) Promote, coordinate, or provide managerial services for income generating activities within and outside Hekima.

f) Provide managerial services for consultancies, research, production and other income generating activities undertaken by units in Hekima.

One such activity that ESTLTD was involved in the management of was the introduction of self-sponsored programmes, in which self sponsored students were now admissible to Hekima. ESLTD was charged with the responsibility of collecting fees from self-sponsored students. The administrative matters of the self sponsored students were done by the schools and the central admissions and examinations were initially reluctant to get involved without further monetary incentives since colleagues on similar grades were deployed to ESTLD were on better terms as it was a company. The opening of the university to the self sponsored students (fully fee paying students) resulted in a vast number of students enrolling for available courses, as illustrated in the percentage growth in Table 4-1. These entrepreneurial actions enabled Hekima to generate substantial funds and offer higher education to a larger population locked out of public universities, especially at the undergraduate levels, by the limited government sponsorship.

However, a greater challenge in relation to the management of students' records emerged. Unlike government sponsored students whose systems and procedures were well institutionalised in Hekima, at theinception of the self sponsored programmes, there were no clear systems and procedures for the administration of student processes. In the view of Hekima's central administration section concerned with the

tasks of student records, the challenge was mainly attributed to a lack of proper systems of procedures and regulations for this new kind of student, the self sponsored student that varied from one school to another. At the same time, roles seemed to overlap and the process of streamlining the procedures took long to be implemented, while there was conflict of interest in the stakeholders concerned with the administration of the student processes. For example, the admission process for the self sponsored students was initially decentralised to the schools, and there was no central mechanism for updating the self sponsored students nominal roll data, hence creating a lot of inconsistencies and inaccuracies in the data. A central administration's examinations officer said on the matter:

> I think there was no system customized to self-sponsored students...Directors would bring admission lists, give letters and the students are reporting the coming week, there was no period to issue student files...no systems ,no data for these students.

Although Hekima under the requirement by the government to conform to the UIP progam requirements developed a development plan, it was during the 1998/1999 rationalization program that Hekima took steps towards a formal strategic planning for the entire university, using a committee approach. The objective of the 1998/1999 strategic planning exercise was to respond to the emerging financial challenges and the governments' rationalization and right-sizing of staff in public institutions. The exercise led to the retrenchment of some of the non-core staff but other key recommendations did not see the light of the day at that time such as the rationalization of the schools, the re-engineering of business processes, and the offering of some of the student services at cost-recovery levels. As the reforms described in section 4.2 started to be institutionalized, strategic planning was embraced, and as Hekima adopted the use of strategic plans at the university level, campuses and units were required to conform and prepare strategic plans. The IT function prepared a strategic plan document for the period 2002-2006, detailing the need of rationalization of the separation from the teaching department and strategies for the functions and operations for the planning period.

As a consequence of infrastructural growth (described in the next section), a separate unit in charge of computing services was created. The unit, the IT function, was a centralized computing service provision centre, whose mandate was to provide ICT support to the entire university. This as explained by CE2 was guided by the need to have a university-wide service facility to manage growing ICT infrastructure and systems. CE2 also envisioned his action as a means to expand the technical capacity not only to support the infrastructural changes that were ongoing but also for sustainability of future ICT systems. Prior to the separation, the IT function was part of the teaching computer science institute.

4.3.3 ICT Infrastructural Changes

At the beginning of the case study period, in 1996, Hekima's computing environment consisted of two DEC VAX 6310 computers operating in a clustered environment, each having 32 MB RAM, and a total storage capacity of 6 GB, supporting VAX Relational Database tools and software languages that included high level programming languages, such as Pascal and COBOL. The computing environment in addition supported the mainframe-based architecture with dumb terminal sites in some of Hekima's schools. Access to the computer services, centralised at the IT function was through a LAN based on the DecNet communications architecture using thick Ethernet to sites near the IT function and through leased lines provided by a third party telephone network at the speed of 24Kbps to the remote sites.

Around 1998/1999, two sources of funds facilitated the creation of a modern information and computing infrastructure in Hekima. The first source of funds was the Universities Investment Project, a World Bank-funded project that saw the creation of Local Area Networks (LANs) based on the Ethernet protocols in some campuses including the central administration and the migration from the dumb terminals to over 200 personal computers (PCs). The computing environment was upgraded to three Alpha Servers , two of which had 512 MB and one of 128 MB RAM, with a total a storage capacity of 42.6 GB. The software development platform

included the ORACLE[9] database system and oracle client-server development tools such as the Oracle forms and reports. Technical and user training was offered under the project to sustain the installed systems. The second source of funds was from a European Union country government. With this funding, Hekima continued to upgrade its network connectivity in the schools that included the development of a fibre distributed data interface (FDDI) ring around the IT department and schools near it. Connectivity to remote campuses was achieved using kenstream services contracted to a third party supplier, with the speeds of 64 Kbps. Hekima also implemented its first internet connection. Capacity building to sustain the implemented technologies was also a core activity of the funding leading to a differentiated computing environment as compared to the previous periods. Indeed, CE2 viewed the two sources of funds as timely, and Hekima to have been lucky, saying:

> We have had problems earlier when we agreed to support and adopt ICT supported business styles; the first question was where the money would ultimately come from. Hekima was very fortunate to the European Union country government support in the enhancements of ICT, the library, capacity and of course the training programmes for the managers.

By 2000, the information and computing scenario had been transformed from a centralized mainframe computer system with dumb-terminal LANs covering only a small portion of Hekima to an environment with over 1,000 personal computers of which 600 were connected to the university backbone network through the campus LANs. Upgrade to the networking infrastructure continued, and by the end of 2001, connectivity between the IT function, its environs and the central administration was on gigabyte Ethernet, while connectivity to the remote campuses continued to be provided bt third party contracted suppliers at speeds of 128Kbps. The computing environment was also upgraded in the year 2003, to increase the storage capacity to 100 GB disk storage. The enhancements to the infrastructure continued and by the

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[9] Oracle Database (commonly referred to as Oracle RDBMS or simply Oracle) is a relational database management system (RDBMS) produced and marketed by Oracle Corporation.

end of 2004, Hekima had several school LANs connected and remote campuses connected through a wireless wide area network to the central computing services for the provision of internet and intranet services, which included MIS applications, with over 2,000 personal computers. At the end of the case study period, it was observed that Hekima continued to enhance its computing infrastructure through funds generated by the self-sponsored programmes.

4.3.4 Historical Development of IS

The use of computer-based systems in Hekima was traced to the early 1980s. Hekima's application portfolio included systems for admissions (the joint admissions for all public universities), nominal roll, and payroll. The government sponsored students were (and continue to be) admitted through the joint public universities admissions, under the Joint Admissions Board. These admissions are facilitated by use of the board's admission decision support system, the JAB information system, a legacy system, based on COBOL and administered by the IT function, where all computer related processes are centralised. This admission system is integrated to the national examinations results through a file that details the national examination results and bio data, provided by the national examinations council. From the admission's board system, all public universities get a nominal roll portable to their own students systems. Hekima, being one of the public universities also gets its nominal roll for each cohort of the government sponsored students each academic year. However, updates to the nominal roll, although a responsibility to the central administration admissions office, was centralized at the IT function, using the legacy nominal roll system, and later replaced with the SMS's nominal roll module. The national examinations results data has recently been integrated to the self sponsored students' admission process at Hekima, and is used as a source for data validation of the applicants to the self sponsored programmes.

Although in the early 1990s most of Hekima's application systems were COBOL[10] based, there existed a Dbase IV-based course unit registration system. This was a

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[10] COBOL is acronym for COmmon Business-Oriented Language. The language is one of the earliest high-level computer programming languages.

centralized system, run by Hekima's IT technical department of the computer science institute that produced class lists and later course mark-sheets.

The disparate nature of these systems occasioned efforts towards the development of integrated university MIS in the late 1980s and the early 1990s. Students working towards their postgraduate diplomas at the computer science institute did the analysis and design of the intended integrated MIS. These two tasks were achieved, and the design frameworks developed were generic to facilitate the implementation on any RDBMS[11] platform. The students did not implement the frameworks developed due to time constraints. Hekima employed one of the students to pursue the implementation of the integrated university MIS and attempted to implement the design on the main-frame cluster.

Although minimal implementation was achieved for only the human resources subsystem of the integrated university MIS designed, wide use of the subsystem within Hekima was not achieved. The lack of use of the subsystem is explained by five factors. First, computing operations were centralized; all clerical data entry processes were done by staff at the IT department, with the other departments performing only data collection. Second, computing resources within Hekima were minimal, the dumb terminals were few. Third, computing skills in other departments were lacking. Fourth, the shortcomings of the main-frame environment, specifically the RDBMS, made the development of functionalities of the other subsystems impossible and fifth the lack of human resources to pursue the development of the integrated system when the employed student left for further studies.

In the central administration's examinations section, another technical staff member was employed and developed a stand-alone dbaseIV PC-based transcript processing system to produce final transcripts from the manual consolidated mark-sheets submitted by schools, since the course registration system at the IT department did not produce transcripts. Prior to the dbaseIV, Hekima had to typewrite all student transcripts. The shortcomings that were associated with the dbaseIV system included

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[11] Relational Database Management Systems.

accusations of changing of marks and of inefficiency (it took a turn-around time of approximately two weeks for a student to get a transcript on application).

Despite the failure of achieving an integrated university MIS by the IT department of the computer science institute, the IT department continued running COBOL-based applications such as admissions, nominal-roll and payroll subsystems to provide the university with required information on students and staff.

Over time, the computer science institute began to offer the Bachelor of Science (Computer Science) programme aimed at meeting computing development needs in Kenya. One of the key requirements for the undergraduate students continues to be the development of a project in the course of their studies. One student developed a fees-collection system on MS-Access for one of Hekima's schools as part of his studies. The student later implemented the system in the school around 1997 and continued to support the school by making amendments as required. The continued support to the school by the student developer soon became impossible after the student got a full-time paying job. The computer science institute employed four students to boost its technical human resource from the cohort of the BSc computer science students. A fully-fledged MS-Access fee-paying system was developed by the newly recruited students and implemented in two schools in 1998 and later in Hekima's private company, ESLTD.

The acquisition of the new computing infrastructure that we described in the previous section provided an environment for the re-development of all the existing applications systems into integrated subsystems. The re-development of the IS applications was a strategy applied by the Director of the computer science institute to acquire and maintain integrated MIS applications where data was captured, verified and validated at the source with the sole objective of increasing efficiency and effectiveness of Hekima's academic and administrative processes. One such system, SMS, is our focus in describing organizational assimilation of IS innovations in Hekima whose development process we next describe.

4.4 SMS Development Process

4.4.1 SMS Description

The key modules of SMS are nominal roll (with online registration component), fees processing, course registration and examination processing, and integrated hostel administration. Recently, an added functionality has been the provision of capturing admission details for the self-sponsored programmes to facilitate the printing of admissions letters. This has replaced the admission of self sponsored students at the schools level, and regularized by centralizing the coordination of the admission process at the central administration admissions unit. These modules are outlined below.

a) *The Nominal Roll Module*: The key function of the module is to maintain student personal bio-data and the status of the student in relation to academic progression. The module facilitates the maintenance of information that relates to transfers within the schools, the current level of study, whether the student is registered for a particular academic year or a student has deferred studies or has been discontinued from the university. The module enables the storage and updates of the academic progression of students from the time of their admission to their graduation. Data captured or updated via this module is critical for the production of various student summaries such as the total population of students registered in a particular academic year. The provision for the online registration enables the registration of students at the beginning of every academic year and integrates both the fees processing and hostel administration modules. Thus, a student is considered a legitimate student for the academic year upon the payment of fees, which automatically updates the registration status and shows that a student is eligible for accommodation services. The nominal roll for the undergraduate is sourced from the national joint admissions board information system. The admission for the self-sponsored students was integrated to SMS early 2006. The integration of SMS and the national joint admissions board information system is illustrated in Figure 4-1.

b) *Fees Processing Module*: The module deals with students' fees payment in terms of direct student receipts, the updating of students' loans and bursaries where applicable, and the providing of detailed fees statements for all monies received in the students' accounts. Due to differing fees requirements for the two categories of students, the fees processing modules have been customized to enable appropriate billing methods that are aligned to the fees policies.

c) *Course Registration and Examination Module*: All students are required to register for the courses to be studied, and this requirement is facilitated by the use of the course registration module. Students fill registration forms with the course details which are later captured in the SMS application by various schools. This information is used to prepare class lists, course mark-sheets and examination cards. The same information is later used to update and process examination results, facilitating the production of student transcripts.

The degree programmes offered by the various schools have varied examination rules and regulations, hence the need for SMS to have different customizations for each school.

d) *Hostel Administration Module*: Students wishing to be accommodated in the university hostels, mainly the government sponsored students are allocated rooms via this module. Only students who have no fees balances are eligible for room allocation, and only names of such students appear in this module. The student is required to pay accommodation fees, which is captured in this module and proceeds to choose any available room for allocation. Once a room is allocated to a student, a room allocation slip is printed and the student is required to hand in the allocation slip for further services in the hostels.
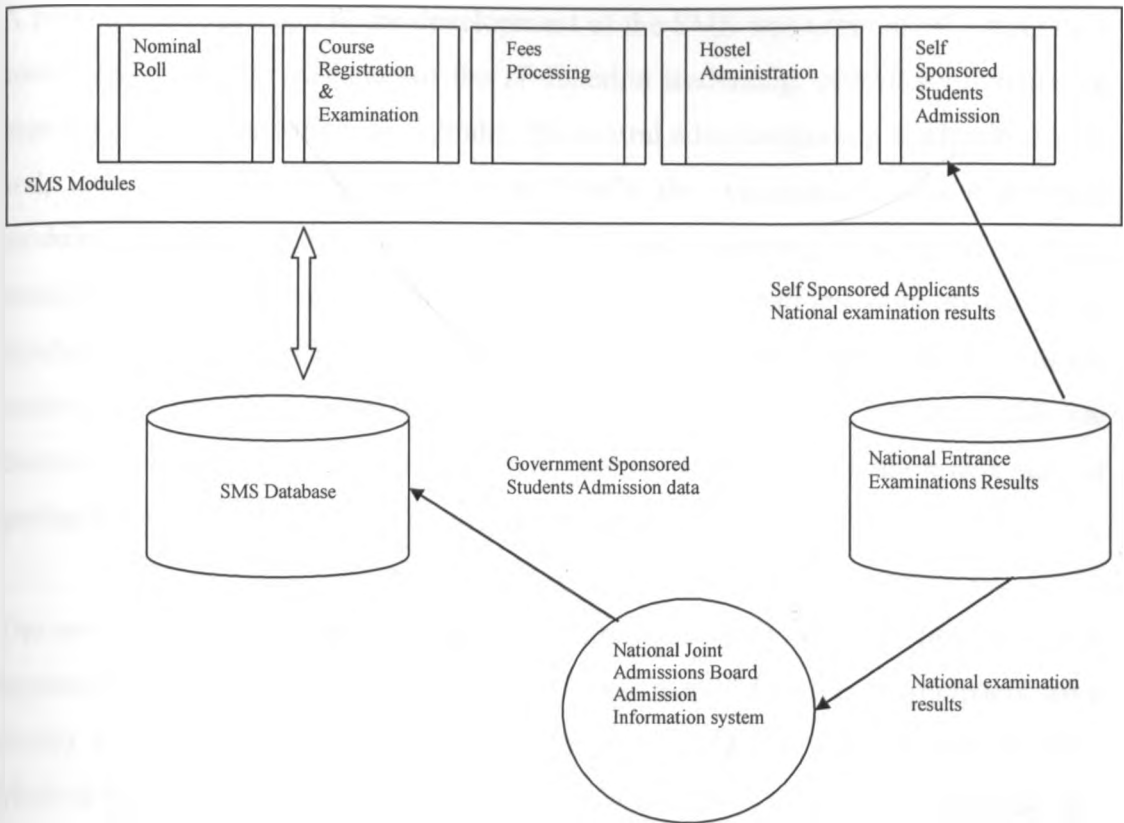
Figure 4-1: SMS integration with the national joint admission board information system

4.4.2 SMS In-House Development (2000-May 2002)

The SMS is an in-house developed application by Hekima's IT function and, as described above, is an integrated relational student management system with four modules described in the previous section.

A documented detailed project plan was not done, and the IT Director explained that the project was planned for three phases, and that the committee involved in the early phases of the SMS development knew the general plan. The *first phase* was for the nominal rolls, course registration, and the production of consolidated mark-sheets at the school level for government-sponsored students. The *second phase* was to involve the individual lecturer who taught a particular course to be part of the system by using the class list produced and entering student marks directly instead of by manual compilation. In the *third, and final, phase*, the plan was for the development of customized solutions for the self-sponsored student; whose financial requirements, rules, and regulations were quite varied across the university.

A participative approach to the development of the SMS was adopted by setting up a committee under the guidance of the IT function leadership; essentially comprising members of user departments—initially, the central administration's academic section and, later, different sub-committees—to handle the requirements of the different modules of the system. From the central administration's academic section, participants were drawn from the admissions and examinations units all under the Academic Registrar's office and the School of Postgraduate Studies (SPGS). For the student fees module, members were drawn from the finance section. This was deemed necessary by the IT Director, who perceived user participation as a way of getting the envisaged users' commitment throughout the process.

The selection of the members was the responsibility of the heads of section; who then appointed participants to the committee. Consequently, the key participants were mostly administrators with the IT staff as the developers and implementers of SMS. Most of the administrators were not computer literate but had a lot of knowledge and experience about the manual processes and procedures followed in Hekima. An examinations officer described his participation thus:

> It was at first quite Greek, IT Director and his team gave us a lot of support, most of us were not computer literate, we had to go through some training and we learnt a lot.

At the start of the project, only one member of the technical staff; who doubled up as the project leader, analyst and programmer, was available; later on, one more developer joined the team. Although the project leader left, this did not affect the SMS development as the IT function had employed more staff. The core developers of SMS in the early years were fresh graduates who had no prior experience with projects of such magnitude. Indeed, the project leader described the experience as overwhelming caused by lack of experience in dealing with users and limited knowledge then. The former project leader summed up the experience:

> I would rank the knowledge I had to carry the task as 30% of what I required. It was like a learning process.

Additionally, the developers adopted the prototype methodology as a means of ascertaining user requirements and enhancing the modules from feedback of the committee members coupled with trying out pilot runs in central administration academic units until the first phase of the system was complete and working well to the satisfaction of the committee. The prototyping enabled the non-technical members to have a feel of what the system would look like in addition to reducing their resistance to the system. By mid-2002, the first version of SMS, an ORACLE client-server application, with the nominal roll and the examination modules was ready for roll-out. Using the knowledge gained from the MS-Access fees system developed earlier, the developers re-developed the MS-Access version to an ORACLE client-server version as a module of SMS and later invited staff from the finance section, appointed by their head of section, for a demonstration of the prototype. During the review meeting of the fees processing prototype, the finance section staff together with the technical developers formed a finance development committee to produce a working module, thus replicating the adopted partnership approach.

4.4.3 SMS Adoption and Assimilation (Mid-2002—2006)

4.4.3.1 SMS Deployment

Earnest deployment of the nominal roll and examinations modules started immediately after their development completion with three key activities: data migration, training, and a workshop held for Hekima's management board and Directors of schools.

Despite the focus of the first phase being on the government-sponsored students, it soon became impossible to differentiate the two types of students in Hekima; hence data migration was done for all students. The data migration included nominal roll data for all undergraduate students and postgraduate students and thereafter continuous updates by the users. For the examinations module, the task of data migration was monumental as the examinations department had only two data entry clerks, and temporary clerks were hired to assist in the data capture. Despite these efforts, it soon emerged that having correct and accurate updates was difficult,

especially due to delays caused by examination procedures in Hekima, coupled by the failure of not capturing the course registration data at the school levels and incorrect or duplicate course codes. One strategy that was applied to deal with data updates was the decentralization of entering course marks at the school level, which was in line with the IT function's strategy of decentralizing MIS operations to users and where data would be captured, verified, and validated at the source. The process is discussed under school adoption in the later sections of this chapter.

The first training was directed to specific users from the central administration who were directly involved with the nominal roll and the examinations modules. This group of users was trained on not only the operations of the modules but also technical aspects of report production using the ORACLE platform.[12] Although the training was sufficient to perform tasks such as updates and printing of pre-formatted reports, the users perceived the training as inadequate as they could not perform minor changes to the data such as change of dates on transcripts before printing and had to keep on relying on the developers. Said one user:

> People said ORACLE is high level but maybe I needed the basics on how to change minor things such as how to change the years from one to another...I might try and then mess the data, yet with some training I could work well.

Training sessions were mounted where all the central administration's academic section middle managers and schools' administrators were trained on the nominal roll and examinations modules. The developers doubled up as the trainers and all training sessions were mostly carried out at the IT function premises or student computer laboratories. In the early stages of implementation, the users trained did not have computing facilities in their offices to try out what they had been taught. As explained by an examinations officer, "Initial training was not adequate; some of us had no access to computers...you could not practise what you trained in the first initial training."

Although the IT function facilitated basic computer literacy training for Hekima's top management, the same basic computer literacy training was not available for the

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[12] ORACLE report production tools used were the in-built reports and query-builder. These tools need some basic understanding of the Relational Database concepts.

envisaged users of SMS. The trainers made an assumption that staff who attended the training on the operation of SMS were computer literate, an assumption that later on became costly. Further, a training needs analysis for the envisaged users was not carried out, leading to a situation that presupposed that the implementers had adequate knowledge on the training needs, or as described by an admissions officer:

> They assumed they knew our training needs, some of these assumptions were wrong. The training was not sufficient and sometimes not relevant as sometimes the supervisory management were trained on the clerical data entry, a task for the operations staff.

Although this training created awareness and exposure for the middle managers, who later on became computer literate, the management role of this cadre of staff was not catered for in the system, or as explained by an admissions officer:

> We would go for training and be taught how to key in data; it is not I who key in the data…Management were not trained how to use management reports. Most of us in management are not using SMS for management reports, to assist as a basis in making decisions, and at our levels, that is what we should be doing.

The third session of training was mounted for all users who would be involved in the first online registration process. Each school was required to appoint persons who were computer literate for the two-day training on SMS operations, and also, all IT function staff was trained to assist the users during the registration process.

Training continued after the first registration process. All middle managers comprising administrative registrars from schools were invited for training in readiness for student course registration in the schools. This training was deemed crucial as the administrative registrars were directly responsible for student records at the school levels. Unfortunately, at the supervisory level the administrative registrars could not perform the updates role and some opted to trained clerks in their schools to perform the updates thereby causing varied results.

Contrary to the views of users on the issue of the appropriateness of the training, the IT function explained it was driven by the need to impart adequate training to perform the next job that included mostly operational work of data entry and the production of pre-specified reports. A scheduled training programme on the SMS was not carried out and, after training support, was also minimal in the early years of the SMS use. As explained by the IT Director and the former project leader, this approach to training was attributed largely to limited human resource; a situation that changed with the added human resource committed to the SMS project.

By early 2003, schools that were lagging behind in the course registration cited lack of updates due to lack of training, staff transfers or commitment were asked to nominate persons to be trained on the clerical data entry operations. SHU took upon itself to conduct basic IT skills training for its entire staff, using available resources within the unit, such as members from the unit involved with the development of SMS, and requesting additional trainers from the IT functions' expanded human resource. On completion of basic IT skills training, the entire members of staff from the SHU were trained on the hostel administration module of SMS.

Training continued to be conducted, especially in 2004, after the redevelopment of SMS using web technologies, with the IT function sending out invitations for the training program. The invitation read in part:

> The team in charge of development of the SMS has made significant changes to the system. We would like users to use it and give us feedback…We shall therefore hold training sessions on the dates shown below.

By the end of 2004, staff from schools that had adopted SMS were fully trained. With a critical population of users trained, training continued to be mounted on demand, on the request by schools.

4.4.3.2 Workshops and School Academic Boards

Hekima's management board and Directors of schools attended a two-day workshop in September 2002. The workshop's objective was to discuss student academic and

financial records management, including the use of ICTs in Hekima. The SMS development committee used the workshop to get critical policy issues discussed and solutions recommended adapted for implementation by middle managers. An example was the regularization of self-sponsored students' admissions to only three intakes a year that eased the management of academic processes in the central administration units. The regularization entailed to admitting self sponsored students in three different sessions only unlike previously where admissions were done all year round. Academic processes and delays caused by schools were also demonstrated during the workshop and their effects on records management demonstrated. The SMS developed was demonstrated and its interactions with Hekima's policies, business processes, and delays in information flows illustrated. In summing up the workshop, CE2 commissioned SMS and asked all schools to adopt SMS for efficiency but no given time-frame for adoption and use of the SMS was issued. The admissions officer explained:

> Once the university adopted SMS, it left options wide open for the Directors... we were told to reach out to ICT....but no specific timeframe, of one year or six months, it has been left open.

The CE further mandated the SMS committee during the 2002 workshop to ensure that henceforth, all students registering in Hekima would do so only through the SMS and all their fees captured.

The SHU held its own workshop in 2003 to educate its members, the workshop doubled as a forum for participation, with a view of gaining commitment to the change initiative introduced by the hostel administration module.

As several other workshops within the university were organized, the SMS development team was invited to present progress and demonstration of the system.

The growth of the ICT infrastructure in Hekima necessitated the devolvement of ICT services to the schools and, in due time, as ICT issues became critical to the schools, the IT function staff were required to attend school academic board meetings to respond to ICT issues. In some instances, where such ICT issues concerned the

management of student records, the IT Project Leader in charge of SMS development would be invited to demonstrate SMS to the board members. The Project Leader would then actively follow up with the Directors of schools met in workshops and management meetings to "sell" SMS to them. Indeed, social relationships created in the course of providing ICT services within Hekima also provided a means by which some users would feel obliged to listen to the SMS "story." The slow response to actively use the SMS according to the IT Project Leader was the perception that the implementation of SMS was an IT function project. He said:

> Users think that it is an IT function project. Therefore, unless you befriend them and become personal, being personal means that they will give some ICT problems that are not related to the system for you to assist them. Without you helping them in their problems, then they will not support whatever you do. So that if you do something for them, even if it is as simple as putting a screensaver, they will feel obliged to do your part.

4.4.4 The Online Registration Process (2002-2006)

The registration process was a three-step process that involved students paying fees in finance offices, and then signing the nominal roll at the school. Students, largely the government sponsored students, wishing to be accommodated in the student hostels would then go to the SHU unit for room allocation on the production of a fees receipt.

CE2 was very keen to have Hekima's business processes, especially services to students, transformed by ICT, hence his mandating the adoption of online registration. Firstly, students' registration, especially at the beginning of an academic year was an important activity as the number of students who intended to study in a particular year was derived from registration statistics. Secondly, the various fees levied to students was collected during this period and in accordance with the policy on payment of fees, only students who paid fees were considered legitimate and legible for services in the university.

However, over the years, this policy had not been adhered to, the university was losing money due to non-payment of fees by students, and, as explained by an examinations officer, SMS was an attractive solution to CE2 due to its capability:

> When SMS was sold to the CE and it was explained that we can actually register a student from the first semester; ensure all fees is collected, be able to check that the student has actually done all the courses they are supposed to, and link academic performance records with fee collection, that solution was a very attractive thing.

Coincidentally, in mid-2002, the Director of the SHU approached the IT function seeking its participation in the development of a system that would enable the unit to register students online for accommodation services and automation of the hostel administrative functions.

A fact-finding team from the IT function was formed with a view of defining accurate terms of reference for the requirements of the SHU project. It emerged that the SHU intended to use the system at the start of the 2002/2003 academic year and coincided with the online registration planned by the SMS team. Based on the facts collected from the SHU, a plan was drawn for the development of the hostel administration application detailing the functional requirements of the application and a work plan. The plan was discussed by the SHU and the IT function in July 2002. In mutual agreement, the two units agreed to form an implementation team to ensure that the system was developed as stipulated in the terms of reference. A project steering committee to guide the overall project and ensure that the system was ready for use by October 2002 was formed. The key objectives of the system were to automate room allocation at the point of student registration and fees collection for allocated rooms.

The implementation team comprised halls officers from the SHU and system developers from the IT function while the steering committee comprised the heads of the two sections and three members from the implementation team. The system was based on the client-server framework and was developed on the same platform as the SMS, which facilitated its integration into SMS. Overall, the system was developed in two months, with only two weeks for acceptance testing and user training before

going live. The halls officers who were part of the implementation team performed acceptance testing, and training was mounted one week prior to the first online registration. The commitment and ownership by the SHU, led by their Director made the development of the hostel administration module to be completed quickly.

4.4.4.1 First Online Registration

The IT Director and the members of the larger SMS team were key in the preparation for online registration with active involvement of the CE, Deputy-CEs, and administration registrars. The Deputy-CE (Academic Affairs) chaired all planning meetings while the CE and the Deputy CE (Administration and Finance) facilitated the procurement processes for the necessary facilities required for the registration. Items which were required on short notice included routers, printers, computer accessories and consumables. The parallel development of the network infrastructure funded by the European Union country government included the purchase of computers, and therefore all computers that had been purchased were made available for use during the registration. To facilitate the registration process, registration centres were prepared in the different campuses all connecting to a centralized ORACLE RDBMS Server. Although Hekima's network infrastructure had not been widely implemented by 2002, temporary standalone servers were provided for the campuses not connected to the intranet and modalities for data migration to the centralized database put in place.

Hekima's first change from manual student registration to automated online registration occurred in October 2002. The registration process necessitated the updating of the students' records via the nominal roll module once a student had paid all the required fees, after which students wishing to be housed by SHU proceeded to be allocated rooms via the SMS. The receipting of fees paid was done manually and students' record updated on site to reflect the amounts paid.

A review meeting by key stakeholders followed; it identified key problems experienced, actions taken to solve the problems and recommendations for future processes. Four factors that affected the effectiveness of the registration process emerged during this review meeting. Firstly, the training of users was inadequate,

especially for users who had little exposure to computers, while at a number of registration centres, persons who had been trained were not deployed for data capture; leading to quick unplanned "on-site training sessions" as the persons were serving students. This inadequate training contributed to instances of erroneous data being captured, attributed to lack of confidence in data entry processes. Consequently, there were errors in the nominal rolls that were corrected after the registration exercise. Secondly, data inaccuracy and anomalies especially concerning the nominal roll, fees balances, and housing rooms was either not available or wrong, causing long queues of students waiting for the registration service. The data inaccuracies were caused by disparate data banks within Hekima thus requiring migration of student fees history from existing systems, such as an old financial system at the finance unit to the centralized ORACLE RDBMS. Thirdly, policies concerning fees payments from the staff support fund and for self-sponsored students were not clear to the users, while admissions for self-sponsored students in some schools had not been completed, thus delaying the student registration service. Fourthly, system errors in the hostel administration module and demands for reports not catered for by SMS necessitated "on the run" coding. The manual receipting caused delays in data capture while some cashiers were not capturing data on site hence rendering some reports inaccurate.

Four key recommendations identified by the stakeholders, which were to be implemented in the course of the year before the next online registration process, were shared out to the responsible accounting officers and units. The first recommendation was the scheduling of training for all of Hekima's administrative staff in the central administration units, the SHU, and schools. This training was aimed at upgrading users' skills in using SMS. A second recommendation concerned data verification and validation in the nominal roll and fees records by the schools, bursars and the SHU to enhance the reliability of reports produced by SMS and to ensure data stored in the SMS was done. The third recommendation was that the SMS development teams were tasked with enhancing the system quality by ensuring that elaborate testing was done with errors highlighted corrected and adding functionalities such as receipt production. The fourth recommendation was the production of a circular, detailing the fees policy, and circulated on various notice boards, thus ensuring the university community was aware of the policy.

Overall, the stakeholders perceived the online registration process successful, as noted in the review meeting minutes:

> The exercise was successful despite the short notice to roll out—all concerned rendered the necessary facilitation and support.

However, despite the perceived success, the exercise exposed shortcomings in the training, especially for people who had little exposure to the use of computers. Additionally the state of ICT readiness by the staff and the organization was put on the spot by the many data errors due to a lack of user confidence and missing and inaccurate data. Further non-adherence to admission policies and rules as observed by missing self-sponsored students' records and non-availability of accurate data displayed the interaction between procedures and the effective working of SMS to have the desired impact in Hekima. Resources especially PCs acquired to facilitate the registration process, were distributed to the campuses to enable continued data capture, validation and updates into SMS.

4.4.4.2   Second Online Registration

The second registration took place in October 2003. Prior to this event, the recommendations discussed in the previous section were implemented. For example, improvements especially concerning fees collection and the enhancement of SMS functionality had been done. Around mid-August 2003, the first planning meeting in preparation for the annual online registration was held and chaired by the Deputy-CE (Academic Affairs). Discussions on the requirements in the various registration centres and the schedule of activities and responsibilities prior to and during the registration were deliberated and agreed upon. Training for a period of one week was scheduled and all the schools, the finance section, and the SHU were requested to ensure that staff deployed to serve students had been trained. Once again, especially for the fees collection module of the SMS, users perceived the training as inadequate due to the short period just before the registration exercise, as a finance staff said,

...it was more or less of a decree from above that all fee collection will be handled through the SMS, and people were rushed in the last two or three days before the students reported for training.

This decision to phase out manual receipts was a result of the demonstration of SMS to Hekima's management, a decision made very close to the registration period.

A mock registration exercise to give users the confidence in the role they were to play on the actual registration day was planned for due to the postponement of the reporting date of the students, thus giving users an opportunity to test their readiness. The idea for the mock registration was recommended during the planning meeting for the registration exercise.

While the users were relatively prepared, technology resources marred the second registration exercise. The system's constant failure, slow server response and poor network communication links between the far-off campuses and the central network services had a negative effect on the registration process. Some registration centres reverted to the manual processes and data was keyed in later into the system once all the technical problems were cleared, while other centres preferred to continue with the online registration albeit at a slow pace, necessitating patience from students. Contrasting the reactions of new students and continuing students, the new students were patient with the systems as the technical hitches were solved. Compared to the new students, the continuing students who reported a week later, tried to resist the new system, a reaction that was not anticipated. The continuing students were not cooperative when they realised that the system would instantly give fee balances, especially for students' accommodation dues, a situation they would not have preferred. These students were happy with manual systems because they could continue with fees balances and, as had been the case, some would never pay the fees balances in full. The new mode of fees payment that was through the bank, even for SHU, complicated the exercise but the determination of the SHU officers to institute the computerised allocation of accommodation saved the day.

4.4.4.3 Third Online Registration

Before the third registration in November 2004, three planning meetings chaired by the Deputy CE (Academic Affairs) were held in August, October and November just before the registration.

The August meeting was a review of the 2003 registration and progress made towards solving problems that had been encountered were discussed. The solutions included the creation of fees collection accounts for students, the opening of registration centres two weeks well in advance, and clear instructions regarding fees payments communicated to the students before their registration. In addition, each section was reminded of their roles in SMS especially in regards to data updates. The SMS was reported to have been improved by migrating from the client-server platform to a web-based platform. The web-base platform was considered more user-friendly and an easier interface to learn. Training was scheduled and conducted, and a mock registration performed in early October 2004.

The October meeting was a review meeting of all the activities, roles and the results of the mock demonstration. Progress on the upgrade of servers and the network connectivity within the campuses was reported. It emerged that the mock registration was not taken seriously and the Deputy-CE (Academic Affairs) ordered a repeat of the exercise citing its importance on the indication of preparedness levels and providing of an opportunity for possible problems to be solved well in advance.

The final planning meeting was held in November 2004, a few days before the registration process.   The success of the mock registration which took two consecutive days, increased confidence in the users and tested the newly installed upgraded servers and network connections.

The third registration exercise went on smoothly with the participants and the stakeholders perceiving it the greatest success ever in using the online registration process and marking a milestone achieved by Hekima (the migration of manual registration to computerized registration processes).

4.4.4.4 Fourth and Fifth Online Registrations

The fourth registration took place in 2005. Planning meetings continued to be held and were chaired by the Deputy CE (Academic Affairs), with each stakeholder accepting and reporting on their roles. The exercise started two weeks prior to the opening dates to control long queues while fee payments continued to be done through the bank with Hekima downloading the payment details into the SMS. User issues that were initially problematic such as data errors and lack of user confidence were no longer visible. Further, the assimilation of the registration exercise by all the stakeholders had been achieved.

As the university continued increasing its voluminous data in the available ICT resources, the fifth registration, that took place in 2006, displayed the need to enhance its technical capacity. The registration for fresh students went on smoothly while for the continuing students, the system response time was slow. The automatic calculation of fees balances to reflect the real-time position of student balances was cited as the reason for slow response times occasioned by the limited capacity of the servers which provide centralized services for all MIS applications for the entire university. This technical hitch necessitated the IT function, charged with the responsibility of advising and implementing appropriate technical solutions, to rethink its production server capacities in an effort to improve ICT services given that the computing infrastructure was at the end of its useful life having been implemented in 1998/1999. In addition to infrastructural capacities, the server services' availability with minimal disruptions was critical to ensuring efficient services.

4.4.5 SMS Adoption in Central Administration and Student Housing Units

4.4.5.1 Adoption at Central Administration

The central administration middle management officers were involved in the development of the SMS and hence adoption and use of the SMS was more acceptable. This acceptance was mainly because the middle managers, especially the admission, examinations, and finance officers had been exposed to the benefits of

computer systems from the earlier versions of COBOL and dbase IV systems. Further, the finance section was running computerized payroll services.

The finance section, driven by the need to produce accurate financial reports concerning student fees, continued to work with the developers towards improving the fees module immediately after the first online registration. This included counter-checking fees transactions against the manual receipts for accuracy, the development of the necessary functionalities, and the training of the section. The collection of fees for government-sponsored students was under the central administration's finance section. The Finance Officer, who headed the section, not only was conversant with computer-based applications but also was required to produce financial reports related to students' fees. This background provided an environment in which the Finance Officer took over the championship of the fees processing module with ease. By July 2003, he was spearheading meetings concerned with the module.

One of the key changes introduced was the collection of fees through banks. Some banks levied charges to the students for depositing fees through their banks, and the charges levied by the banks were not acceptable by the students, who preferred to pay no other costs above the required fees. Tthe process of reconciling the payments became cumbersome, using manual reports from the banks. The Finance Officer facilitated the process of opening fee collection accounts with one local bank that provided a secured mechanism of downloading payment transactions from the banks directly to SMS. He also ensured that the finance staff could log to their respective bank accounts and download student fee payments, thereby facilitating a more reliable financial data reconciliation process. This mechanism provided the adoption of the receipting module as it reduced data errors and lessened data entry operations by the finance staff.

The Finance Officer was also directly involved in ensuring that all functional problems experienced after the introduction of the receipting module were handled amicably and all reports designed and generated by the fee module implementation team were satisfactory and useful as inputs into his financial management reports. His involvement and commitment was evident in a meeting he chaired, called after the second registration and attended by the IT development team, where the heads of

finance in the various registration centres narrated their experiences, especially with the slow server response time, which forced many sites to revert to manual operations as a result of long queues of students waiting to be registered.

The finance section users further noted that familiarization with the system and commitment to SMS was needed for the module to be a success. One campus was singled out for not using the system during the whole exercise and by March 2004 had not updated fees transactions. It later emerged the campus finance officer was using MS-Excel sheets that could not print student statements, which students were requesting. The IT Director pointed out that the fees subsystem was a collection module and not an accounting system, as most finance members were interested in accounting capabilities, which was being handled by a different committee.

Although initially after the introduction of the online receipting there were some users who preferred the manual receipting, it soon dawned on them that their supervisors' and indeed the top management's need for reports on collection of fees as the registration of students was ongoing and the students' demand for fees statements would not allow any excuses. By the end of 2004, all finance officers in Hekima were using the fees subsystem and, by 2005, were very well versed with the fees subsystem and used the system for fees transactions. As observed by the SMS Project Leader, this single module was quite successful; he attributed this to users achieving immediate tangible benefits—more funds collected. The Figure 4-1 gives a summary of student fees collected, which the finance staff attributed to the increased collection and reduced student debts, attributed to more efficient fees collection systems using SMS. However, there was also increase in the enrolment of students at Hekima as shown in Table 4-1.
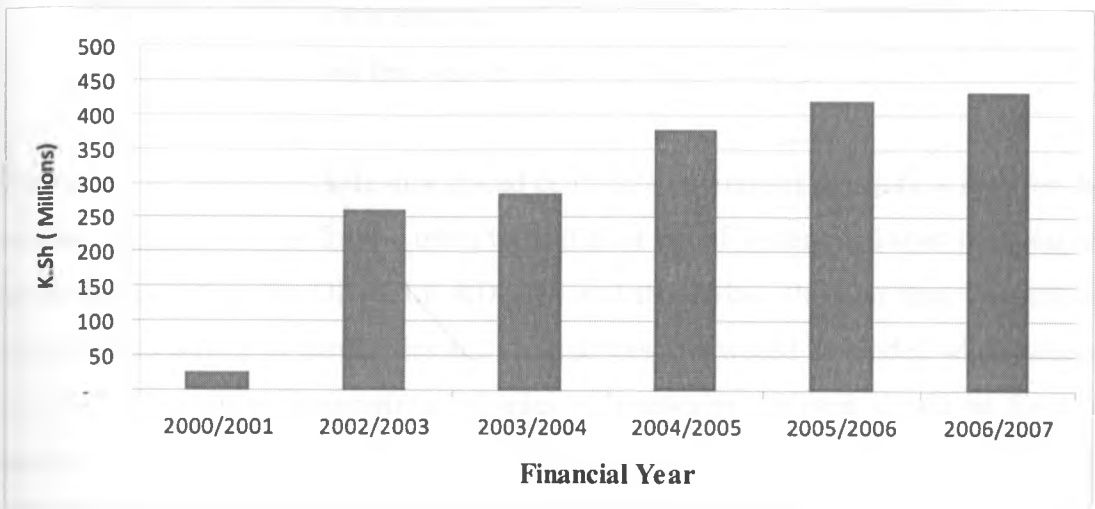
Figure 4-2 : Tuition and other Fees Income (Source: Finance Department)

The initial adoption of the academic modules (Nominal Roll, Course Registration and Examination Processing) by the central administration academic section was more acceptable due to the involvement of most administrators, except the head of section, the Academic Registrar, who was not very interested in the whole process. The function of updating the nominal roll by the admission section was initially resisted due to a change of roles. The role had been performed by the IT staff but the change was necessitated by a strategic change, driven by the IT Director, of ensuring that data was captured at the source. The admissions administrators on their initiative later pushed for more functionality for dealing with self-sponsored students' admission letters within the system, a functionality that had previously not been catered for.

The examinations section, despite having been involved throughout the development of SMS was more sceptical. For a start, the system introduced changes in the work roles of the section, in which the section was required to relinquish data entry of student marks to be done at the source, the schools. The concept did not settle well initially, but on realization that the section was not going to cope with the amount of work and the immediate benefit to their workloads, the changes in role was acceptable. One examinations officer said:

> One of the things which made us sceptical on this was the data entry of the
> marks, from time immemorial the marks would come here and we work on
> them ourselves. Nevertheless, later it emerged that with the large numbers of

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data from the schools and we only had two data entry clerks, we were not going to manage and that was the only way out.

The notion of data being safe in a shared centralized computer was a new idea for the section, and it took time for the users to shift their belief system and trust the security mechanisms within the ORACLE RDBMS and the SMS. Prior to this, the section stored marks offline as hardcopies and on diskettes that would be loaded when needed for the production of transcripts. Copies of transcripts printed would be kept in student files and stored in the archives. One examinations officer narrated his experience:

> In the beginning there was a lot of fear that when the transcripts are done on the computers, people would be changing marks.

Unlike the fees processing module which was adapted and owned by the finance section wholly under the guidance of the head of section, the Finance Officer, the academic modules of the system (Nominal Roll, Course Registration and Examination Processing) were not owned immediately by the head of section, the Academic Registrar. While the Academic Registrar sent his immediate deputy and senior administrators to the development committee and various meetings concerning SMS, his participation and ownership of the process was clearly missing. One admissions officer blamed the slow pace of implementation of additional requirements to the lack of participation of his boss and summarised the problem thus:

> Am sorry to say the leadership should be going down and monitoring this, looking for difficulties experienced and improvements. As far as I am concerned in SMS, especially from the academic division it is a problem.

Interviewees had various explanations for the observed lack of leadership by their boss. Some participants attributed it to his personal character, while others were of the view that he was about to retire and had never used computers directly despite having one in his office and, therefore, he was not interested in SMS. Despite the leadership gap, the SMS operations in the central administration's academic department continued to be championed by the middle management who rose up the

ranks and are now in charge of the section. The section's adoption of SMS has not only made its work easier but resolved student unrest that was normally associated with delays in the production of their results. This was explained thus by an examinations officer:

> It has made our lives easier and we do not have those rowdy crowds. The students from School A used to make a lot of noise, run to the CE; it was chaotic; we do not see these things anymore. One time we were waylaid by students and we had to work late and we were almost ambushed by rioting students. So those scenes are at least behind us.

4.4.5.2 Adoption at Student Housing Unit

The hostel administration module of the SMS was developed with two key objectives. Firstly, to allocate student accommodation rooms at the point of student registration and deal with the double allocation of rooms that was persistent due to manual processes. Therefore, by achieving the objective, the SHU would control the rooms in addition to having access to statistical information about student accommodation activities. Secondly, to collect fees for rooms allocated. There was no uniform method for paying fees for the rooms, as it was paid at the SHU's offices located in the various campuses while other students paid for the rooms together with tuition fees. The revenue collection for allocated rooms was not efficient and refunding students for overpayments was problematic, especially in establishing if the refund was genuine. Similar to the collection of other fees at Hekima, payment procedures for rooms was changed in the course of implementation of SMS, and all such payments became only payable through deposits in a specified bank account

On the completion of the first registration, it emerged that the SHU had not captured all the necessary data, and it was observed that the finance personnel from the SHU were reluctant to update data from the manual receipts that they had issued. A meeting between the IT function and the SHU immediately followed where problematic areas as experienced by the unit's users were discussed. These areas included enhancement of the subsystem, the verification and the capture of data, and the resistance by some unit users (the halls custodians and finance staff). One SHU

officer explained that the resistance by some of the staff was related to fraudulent activities using the manual operations but would cease with the computerisation of room allocation. To cater for the immediate need of data verification and capture, a temporary data capture centre was created at the SHU's headquarters and all users were required to update their data using these facilities. Two key members of staff, who were extensively involved in the development of the subsystem provided data entry support and ensured all problems with the data were solved. The head of finance in the SHU was incorporated in the implementation team with a view of mitigating resistance from his section. The resistance was viewed to be a result of non-representation of the section during development of the hostel administration module. A workshop was proposed to sensitise all SHU staff about the hostel administration module.

In mid-2003, a workshop for all staff from the unit was facilitated by the SHU Director, who shared the vision he had with the staff while the IT function participated in demonstrating the system, its benefits, and the role of information flow in the system and in the unit. The Deputy-CE (Administration and Finance) urged the staff to inculcate integrity in carrying out their duties and warned that disciplinary measures would be taken against any person found to be involved in fraudulent activities. Two key recommendations that emerged from the workshop and later implemented were the training of all staff in basic IT skills and the ownership of the hostel administration module by the unit. The unit Director actively participated in and supported the training by according resources, especially financial resources, for the procurement of the required materials and later motivating trainers by paying them some allowance.

As the training was going on, technical enhancement to the hostel administration module was also progressing. By the third online registration the performance of the module was acceptable to the users. All the operations and queries of the SHU were handled by the unit's two members of staff involved in the implementation of the module and only escalated for technical support if not solvable at their level.

To facilitate the second registration, the unit took upon itself and increased its computing resources, especially printers and computers, which were later distributed

to various offices within the unit for continuity with the hostel administration operations. By the third registration, the unit had expanded its computing resources, and also due to the expansion of the university's network infrastructure, and piloted the use of the system from the comfort of its headquarters. From the success of the third registration, the SHU adopted the use of wireless technology during the fourth registration, creating more registration sites resulting in efficiency in its operations. One SHU officer viewed the system as a better tool for working and said, "It has reduced the headache of planning and the process of room allocation." He was happy with the results of the implementation thus far, despite the challenges. He viewed three key consequences of the implementation as important to the SHU. These included the increase in revenue collection at a rate of 99%, full utilization of declared bed spaces and the ease of access to analytical statistics. In addition the integrity of the declared capacity was enhanced by SMS

4.4.6 Adoption in Schools

Once the first registration was done, schools were expected to capture student course registration data that would be used to generate necessary examination reports, such as class lists, examination cards, individual course mark sheets, and consolidated mark-sheets, through the course registration and examinations processing module. The adoption and use of the course registration and examination processing module at the schools was a slow process and was characterised by some schools being early adopters and others later adopters. We describe the adoption and assimilation processes in three schools, School A, B and C.

4.4.6.1 School A

School A had always lagged behind in the processing of examinations, and hence the course registration and examinations subsystem was crucial in operations at the school. Reports from the data migration exercise carried out to facilitate the initial deployment of the course registration and examination processing modules indicated non-availability of data due to non-submission to the central administration's examinations section. In the early developmental stages, the school was identified as one where piloting would be done due two key factors. One, the school had the

largest number of students; approximately 30% of all Hekima students, and, two, the school's students were edgy on the delays of examination results. The previous SMS Project Leader, responsible for development of SMS indeed sought to assist in the collating of the available marks to Excel format for migration. While initial visits to the school were welcomed by the administrators, the Director of the school was not supportive of any efforts. On realization that some student marks had been migrated to SMS, the Director barred the SMS Project Leader from visiting the school offices and access to the computer for SMS-related work was subsequently denied. Efforts to put more computers in an available room where staff would work on the students' data were thwarted by the Director, who locked up the room. The resistance by the Director later emerged to have been driven by the motive of engaging a private contractor to do the computerisation of students' records in the school.

However, by May 2003, the school was under new leadership and through interactions with the school staff, the new Director got to learn about SMS and made further enquiries from the IT function about SMS. That marked the turning of events in the school and paved way for a deliberation meeting between the SMS team and the school in May 2003 that charted the way forward for the SMS implementation in the school. The Director described his motivation for adopting SMS as a tool to run the school more efficiently and provide students with results. The inspiration for use of SMS was also necessitated by the transfer of the school administrator who was well versed with the practised examination rules and regulations and that were not documented, making the task of dealing with student records more difficult for the Director. At the same time, the Director realized that the huge challenges in dealing with manual procedures were an enormous task especially with the increase of student numbers as illustrated in Table 4-2 below.

Academic Year	2001/2002	2002/2003	2003/2004
Government-Sponsored Students	2,491	2,769	3,136
Self-Sponsored Students	1,590	1,672	2,073
Total	4,081	4,441	5,209

Table 4-2 : Undergraduate Student Enrolment in School A (Source: SMS)

A working team comprising staff from the school and the IT unit embarked on data migration and validation while the Director of the school facilitated the process by motivating his staff and providing resources such as the creation of a student records' office where students' data-related activities were carried out using shared resources. Although computing facilities initially were not enough, this did not deter his efforts to be efficient with the meagre resources. He said:

> We did not have enough facilities and even now we do not have enough, the school is not completely networked and the computers are not enough. However, I did say that we must make a start with the few facilities that we have.

The users at the school gained additional training and support as they worked with the IT staff, hence gaining more confidence. These initial efforts were geared towards government-sponsored students, and transcripts for the school became easy to produce lessening off students' pressure on the Director and Hekima's management, and subsequently reduced tendencies of chaos by the school's students because of late examination results. Despite this advancement, the Director soon realised anomalies in the self-sponsored students' records, which were not as streamlined as those of the government-sponsored students. The production of examination results for this group of students was rather problematic and inefficient as indicated in part of his memo requesting for a solution. We quote from the memo:

> We are concerned that the self-sponsored examination records are not as streamlined as those of the other students....I strongly recommend that IT function staff closely works with the school staff to develop a programme that will urgently correct this anomaly....This will go a long way in sorting out the problems being currently experience in the preparation of both provisional and official transcripts.

Although the IT section was waiting for an opportune time to develop a strategy to handle self-sponsored students' records as the third phase of SMS development, the request from the Director could not be turned down as the success of his school was boosting the SMS implementation. Rather, the IT and the school's staff developed a

solution that was acceptable and workable at the school, one that later became the prototype for self-sponsored students' records management. As tangible outcomes from the system emerged, that is, the preparation of provisional and official transcripts for all students in the school, the Director requested for additional functionality, an examination timetabling option, which was beyond the scope of the students' records' management system. The Director was unhappy with the non-implementation of his new requirement.

Nevertheless, resources and human-related problems affected the examinations process and hence reflected in the timeliness of report production. Key among them were delays in the submission of marks from the departments, partly due to the examination process itself that required chairpersons of each department to get results from each member of staff and collate the results for onward transmission to the Director's Office for further processing through SMS. The Director expressed his experience, saying: "Sometimes you find a chairperson who is not able to actually do their work in the department and that delays us."

At the departmental level, lack of resources, especially PCs, made the implementation efforts slow. To enhance the process, the school planned to acquire more PCs for distribution to each department for the purposes of consolidating students' records at that level.

The turnaround of the school, from being inefficient, to a situation where results were available at the end of each semester, something the school had never done before, was a major achievement. The use of SMS in the school was now considered a normal practice, with the manual ways replaced. The examination rules and regulations for the school were incorporated into SMS, and facilitated the production of the final year students degree classification report that eased decision making on the list of graduands by the school's board of examiners. That SMS had transformed the school from being the worst performer in conveying examinations results at the Senate level to being a shining example to be emulated was a success for the Director. Indeed in a workshop held for Hekima's management board and the Directors of schools in 2004, the school was commended for its achievement.

4.4.6.2   School B

The implementation efforts of SMS in the school started early 2003. The school is located in one of the separate campuses of Hekima, about fifteen kilometres away from the IT function. The school was not connected to Hekima's intranet. SMS operations were achieved by the use of a standalone server where data would be migrated to the centralized servers every two weeks by the IT department. By March 2003, students' records after the first registration had not been updated and the school administrator reported lack of staff to manage students' records. The lack of trained personnel to perform data entry and updates was explained to be a cause of inaccurate student records at the school.

The non-use of SMS prompted a meeting held in May 2003 and attended by the school's Directors, administrators, central administration's examinations staff and IT staff. It emerged that all the schools in the campus had lagged behind in terms of ICT operations and especially the use of SMS. While hardcopies of the consolidated mark-sheets had been forwarded to the central administration examinations unit, the same data was not available via the SMS. Minimal progress in students' examination record updates had been achieved despite efforts to avail computing resources (three PCs had been connected to the standalone server for students' records; the finance office used the same server to update fees transaction). There was general lack of enthusiasm about ICT and SMS, and therefore not much progress in use of SMS had been made until late 2004. As explained by the chairman of the campus examination secretariat, the lack of use of SMS was because there was no interest in SMS, and the school's leadership did not champion use of SMS. Also the beliefs that the academic and administration functions were unrelated contributed to the lack of interest in SMS at the school. He said:

> The computers and server were there, nobody was interested, there was no champion. We are de-linked, the academic side and the administration. We do not see how we can work together and we have never had a session in the university to tell us we depend on one another...Actually, the academicians have nothing to do with the administration of marks after handing over marks

and administrators have nothing to do with academicians, yet have so much that they can do together. That is the problem in the university.

Towards the end 2004, graduation of students was around the corner, the school had changed leadership, with a new Director. John[13] an academic member of the school was appointed to coordinate the generation of the graduation list, which was normally done manually. As was tradition in the school, he was handed over manual files to extract names of students eligible for graduation. John was exposed to ICT and after realising the data on the standalone server was not updated and the staff trained could not manipulate the ORACLE database, contracted an external consultant to assist in the exercise and recruited clerical staff to key in the data in MS-Excel, thus forming an examination secretariat that he headed. The contractor was not up to the task and had to constantly engage technical staff from the IT function to assist in the accomplishment of the task within the short timeframe in trying to design and develop MS-Access version of transcript processing. All data that had been captured in MS-Excel was transferred to the ORACLE standalone server after the graduation.

The IT staff involved gained knowledge of the rules and regulations which they embedded in the newly enhanced web-based SMS in readiness for the school's migration from stand-alone operations to centralized online operations. By February, 2005 the development of the infrastructure in the campus had advanced and was now connected to Hekima's intranet. In addition, the IT function SMS development team had continued testing the customized examination processing module and was confident that it was working well for government-sponsored students and self-sponsored students. A campus-level stakeholders' meeting was held in the same month and recommended the migration of SMS operations from the stand-alone server to the centralized server. This marked the adoption of SMS at the school, with all data in the MS-Access migrated to the centralized server, from which transcripts were printable from the central administration's examination unit, and user training was scheduled.

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[13] Names used in the case are fictitious

The initial user response to the withdrawal of the standalone server was met with complaints of erratic connections to the central servers and fears of data loss. These complaints were inconsequential to the adoption process since the performance of the wireless connections was enhanced and data assumed to be lost was uploaded and made accessible.

The consultant, through John, sought to have the contract extended and the same approach used for the other schools in the campus. The consultant's intentions were in conflict with Hekima's already developed SMS, and because the campus was connected to the intranet, the excuse of lack of ORACLE knowledge was no longer valid because the user interfaces did not require high technical knowledge. However, an alternative approach to the proposal was the hiring of temporary clerks to capture the data directly onto the SMS, thereby saving Hekima unnecessary expenses.

John in liaison with the IT department coordinated the training programme not only for his school but also for the entire campus in the use of the course registration and examinations modules of SMS. On the completion of the training, data cleaning and verification followed, with the ICT centre providing on site support, until the users from the school gained confidence in the use of the system.

By the end of October 2005, School B had adopted SMS, and despite the transfer of John to another school, the examinations secretariat he had formed, under new leadership continued to use the course registration and examinations processing modules, which made transcript production by the central examinations unit efficient.

4.4.6.3 School C

Similar to the schools discussed above, adoption of SMS in School C was traced to the late 2002, where course registration was to be done soon after the first online registration exercise. School C is located in one of the separate campuses of Hekima, approximately twelve kilometres from the IT function. Unlike other schools in Hekima, School C maintained a variant of the central administration's examinations dbase IV application for students' records. The existence of the dbase IV at the school was for the reason that one school member, Njoroge, had worked at the central

administration as an administrator prior to changing careers and transferred to the school. Njoroge, in addition to teaching, was appointed as the Examination Officer at the school responsible for ensuring that all student examination records were accurate and up-to-date and consolidated mark-sheets for the school were submitted to the central administration's examinations unit. By early 2003, progress in the course registration was minimal and a lack of enough staff was explained by the school administrator to be the root cause, or as quoted from the minutes of SMS meeting held early March 2003:

> The school reported lack of personnel to do the work. There was only one person who had been doing the work and the workload has been a lot for him. The school recently got some three persons on attachment and were going to help in the exercise.

Although the Director of the school, Mutiso, was interested in SMS his term expired before much was achieved and the school continued with its operations in dbase IV during the tenure of the newly appointed Director. During this period, resistance to migrate to the university-wide examinations system was done mainly by Njoroge. Njoroge used the inadequate infrastructural facilities between the centralised IT function and the school as the main reason for continued use of the dbase IV application. Njoroge expressed that the slow network speeds would affect efficiency and being in charge of examinations records, considered the dbase IV that he was in charge of was serving the school adequately. With no tangible support from the Director, the implementers shifted their attention to other schools, until there was change of leadership in the school.

Mutiso was re-appointed to serve again as the Director once again in 2005. The public outcry by the students, especially the self-sponsored students, who were now the majority in the school as shown in Table 4-3, coupled with the introduction of the RBM systems seemed to have driven the Director to press for the adoption of SMS in the school.

Academic Year	2002/2003	2003/2004	2004/2005	2005/2006
Government-sponsored Students	1,244	1,267	1,213	1,234
Self-Sponsored Students	2,420	1,856	3,085	2,860
Total	3,664	3,123	4,298	4,094

Table 4-3 : Undergraduate Student Enrolment in School C (Source: SMS)

Mutiso formed a coordination team to ensure migration to the university-wide examinations system. The team comprised Njoroge and three IT literate lecturers from the school. John had been transferred from School B to School C and was invited to the team to share his experiences and assist where necessary. John observed the initial resistance to migrate by the school as related to the general averseness in the university, and the existence of the dbase IV maintained by Njoroge. Said John:

> One chairman came commented...you people (in reference to the coordination team) it is four years since you said you were using dbase on temporarily basis. When I asked why they have not shifted to SMS, they started giving excuses, saying...oh we cannot risk moving, there is a lot of risk averseness amongst ourselves. If something is working, we do not want to move. That is the problem of parallel implementation.

The coordination committee and the IT function staff deliberated migration from the standalone dbase IV system that had become inefficient, especially in the production of consolidated mark-sheets for the self-sponsored students, the larger proportion of students in the school. The larger team agreed on a programme of activities that included data migration, training, customization of the examination subsystem incorporating course rules. Trainees nominated by School C received an invitation letter from the Director, with a clear message of the school's intentions of changing the processing of students' course records. The letter read in part:

The school intends to migrate students' records to the university wide SMS. To achieve this, various groups of employees are to be trained....The schedule of those to be trained is as follows....Please arrange to attend and be punctual.

After attending the classroom training, onsite support for the users was provided as users continued to use the system, until they were confident. By the end of April 2006, the school had fully adopted the SMS for course registration and examinations processing for regular and self-sponsored students.

4.4.6.4 ESLTD

ESLTD in conjunction with Hekima's schools spearheaded the introduction of privately sponsored programmes, referred to as self-sponsored programmes, and described earlier in section 4.3.2. The ESLTD's core function in this endeavour was to collect fees from self-sponsored students, while the government-sponsored students' fees continued to be managed by the central administration's finance section. These fees collection activities were managed at the ESLTD headquarters.

When the self-sponsored programmes were introduced at Hekima, specified/streamlined procedures concerning the processes of admissions, fees payments, course registration and examinations processing were non-existent, leading to a chaotic student records scenario, where it was difficult to trace when a student was admitted and what courses were paid for, and how many courses the student had pursued at any given time. The lack of appropriate administrative systems, as observed by one central administration examinations officer and one ESLTD's finance officer, was caused by trying to follow bureaucratic processes applied for the government-sponsored programmes that were not loose enough for the flexible self-sponsored programmes. There was also no clarity in the roles for the various stakeholders involved in the processes, causing conflicts of interest and in some instances duplication of efforts. Although ESLTD used the MS-Access fees system developed by the computer science institute for fees collection, fees payments was also collected by the various schools, and this made it difficult to have correct students' fees statements. Besides, attempts to reconstruct the self-sponsored students' nominal roll from fees transactions produced inaccurate records, associated

with high withdrawal rates in some programmes, and introduction of new programmes midway in the academic year, creating very dynamic data. Indeed, during the data migration phase of the nominal roll, it was evident that proper students' record keeping had not been done, and the central administration's admissions department did not have accurate records because schools only provided summarised lists of intake for the processing of admission letters.

During the first online registration in October 2002, schools had problems registering students who reported to Hekima before receiving admission letters and did not have admission numbers and were not in the nominal roll, a problem that, as explained by an admissions officer, was caused by a lack of adhering to set deadlines by schools.

The examinations records were also problematic and the crisis deepened in some schools where there was a conflict of interest, due to direct payments made by the schools to staff that provided service to the self-sponsored students. Observed by one ESLTD officer:

> Services for self-sponsored programmes were assumed to be an extra service and in some schools, you may find administrators not involved and say they have been sidelined in favour of programme managers, who are teaching staff and keep the student records. In such schools, the administrators who are supposed to be custodians of student records have little contact with such records; in my view I have noted that the administrator is responsible for government-sponsored students' records but not self-sponsored students.

The lack of proper procedures in regard to self-sponsored students' course registration and examinations updates resulted in incomplete data in SMS. The laxity in the adherence to deadlines, unclear procedures and processes implied that the self-sponsored programmes had not been institutionalized into the administration machinery of Hekima, and created problems such as inefficiency, which made it difficult for computerised systems, as was observed during the 2002 online registration.

The infrastructural developments in ESLTD were similar to the other units at Hekima and hence after registration, a standalone server was provided, where ESLTD would update fees payment transactions and the data later migrated to the central database. This arrangement, however, did not last long especially due to the inconsistencies of the nominal roll, and thus paved way for the ESLTD's decision to revert to the MS-Access fees system. By August 2004, inaccurate data for self-sponsored students' records was evident and generation of reports from SMS was not practicable. A meeting between ESLTD, central administration's academic (admissions and examinations sections), and the IT function discussed these problems. The meeting recommended a re-engineering session
of the self-sponsored programme processes that would be lead to the customization of SMS, but the session never took place.

With the general improvements of infrastructure at the end of the third registration in 2004, ESLTD partially adopted the fees subsystem for some of the self-sponsored students, who they continued to serve from the headquarters. The students' nominal rolls and examination data for the selected self-sponsored programmes were relatively accurate, while for the rest of the self-sponsored programmes they were inaccurate. This was not an efficient way of working, especially for ESLTD users who continuously had to process fees payments at all times. The data errors resulted in users having to switch from two computer applications, the SMS fees processing module and the MS-Access and in cases where the student record was unavailable the users resorted to manual records. One user at ESLTD summed up the experience:

> When collecting fees on the system you may not find the student. You log out and you check in the ms- access and perhaps even manual to see if this student exists, then the next student in the queue , you are supposed to go back to the system...and this is part of the problem why we have not fully utilized SMS. There are no regular updates on the nominal roll.

In a bid to improve service delivery to the growing number of self-sponsored students, a centralized fees collection point was opened. By August 2005, ESLTD decided to centralize all fees collection in the centralized collection point. This centralization was aimed at improving service delivery to all self-sponsored students, especially

minimising the distance covered by students shuttling between schools and the headquarters to resolve fees queries. It also provided a window for streamlining the students' records, where data migration from the MS-Access system followed, starting with the schools that had adopted SMS and data cleaning done in liaison with the schools. The data migration made it easy for users to serve students because the movement from one system to another was no longer viable.

Deliberations between ESLTD and the IT department continued and by the end of 2005, the two departments agreed to enter into a partnership to develop ICT solutions customized to the needs of ESLTD. One solution that was important to the operations of ESLTD was the students' fees processing module that seemed partially implemented.

Despite the two departments' agreement to working together to provide viable ICT solutions, this was delayed mainly due to administrative hindrances, especially in agreeing on payments for the services that the IT function was supposed to provide[14]. However, early in 2006, the implementation was set back due to change of leadership in the IT department. This notwithstanding, the increased pressure to reduce self-sponsored students' debts, a customized fees subsystem for handling fees payments was urgently necessary, and ESLTD agreed to bear the development costs, clearing the way for the implementation of SMS.

Again, a partnership approach was embraced and a team comprising staff from ESLTD and the IT department began customization efforts in May 2006. A project plan was drawn up and the team from the two departments agreed on the schedule of activities and deliverables to guide the customization efforts. It soon became apparent that for the customized solution to be efficient, the nominal rolls for the self-sponsored students needed to be updated. The central administration admissions section proposed the centralization of admissions, which would also increase the accuracy of the nominal rolls for undergraduate students. The team also used the phased approach, by selecting one school initially, to develop a workable customized solution that would then be replicated in all other schools.

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[14] ESLTD pays for services it gets from Hekima as it is a private limited company.

School C, which had just adopted SMS, was identified as the first school to start the implementation for two reasons. Firstly, the school had a large number of self-sponsored students at undergraduate and postgraduate levels, and secondly, Mutiso, the Director, was interested in having the records cleaned, especially postgraduate students, whose records were in very poor state. The coordination team from School C that was involved in the implementation efforts of course registration and examinations processing was part of the self-sponsored students' customization efforts in the school. Several meetings chaired by Mutiso ensued, with the development of prototypes and walkthroughs of the prototypes, until School C and ESLTD were satisfied with the functionality of the customized solution and targeted to use it at the start of the 2006/2007 academic year.

During the walkthrough meetings, it became clear that records for the postgraduate students would not be accurate without proper nominal rolls. Data updates of the postgraduate admissions needed to be done by the concerned unit. The postgraduate nominal roll was handled by a different unit, the school of postgraduate studies. SPGS administrators were contacted and attended the next walkthrough meeting and their role in ensuring the nominal roll was updated was spelt out. ESLTD, which was under pressure by Hekima's management to ensure all self-sponsored student debts were cleared, held deliberations with SPGS. What followed was a fast track adoption of the customized application and nominal roll subsystem in SPGS, where staff from the SPGS were trained and required to update all postgraduate records for the school, as well as update all other postgraduate admissions through SMS.

The use of the customized self-sponsored students' fees processing module started immediately after completion with data migration and validation for all fees balances at the school. However, minimal training was required as users both in School C and ESLTD were familiar with SMS and used it on daily basis.

The self-sponsored fees processing was successful in School C and by the end of 2006, the implementation team had identified a second school for the adoption of the module.

By the close of the case study period, the end of 2006, it was noted that although the development started with no document plan, two of the initial conceptions of the phases described in section 4.4.2 had been achieved. While the implementation started off with phase I, consisting of nominal roll, fees payments, course registration and examination processing for the government-sponsored students, the planned phase III of SMS development, consisting of customized solutions for the self-sponsored students, was indeed implemented as solutions to emerging problems. However, the envisaged phase II, where individual lecturers would interact directly with SMS to update students' marks instead of manual compilation, was not achieved. Also a few schools were still behind in adopting the course registration and examination processing modules.

5 Analysis and Interpretation of the Hekima Case Study

5.1 Introduction

In this chapter, the case described in the previous chapter is analysed using the constructs identified in chapter two. As stated earlier in chapter two, the primary adoption of SMS, although not the focus of the study, was important in understanding its influence on the key focus of the study, the secondary adoption and assimilation of SMS, thereby forming the first section of this chapter. In the second section of the chapter, the analysis of unit level adoption and assimilation of SMS, illustrating the context of each unit and the consequences of the mediating factors is presented, forming the basis for a synthesis of the implementation process at the higher level, the organization. The third section of the chapter focuses on the organizational analysis and is achieved by discussing and integrating the analysis using constructs defined in chapter two. The final section of the chapter discusses the interpretation of the Hekima case. This interpretation is illustrated by developing explanations for the process as observed in the case analysis in addition to synthesising the case analysis from the broader perspective of processual analysis. The explanations from the Hekima case are broadly categorized into thematic relationships between the context, process and outcomes themes.

5.2 Development and Primary Adoption of SMS

Primary adoption as used in this thesis refers to the decision making process to adopt the innovation in the organization by higher authorities, and thereby reaching a decision requiring the organization to move to the implementation process. Although the primary adoption was not the focus of the study, the two outcomes associated with the process – first finding a matching IT innovation and its application in the organization, and secondly the decision to invest resources to the implementation process of SMS formed the basis for further analysis of the Hekima case.

The IT department was driven by two factors into developing SMS in the early years of the case study period. First was the utilization of the newly acquired computing

platform, necessitating the migration from the COBOL-based applications with ORACLE-based applications. Second, the IT Director perceived the management of student records as an important process within the university, which the IT department had an obligation to participate in, by ensuring the implementation of computer applications for managing students' records, thus bringing efficiency. Said the IT Director:

> Managing student records is part our primary business and if we as the IT Department do not sort that one out then the IT Department has no role in supporting management.

Though the decision to purchase a student management system never arose, the in-house development option was inevitable for the main reason that financial resources for purchasing application systems were scare. The IT department had just completed implementing an in-house developed Human Resource Information System. The IT department adopted a *participative approach* by forming a development committee initially consisting of members from the central administration's academic departments and later the formation of different committees for the various modules within SMS. This approach to development of SMS was perceived as crucial for enforcing *commitment to use* SMS. The IT Director said on the approach adopted:

> We adopted a joint effort approach, and we partnered with the users in requirements, designing and going through the system.

Although initially there were no mechanisms for the development committee to communicate to the wider university community on the development progress of SMS, causing varied expectations, the deployment and later planning and reviews of online registration opened up communication channels and provided wider participation. The diverse participation included mostly middle managers appointed by their section managers and administrators of schools, thereby minimising resistance that is widely associated with middle management levels.

A typical *prototyping approach* to software development, where user requirements were implemented and the results demonstrated to the various development

committees for ratification, enhancements, and amendments to the system was used. This approach created confidence in users who were not clear about the product in addition to providing a mechanism for testing the SMS. In the earlier years of SMS development, *inadequate technical and project management skills* for large ICT projects by the SMS development team, coupled with *unclear processes* especially for self-sponsored students were a hindrance to the achievement of a quality system, which discouraged use. This attributed to the development team, especially the programmers who were fresh graduates. Said the IT Director on the skills of the programmers:

> We did not have a senior person who was experienced, all of them had just graduated and so we also took a lot of time there, in that they were also learning, this was perhaps their first big operational system they were developing.

Indeed this observation by the IT Director was corroborated by the former project leader who summed the experience:

> I would rank the knowledge I had to carry the task as 30% of what I required. It was like a learning process.

CE2's conviction on the use of ICT solutions in Hekima was a result of his passion for the "modern ways" of working and intended to change the traditional manual processes of managing student records in Hekima, especially the examinations processes which were largely manual. This shift to computer-based processes was made feasible by the availability of infrastructure funding, and a developed solution (SMS) that provided an enabling environment for SMS adoption by CE2, and later by Hekima's management.

Workshops facilitated by Hekima and attended by staff from the IT function provided forums where Hekima's management and Directors of schools were exposed to ICT-related opportunities in the higher education sector. Using such workshops, the IT department updated Hekima's management, and Directors of schools on the implementation status of various ICT projects, such as the SMS and network

infrastructure, in addition to using the forum to present and discuss key ICT related proposals. One such decision was the decision to adopt and enhance the SMS prototype that was demonstrated as a university solution for managing student academic records from admissions to graduation. The SMS was seen as an attractive solution, especially for managing the growing numbers of self-sponsored students, whose records were inaccurate or unavailable for decision making. The management further envisioned that the adoption of SMS would result in the efficiency and effectiveness of Hekima in managing student affairs. This scenario is in agreement with the two-stage adoption framework that illustrates that the provisions of management objectives and intentions for change together with the availability of technological innovation are factors that influence the primary adoption process. A *support strategy* (also referred to as a passive strategy) from Hekima's management emerged from the case study in the earlier years, with the adopting units taking time to see the SMS prove itself. The IT department, largely viewed as driving the implementation efforts adopted an *advocacy strategy*, ensuring that SMS was adopted by a few schools that were willing/ready to adopt at first and using successes in these units as examples to other units.

Although the focus of the study is in the secondary adoption, the primary adoption and the in-house development of SMS as analysed influenced the secondary adoption in the university, as discussed on the next section.

5.3 Secondary Adoption and Assimilation of SMS

The secondary adoption construct of the theoretical framework concerns the events at the unit level that lead to the adoption of the SMS. In particular, the activities and actions of the actors involved in the units decision to use the SMS, illustrating how a unit reached the decision to embrace and use the SMS is analysed. The assimilation of the SMS at the unit level involving actions geared towards the adaptation, acceptance and infusion of the SMS is also analysed in the seven units/schools that form the Hekima case. The Table 5-1 illustrates the analysis of the SMS adoption and the development of Hekima's computing and network environment over the period covered in the case study.

Time	Development of SMS	Central Administration (Admissions & Examination & Finance Units)	SHU	School A	School B	School C	ESLTD	Infrastructure	
								Computing Environment	Network Environment
1996	Integrated University MIS development efforts by Postgraduate Computer Science Diploma Students							Vax 6312 * 2 Cluster 32* 2 MB RAM 6 GB Disk Storage VAX Relation Database Tools	LAN based on DecNet communications architecture using thick Ethernet around the IT function and its environs. Connectivity to remote campuses achieved using leased lines provided by a 3rd party telephone network with speeds of 2400bps.
1997	Development of MS-Access Based fees processing by BSc. Computer Science Student								
1998							Adoption and use of Ms-Access Based fees processing system		
1999								Alpha Servers * 3 512*2 and 128 * 1 MB RAM 42.6 GB Disk Storage Oracle RDBMS Oracle Forms Oracle Reports	LAN & WANs based on 10Mbps Ethernet protocols. Creation of FDDI ring around the IT function and its environs. Connectivity to remote campuses achieved using kenstream services provided by a 3rd party telephone network with speeds of 64 Kbps to most remote sites. Connectivity to school C through kenstream lines with speed of 128kbps. No connectivity to School B, ESTLD.
2000	Development of Nominal Roll & Course Registration Modules of SMS								

Time	Development of SMS	Central Administration (Admissions & Examination & Finance Units)	SHU	School A	School B	School C	ESLTD	Infrastructure	
								Computing Environment	Network Environment
2001									Connectivity between IT function and the central administration upgraded to use of gigabyte Ethernet. Other remote sites used continued to use kenstream lines with speed of 128kbps.
May 2002	Development of Fees Processing & Hostel Administration Modules of SMS	Deployment of Nominal Roll & Course Registration Modules of SMS for use (marked Secondary Initiation)		Deployment of Nominal Roll & Course Registration modules for use (marked Initiation & adoption)	Deployment of Nominal Roll & Course Registration modules for use (marked Initiation & adoption)	Deployment of Nominal Roll & Course Registration modules for use (marked Initiation & adoption)	Partial Adoption and use of NR module & continued use of MS-Access based Fees processing system		
Oct 2002	Development of Fees Processing Module	Continued use henceforth	Deployment of housing administration module for use (marked Initiation & adoption)						
Jan 2003		Deployment of Fees Processing Module of SMS for use (marked Secondary Initiation	Continued use henceforth					Upgrade of computing environment Alpha servers * 3 512*2 and 128 * 1 MB RAM 100 GB Disk Storage Oracle RDBMS Oracle Forms Oracle Reports	
May 2003				Re-initiation and Secondary adoption Again(New Leadership)	Re-initiation and Secondary adoption Again	Re-initiation and Secondary adoption Again			
Oct 2003		Adoption and use of Fees Processing Module of SMS for use (marked Secondary Adoption)		Continued use henceforth					

Time	Development of SMS	Central Administration (Admissions & Examination & Finance Units)	SHU	School A	School B	School C	ESLTD	Infrastructure	
								Computing Environment	Network Environment
		Continued use henceforth							
2004							Continued Partial use of SMS	Alpha Servers * 3 512*2 and 128 * 1 MB RAM 100 GB Disk Storage HP ML server * 1 1GB RAM 72 GB HDD Oracle RDBMS Oracle Forms Oracle Reports PhP	LAN based on Ethernet protocols with speed of 1000Mbps and 100Mbps to PC. Connectivity to remote campuses using kenstream with speeds of 128-512 kbps and 128 Kbps Leased lines to all campuses except campus where School B is located. Creation of LANS in campus where School B is located
Dec 2004				Integration of SSS records	Adoption of SMS				All campuses connected using wireless services provided by a 3rd Party.
Jan 2005				Continued use(Acceptance, Assimilation)	Continued use(Acceptance, Assimilation)	Adoption of SMS			
April 2006						Continued use(Acceptance, Assimilation)	Full adoption and customization to business processes		
Dec 2006						Integration of SSS records		HP ML server * 3 3* 1 GB RAM 3* 72 GB HDD Oracle RDBMS Oracle Forms Oracle Reports PhP	Gigabyte Ethernet to Central Administration /Finance/SchoolA/SHU Wireless Contracted third party to Remote Campuses 512 Kbps to School C 256 to ESTLD & School B

Table 5-1: Hekima Infrastructure Development and Unit adoption of SMS

5.3.1   Central Administration and the Online Registration Module

The registration process is a main activity within the university calendar, and CE2 directed all administrators and the IT function to ensure that the computerised registration process instead of the manual processes was used, thereby *mandating use* of the online registration subsystem. The wide participation in the process by various sections of the university was planned and coordinated by the Deputy-CE (Academic Affairs) while the facilitation of the CE and the Deputy CE (Administration and Finance) in the *acquisition of the necessary computing resources* on short notice improved the adoption of the registration process.

The assimilation of the computerised online registration process was traced from the planning meetings which created a forum where stakeholders' roles were emphasized, clarified, and levels of preparedness of the various tasks by each stakeholder, and facilitation required were reported on, furthering the acceptance of the system by the users. Policy issues that were not clear to the stakeholders were clarified, for example the fees policy that during earlier registration exercises was difficult to implement due to conflict with the practices of handling students who report to the university without the full fees payable. Mock registration, introduced in the second registration, was widely used as a method of testing preparedness by Hekima as well as for building confidence in the users. As noted in an invitation letter to users for the preparedness of the second online registration in October, 2003 that read in part:

> … it is necessary to have a mock registration at all registration sites in order for all who are involved in the registration to have confidence to successfully play their roles during the actual registration.

The review meetings, again attended by the stakeholders under the leadership of Deputy CE (Academic Affairs) were used as *feedback interventions* in the process, where users' experiences and recommendations were discussed and key solutions that were geared to the improvement of the process were spawned, discussed and implemented. Examples were the opening of collection accounts, improvements on student joining instructions, the opening of registration centres two weeks in advance for the registration of continuing students and the automatic update of the nominal roll

on fees payment. As the continued use of the online registration subsystem became routine, stakeholders no longer required the mock registration. The use of online registration annually and later, on a semester basis by the self-sponsored students signified its assimilation in Hekima.

5.3.2 Central Administration (Fees Subsystem and Academic Modules)

The finance section on the adoption of the fees subsystem, took *ownership of the system* immediately, and the Finance Officer, the head of the finance section at the university, nominated a team of staff to continue perfecting the system. Additionally, the Finance Officer was knowledgeable about computer systems having participated in the implementation of payroll systems, and taken ownership of the payroll systems. The facilitation of required computing resources such as PCs and printers enhanced the adoption of the fees module. *Training* was provided to all users by the implementers and, although initially perceived inadequate, as users progressively continued to use the system, the additional onsite support provided in the later years of implementation ensured that users acquired the necessary skills to use the system. The acceptance of the subsystem was a *consequence of the registration process*, and the accountable *nature of financial transactions* created during the process accelerated by the demands by management on financial reports. Further, the achievement of *immediate results* of the system, higher funds collection and reduced government-sponsored students' debts provided motivation for the continued participation in the improvement, enhancement and use of the subsystem. However, this achievements and benefits tended to be largely for the government sponsored students and a few self sponsored students, where such students were integrated with the government sponsored students.

The central administration's academic section compared to the finance section *lacked leadership in technology adoption* from the head of section, the Academic Registrar, and ownership of the academic modules did not occur in the early years. As noted by one admissions officer on the participation of his boss, the Academic Registrar:

Am sorry to say the leadership should be going down and monitoring this, looking for difficulties experienced and improvements. As far as I am concerned in SMS, especially from the academic division it is a problem.

In the early years of implementation, the academic section relied on the ICT Director for leadership and when requested to own the subsystems, there was initial resistance by the middle managers. This leadership gap however was bridged by the *active participation* of the middle managers who were members of the development committee, leading to the acceptance and the routinization of the academic subsystems. The acceptance of changes in work roles in the examinations and the continued use of the subsystems displayed aspects of *individual learning*, portrayed by the change in beliefs about data security, the acceptance of the new procedures for examination data acquisition and the production of transcripts.

Towards the end of the case study period, early 2006, it was observed that efforts to streamline the admissions of the self sponsored students had been implemented by developing an admissions module and the integration to the national examination results as illustrated in Figure 4-1 achieved. The stable nature of admissions for the government sponsored students and the ease of porting the nominal data for the fresh students each academic year by the admissions section influenced the use of the national data in validating the admissions for the self sponsored students.

5.3.3 Student Housing Unit and the Hostel Administration Module

The adoption of the hostel administration module of SMS was driven by the leadership at the SHU, led by the unit Director, who was actively involved in the process. The commitment to use the system was further driven by SHU officers who were keen on the success of the system and later the Deputy Finance Officer in charge of financial matters in the unit. The need realize higher funds and utilize the available bed space capacity maximally, the intermediate results of higher fees collection provided the motivation for commitment from the SHU officers. The presence of *personal motives* caused by the existence of fraudulent activities within the unit prior to the implementation of the hostel administration module was a main cause of resistance. *Interventions for change* to reduce resistance and educate users on the

benefits of efficient business procedures and accountability were exercised through the holding of a workshop for the whole unit. Also, the *ICT skills knowledge gaps* that existed were minimised through formalised training programmes for all staff and on-site user support. SMS implemented security features at various levels, one of which was the use of audit trails. This security feature was demonstrated, and indeed the monitoring of transactions performed through the system enhanced the understanding of how fraudulent activities could be traced and used for disciplinary actions. The presence of a committed leadership at the unit comprising of the SHU Director and SHU officers created an enabling environment for the acceptance of the hostel administration module and the transition to the use of computerised processes in the unit.

5.3.4 School A

The early adoption of SMS in the school was hampered by the *leadership* and *conflicting interests*, thereby causing willing users to abandon interests in SMS, as use was not seen as important nor encouraged by the leadership. However, on the change of the leadership, the new leadership was *committed to quality service* to students and, driven by the need of efficiency, hastened the adoption of SMS not only for government-sponsored students but also for self-sponsored students. The Director of school expressed his intention as:

> Before I became the Director there was very little that had been done in terms
> of student records computerization. My reason for wanting SMS to be
> introduced to school A was simply that I wanted to use it to run the faculty
> efficiently. We are a very large school, very complex in terms of number of
> program that we run, so I thought computerizing student information; in one
> way would be ensuring efficiency of the faculty.

The realization by the leadership of the *overwhelming manual workload* resulting from the increase in number of students was too much to be done manually by the leadership contributed to adoption. These factors enabled the adoption of SMS in the school. The integration of examinations rules and regulations for the preparation of the list of candidates eligible for award of the degrees, and the limited knowledge of

the new administrator signified the *creation of knowledge* stored within the system, and eliminated the transfers of staff as a cause for inefficient service delivery at the school. In addition, the presence of keen users and the motivation by the later leadership eased the acceptance of SMS within the school. The Director of school A perceived the presence of keen users as important to his effort of adopting and using SMS at the school. Said he,

> I must also say that there were people in this school who were interested in computerizing our students information, that helps but they needed encouragement, they needed somebody to tell them this is the way to go.

The perceived efficiency brought about by the SMS made routine use of the system acceptable, and led the Director of the school to advocate for a computerised solution to the timetabling problems in the school. *Systemic failures* within the school (delays of submission of marks) and procurement procedures within Hekima (delays of PC procurement) were cited however as causes within the context that were impacting negatively on the desired efficiency of the system.

5.3.5 School B

The school lagged behind in the adoption of SMS and this was attributed to the *general lack of a champion* in the use of SMS by the leadership in the school. Additionally, the *working practices* of the school, and indeed the university in general, did not create synergies in processes that involved the academic and the administrative staff for the benefit of the university. John, being ICT knowledgeable and given the traditional manual processes to work with, created *conflict with his beliefs* about ICT, resulting in the creation of an intermediate solution using MS-Access. Said John on the manual processes at School B:

> I was asked to assist in collating the student data for the graduation. When I went to see the Schools' Director, I was given files of manual records and i went back to him and said I don't work this way, and I don't think I will help you by working manually. ….So I said to him, if you allow me I will process this electronically, that is how I am going to do it.

The *immediate benefits* of the MS-Access solution, the list of graduands, created a *motivation* for advancing to the more stable university-wide solution - hence a step towards adoption of SMS. The creation of the examination secretariat and the *recruitment of temporary staff* to perform data entry for back-log records enhanced the adoption of SMS, while the *stabilized network connections* through developments of the infrastructure resulted in the acceptance of SMS. *Training and onsite support* resulted in the continued use, thus achieving the routinization of SMS as users continued to rely on SMS for the production of critical reports such as examination cards and provisional transcripts at the school. The exposure of the school to the use of SMS thus not only created enhanced computer skills and knowledge of ICT-based solutions but also provided the creation of new structures within the school, the *examination secretariat*, and the procedures by which examinations were processed. Thus, the benefits of the migration of the school to SMS acted as an example for the other schools within the campus to imitate and embrace SMS.

5.3.6 School C

The school was one of the later adopters of SMS. Two factors, *lack of leadership championing the use of SMS* and *resistance to change*, resulted in the school's late adoption of SMS. The resistance by knowledgeable ICT staff was a chief cause for the slow pace with which the school adopted SMS. The existence of the dbaseIV variant of the SMS's examinations subsystem and the ability of Njoroge to tweak the dbaseIV to produce consolidated mark-sheets enhanced the resistance to SMS. John observed that the champions of change in School C were risk aversive, a common characteristic of the conservative nature of Hekima. However, the time span within which the resistance was encouraged denoted a leadership gap in the adoption of newer and more efficient technologies, despite having standalone servers and later the improved network access as a consequence of improved infrastructural developments.

The re-emergence of Mutiso, who was initially enthusiastic about SMS before expiry of his previous tenure, as the Director of the school paved the way for the full adoption of SMS in the school. Mutiso, forced by the *emerging circumstances of RBM systems*, and *pressure from students* enabled the leadership to adopt SMS. The

staff from the school nominated for training were sent clear messages by the director of the intended use and the changes thereafter in the procedures of managing student records at the school, signifying mandated use of SMS by the Director. This marked the adoption of SMS in the school. The active involvement of Mutiso, chairing review meetings and signing off milestones agreed upon by the school's development team, enhanced the acceptance of SMS. His presence facilitated the implementation of structural changes within the school that had an impact on the service delivery, such as the separation of offices for handling student queries and the hiring of additional staff to deal with the rising number of students' records in the school.

5.3.7 ESLTD

ESLTD, Hekima's limited company, was among the first units to use the MS-Access fees system developed by the computer science institute but was among the late adopters of SMS, with the unit's adoption of SMS characterised as an *incidental adoption*. The late adoption of SMS is attributed to a *lack of leadership*, occasioned by *administrative conflicts*, in the use of SMS. Said the ESLTD's officer on the adoption of SMS at the unit:

> We are still meeting over this. From ESLTD's point of view, I can say for the self
> sponsored students that the system has not been fully implemented and plans are
> underway, we have had an initial contact meetings to see how this could be
> incorporated so that all self sponsored students' records can be fully put in the
> system....The delay is due to the bureaucracies in the University and in the sense that
> it's not clear cut whose responsibility it is to bring this to the system.

The conflicts occurred due to non-agreement on the best approach to acquire customized solutions for the unique needs of ESLTD in regard to fees collection. While the central administration SMS development committee raised concerns about the state of self-sponsored students records, and proposed a workshop for re-engineering the procedures that would later be shared with the management for the ratification and their implementation, this idea was not supported by the ESLTD leadership. However, an alternative approach was not presented to the development

committee leading to a stalemate with regard to the enhancements of the fees processing module for self-sponsored students.

While ESLTD staff continued to use the MS-Access-based system, Hekima's IT function sought to have the unit migrate to the newly developed SMS by providing a standalone server and offering mechanisms for data migration to the centralized servers. Despite this effort, it was impossible for ESLTD to use the SMS efficiently due to high data inaccuracies in the nominal roll for the self-sponsored students, a *consequence of lack of clear roles* for the stakeholders involved in the provision of services to these students that led to difficulties of updating the nominal roll. This continued state of the non-adoption of SMS was attributed to a lack of the unit's leadership in using SMS. Improvements of the *network infrastructure* led to the adoption of the fees processing module for some self-sponsored programmes whose nominal roll was less problematic.

The intermediate results of this partial adoption as described by an ESLTD officer was a mechanism for faster and easier access to records and the use of audit trails to track data changes led to a better systematic method of keeping students records. However, these benefits were only for some self-sponsored students. With the introduction of a centralized fees collection point, the inefficiencies of running two parallel systems were exposed. However, the *intermediate results achieved by the use of SMS* further motivated the active involvement of ESLTD, in liaison with the schools, to migrate to SMS and validate nominal rolls for all self-sponsored students, thus marking a full adoption of SMS by the unit. The use of SMS at the collection point continued and became routine and ESLTD sought to *enhance the system* to its specific fees collection requirements resulting in the development of customized fees processing module for the self-sponsored students. Although this desire was initially slowed down due to administrative conflicts and a change of leadership in the IT department, *the pressure from the university management* on ESLTD to manage self-sponsored students' debts and increase the collection of funds required the two departments to resolve their interests, paving the way for a customized solution for ESLTD needs.

Two *unintended consequences* of the customization process were experienced. Firstly, the adoption of the nominal roll module by SPGS whose leadership was not keen on SMS and, secondly, the support for the centralization of nominal roll data capture for self-sponsored undergraduate students by the central administration's admissions section. The adoption of a *phased approach and the prototype development by the ESLTD and IT team* displayed the team's preference for following a similar approach displayed in the implementation of SMS in Hekima. This presented an opportunity to learn and perfect the customized solution with minimal disruptions to the services provided to students. The team working under an agreed upon project plan showed a team that had *acquired project management skills* and had learned from previous experiences of the SMS implementation in the various units in Hekima.

5.4 Discussion and Integration of Organizational Implementation

The previous section analysed the implementation process in various units. In this section, we synthesize the implementation at the higher unit level, the organization, using the theoretical framework discussed in chapter two. The theoretical framework is broadly categorised into three main themes, the implementation context, the implementation process and outcomes.

5.4.1 Implementation Context

The implementation context of the innovation discusses the organizational context of Hekima in relation to the implementation of SMS. The analysis of the implementation context includes managerial interventions, subjective norms, facilitating conditions and other factors that had an impact in the implementation process of SMS. These factors are next discussed.

5.4.1.1 Managerial Interventions

Managerial actions and change management strategies that were taken in Hekima to create an enabling environment for the implementation of SMS are illustrated in this section.

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The university managers, top managers and unit managers across the units that embraced SMS, in varying efforts, tried to mediate the implementation process in various ways. Five themes emerged as mechanisms by which the various actors involved in the implementation process intentionally used to enhance and create an enabling environment in the course of the case study period. These were training and on-site support, the recruitment of additional staff, the enhancement of computing resources, mandating and motivating the use of SMS, and the monitoring of process progress. The management of changes brought about by SMS were mediated by the use of participative approaches, seminars, demonstrations and workshops.

a) *Training and On-Site Support*: The general view of the training provided was that of inadequacy with respondents calling for the need for continuous training, especially in the early stages of SMS adoption and use. The impact of the inadequate training was evident in the critical events of students' registration; especially the first student registration that took place in October 2002, and continued to emerge during such events, leading to a lack of confidence in the use of computers and the emergence of data errors. To overcome this challenge, training sessions were scheduled a few days prior to the annual registration process at the start of each academic year. These training sessions continued to be carried out.

Despite the emphasis laid on and effort put into training in the early years, a recurring issue that affected the quality of the training was the availability of computers for people to use once they returned to their offices. The IT department carried out the training in anticipation of availability of computing resources which in some instances were delayed due to the procurement process. The trainee would quickly forget how to perform tasks using SMS without access to a computer and they would require a refresher course on the processes in SMS, leading to the implementers having to train a person several times. Sometimes the implementers would need to provided more personalised training as the users performed their tasks with the computer. This was not an efficient way of utilising the scarce technical human resources. Although the IT department recognized the need for training, the

lack of adequate technical staff, where SMS developers doubled up as trainers, forced the department to adopt a need-based training approach. This entailed a person only being taught how to operate the system to perform the task required. The users perceived the training offered as inadequate as users had to rely on calling IT staff to sort out small problems as they used the system. In addition, the inappropriateness of the initial training in some scenarios, especially where the middle management was trained on operational tasks, did not entice middle managers to use the system. The non-alignment of the training with the availability of computing facilities hindered the learning of the SMS while the inadequate training produced incompetent users, thereby slowing acceptance of SMS in the initial stages of organization assimilation.

The increase of human resource capacity in the IT department changed the training approach. After the classroom training, on site support was introduced, and staff continued training users at their workstations as they used the system, creating user confidence in the use of the system and providing opportunities for more clarifications on the work flow as implemented in SMS. The provision of on site support enhanced the skills of the users, leading to routine use of SMS. At the close of the case period, it was observed that most of the SMS users were competent, and training sessions continued to be mounted as need arose with refresher coursers for persons affected by transfers from one unit to another.

b) *Recruitment of Additional Staff*: Starting with one technical member of staff in the early years of SMS development, the employment of more personnel in the IT function who were later dedicated to the implementation of SMS improved the process. Despite this, staff in the IT unit was not adequate for all ICT-related activities in Hekima, and thus caused deployment of SMS to be carried out one school at a time, slowing the pace of the roll-out of SMS. The hiring of temporary staff, facilitated by various unit managers, to perform massive operational tasks when the need arose, such as the data capture in the central administration's examinations section and School B, enhanced the adoption of SMS and showed commitment to SMS by the concerned managers in the process. In other units, the managers restructured work tasks to cater for the

frequent and continuous operational tasks that were under their mandate. Examples of these tasks included the redefining of roles for secretaries in the central administration's admissions section and clerks in the schools who after undergoing training took up data capture and validation roles in their respective units. Units, such as School C with large numbers of students, recruited additional staff to enhance the human capacity involved in the SMS operations.

c) *Enhancement of Computing Facilities*: Although in the early years of the SMS implementation, the available computing resources, especially PCs, were cited as a hindrance to acquiring ICT skills, the IT function tried to distribute the resources equitably. This was achieved, especially after the first registration, by distributing the available computers equitably to schools to facilitate the progression of SMS operations. All officers involved in SMS operations preferred to each have a PC in their offices, and where that was not possible the creation of centralized students' offices with shared resources was implemented as an alternative. However, as the university's exposure to the use of SMS and other ICT areas expanded, such as the use of email and internet, access to PCs became much easier as departments purchased them for their members of staff. By 2006, all staff required to use SMS had access to a PC in their offices.

The continued enhancement of central computing resources, especially the servers, notably after the second online registration and again after the fifth online registration, reflect interventions to increase the capacity of ICT facilities within Hekima to accommodate the increasing demand of SMS.

d) *Mandating and Motivating Use*: CE2 had knowledge about the need of SMS, especially the benefits of registration and fees collection, and mandated the use of the online registration and the fees processing modules in the central administration units. Similarly, the later leadership in School C sent clear messages about the change to SMS, thus mandating use. Although mandating use led to the adoption; the acceptance and use of SMS were enhanced by the ensuing support provided by the authorities such as logistical and resources

accorded for the adoption to be fruitful. Likewise, the Deputy-CE (Academic Affairs) mandated the use of SMS during the planning and review meetings for online registration.

A general incentive system in the university was lacking, and there was no punishment for the disuse of SMS. However, during the annual registration participants in the exercises were rewarded with some monetary payments, while in some schools overtime work was paid. These rewards were not inducements for SMS use. The motivation for the use of SMS stemmed from individual users especially those who were ICT literate, and their leadership in the various units such as SHU, and School A. For example, the Director of School A and the SHU Director, who knew about the business need of the system, used their leadership skills to motivate their staff by supporting them in organizing and following up on problematic areas raised and keenly followed and monitored the process.

e) *Monitoring and Evaluation*: The absence of a university-wide monitoring and evaluation schedule was perceived as a weakness in the implementation process, and resulted in difficulty of getting progress feedback of the total project at university-wide level. Although the SMS team at the IT function submitted reports indicating how the schools were progressing in the use of SMS and in the examinations data captured in the system, the general lack of an overall implementation time schedule made evaluation of the progress difficult. However, in the later years, especially with the adoption of RBM at Hekima that resulted in the automation of students' records as one of organizational capacity development indicators provided a means by which the overall computerization process could be evaluated. The extent of the implementation of SMS in schools was one of the key performance indicators and this helped in the adoption of SMS, especially by the later adopters.

f) *Change Management Interventions*: The conceptualization of change management in this thesis is limited to the actions of the implementers in response to the implementation of the SMS.

Change management interventions were evident, and included *workshops* where participation of the various participants from the development committee elicited challenges involved in the implementation process and proposed solutions for the adoption of SMS where possible. IT staff were invited and demonstrated the system functionalities expounding the advantages of the system while bringing the various roles of the different stakeholders.

The implementation of SMS adopted *participative approaches* such as the involvement of the users and holding problem-solving meetings with users. However, a key component of managing change seemed to lack in the early phases of SMS development—*communication to the university community*. This lack of communication changed once deployment was started with frequent communication to the rest of the stakeholders and not just the development committees. However, technical changes tended to be a preserve of the IT function staff and were not shared much with the other users. A typical example was the decision by the IT staff to overhaul the client-server environment without involving the stakeholders. Although there were good technological reasons to do so, some interviewees observed that their input was not asked for and they only found a replacement of the previous system. Thus *communication emerged as critical* to building interest in and support for SMS. It was during some of these sessions of communicating to users the strategic agenda, operational issues and expected results from SMS, in a workshop for example, that social relationships were created between the implementers and the users that contributed to a commitment to the SMS project.

The general lack of a proper planning in the Hekima was observed in the implementation of the SMS. Intially, no documentation of a plan was available, and this changed in the course of the implementation period. The presence of a university-wide plan for the implementation of SMS was not there, and the change management framework that emerged from the case study pointed to *improvisational actions*, responding to change as the implementation process proceeded.

No major structural changes at Hekima were implemented as a result of SMS, but several changes were found in the practices or processes, culture and the technology itself (SMS). Mechanisms through which the changes were recognized included system demonstrations, workshops and online registration review meetings and actions agreed upon in these forums taken by the implementing unit. *User training sessions* were also another key avenue for managing change. Training the users and, in the later years of implementation, providing on-site training and support smoothed the changing work practices.

5.4.1.2 Subjective Norms

The social influence of the organization context has been identified to have influence to the actions of people in organizations. This was also observed in the Hekima case as analysed. University units and staff do not exist in isolation; hence what happens in one unit may have some influence on others. In the case of SMS, two social influences were observed in the case study. These were mimicking and conformance influences, and are as illustrated below.

The initial adoption of the SMS in some schools was motivated by the need to be efficient, for example School A. The other schools seemed to be driven by mimicking the initial adopters especially the large School A, which in its history was among the "worst run" schools but did a turnaround to efficiency using the SMS. The decisions to adopt SMS by schools that wanted to be like other schools that had successfully used SMS in the belief that they would also benefit from using the same technology in a similar manner is very much consistent with the conservative culture at Hekima. Indeed, it was observed that the earlier adoption of MS-Access fees system by a few schools and ESLTD was also done through mimicking successful adopters. The actions of schools observing, learning from actions and benefits of earlier adopters, displayed the risk averseness cited by the case participants. The later adopters of SMS were driven by conformance generated by the introduction of RBM systems, with Hekima's management requiring all schools to implement and use SMS.

At the user level, there was no indication of an individual's beliefs about the expectation of one's supervisors or peers regarding their own secondary adoption behaviour. This can be explained by the fact that once a school adopted SMS there was no room for individuals to negotiate whether they were going to use the system or not, as it was required that they do. However, in School A, the initial leadership refused to accord the required support thereby discouraging the initial use of SMS.

5.4.1.3 Facilitating Conditions

Facilitating conditions, defined in the theoretical framework, refer to factors that make innovation implementation more or less likely to happen. The case organization revealed several factors in the context that facilitated the implementation process, while others constrained the process. These factors included the computing infrastructure, leadership in technology adoption, and the university culture and are reviewed below.

a) *Computing Infrastructure*: The envisaged availability of the communication and network infrastructure was a driving factor in the primary adoption of SMS, but it emerged to constrain faster secondary adoption of SMS. In the early years of the implementation, infrastructure development in the university was a cause of impeding the process with the interim provision of standalone servers by the IT unit as a mechanism to circumvent this shortcoming, but it did not yield the desired use of SMS. The development of the communication and network infrastructure was phased and this led to varied access to the resource in the university. The IT Director had knowledge of the phased network infrastructure developments and thus opted to have the implementation efforts concentrated where the network infrastructure was available. As the infrastructure development progressed, so did the number of units using SMS, implying a parallel growth. The phased approach to the implementation of SMS adopted in the early years whereby the implementation moved in tandem with infrastructure developments was a consequence of the availability of the network infrastructure. This indeed was a recognition that a successful application of IS cannot take place without network infrastructure as illustrated in Figure 5-1.

Units at Hekima

Units	1996	1997	1998	1999	2000	2001	May 2002	Oct 2002	Jan	May 2003	Oct	Dec 2004	Jan 2005	April-Dec 2006
SCHOOL B							Initiation to use Course-Examination Modules					Secondary adoption of Course-Examination Modules		
SCHOOL A							Initiation to use Course-Examination Modules			Secondary adoption of Course-Examination Modules				
SHU														
CENTRAL ADMINISTRATION										Initiation of Fees processing module	Adoption of Fees processing module			
CENTRAL ADMINISTRATION							Secondary Initiation & Adoption of NR & Course-Examination Modules							
ESTLD			Adoption and use of MS-Access Fees processing system				Partial adoption and use of Nominal Roll & Fees processing modules							Full adoption of customized SMS

Time →
1996 1997 1998 1999 2000 2001 May 2002 Oct 2002 Jan May 2003 Oct Dec 2004 Jan 2005 April-Dec 2006

Network Environments at Hekima

LAN based on DecNet communications architecture using thick Ethernet around the IT function and its environs. Connectivity to remote campuses achieved using leased lines provided by a 3rd party telephone network with speeds of 2400bps.	LAN & WANs based on 10Mbps Ethernet protocols. Creation of FDDI ring around the IT function and its environs. Connectivity to remote campuses achieved using kenstream services provided by a 3rd party telephone network with speeds of 64 Kbps to most remote sites. Connectivity to school C through kenstream lines with speed of 128kbps. No connectivity to School B, ESTLD.	Connectivity between IT function and the central administration upgraded to use of gigabit Ethernet. Other remote sites used continued to use kenstream lines with speed of 128kbps. No connectivity to School B	All campuses connected using wireless services provided by a 3rd Party. Gigabit Ethernet to Central Administration /Finance/SchoolA/SHU connections to School C 256 Kbps Wireless connections to ESTLD & School A

Figure 5-1: SMS adoption at the units against network infrastructure development

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While there was a tremendous growth in the network infrastructure, there was little growth in the computing infrastructure (data and application servers). As was experienced during the second registration event in 2003, the computing infrastructure contributed to inefficient services, leading to the upgrading of the servers. The growth in the use of MIS applications over the years contributed to resource competition, with the available computing resources incapable of the desired efficiency as was observed in the 2006 registration.

b) *Leadership in Adoption of Technology:* The *top management explicitly supported* the implementation of SMS, and mandated its adoption. However, the process of the implementation, involving the adoption and the assimilation of SMS at the unit levels was managed using a support strategy. As a result of the *top management's non continuous active involvement, a non-tactical bottom-up approach of the process emerged* from the context. Two prime strategies used in the context were user participation and prototyping. The use of prototyping was essential in getting a feedback from the users as a mechanism of checking for requirements satisfaction and at the same time enabling the users to have a feel of the product they were building. Even though the IT function provided leadership in the early years especially in the development of SMS, the participation of users became useful in the adoption of SMS at unit levels, with the members of the various implementation committees committed to spearhead use of a product they owned. In the absence of a university-wide implementation committee, a consequence of the inactive involvement of the top management, different development committees formed during the implementation took leadership in the implementation of the respective subsystems.

The growth and expansion of the communication network did not translate to immediate use of SMS at the university. This slow adoption was because of a lack of *user leadership (at the unit levels) in the adoption of technology* that seemed to be visible in many schools, with the exception of the early adopting units, the IT function and minimally the top management. Indeed it was observed that the lack of leadership in the adoption and the use of technology was the cause for the delayed ownership of the academic subsystems of SMS

by the Academic Registrar. The IT Director, who took leadership of the process and was keen to have SMS implemented, minimized this leadership gap. Leadership has been tied to culture in the literature, and this was observed in the Hekima case, where the *conservative nature caused reluctance to the use of technology*, displayed by the "wait-and-see-first" scenario that led to fewer schools initially embracing SMS.

c) *Culture and Power*: The notion of administrative power in a university is based on hierarchy and a culture that values bureaucratic norms and structures, power and influence, rationality, control, and coordination of activities. The professional authority power is based on knowledge and a culture that emphasizes dialogue, shared power, autonomy, and peer review. The existence of the two categories of power systems in Hekima was portrayed by the university managers, academic managers and professional managers. The academic managers (Directors of schools, who are academic members of the school) are appointed for a short term and are mostly responsible for strategic issues and running of the schools widely display professional authority power, while the functional managers (such as the Finance Officer, Administrators and Technical staff) who are responsible for operative tasks and are on permanent and pensionable terms display the administrative power. The top management such as the CE, Deputy-CE's, Campus Principals' posses both the professional authority and the administrative authority power

The early adoption of SMS was characterised by both power systems. CE2 used his administrative power and directed the adoption of online registration and the use of fees processing modules. The professional managers, valuing rationality, control and coordination of activities went ahead, adopted, enhanced and assimilated the processes. CE2 as well did not mandate the academic managers to adopt and use the course registration and examination processing modules; rather leaving the option wide for them, he asked that the Directors seek help from the IT department in the management of student records using SMS, thereby displaying the professional authority power of university academicians, that values autonomy. This did not settle well with the professional managers, especially from the central administration's

examinations section, who preferred a specific bound period for all the schools to adopt and use SMS.

The IT function had the administrative power delegated by CE2 to implement SMS in Hekima; however, there was no mechanism of resolving a school's internal problems that arose due to the professional authority power systems existing in a school, as was displayed by the initial leadership in School A. Bureaucratic norms of the university were keenly followed, such as in the progress and review meetings and in communications to the various schools, as observed in the documentation, and in the implementation of university-wide changes occasioned by the SMS implementation.

Administrators in schools observed administrative power and in instances where the academic managers were not keen on SMS, the administrators would not allocate personnel or follow-up to improve efficiency within their schools. The administrators from the central administration's academic section—admissions and examinations—pressed for the adherence to deadlines by schools which would ensure efficiency of SMS, but the academic managers seemed not to push the chairpersons of departments to submit marks on time, thereby displaying the professional authority of the academician; these systemic failures affected SMS processes.

Efficient service provision was not deemed critical and respondents viewed Hekima's larger proportion of staff as having portrayed the "do not care" attitudes, displaying *an inefficient working culture* comfortable with the status quo and not interested in systems that brought efficiency and transparency. The introduction of the *RBM* in the university led to the top management stressing the need for efficient service delivery to students, the primary customers. This need for efficiency placed the use of SMS as one important mechanism of providing enhanced better services to students. This indeed meant that SMS was tightly linked to the business of the university and was a strategic application. The adoption of the SMS in 2006 by many schools, driven by the top management, was attributed to this linkage.

The belief that the two key arms of the university were unrelated (that is, the academic side and the administrators) was visible in some schools, especially when such schools were interested in introducing variants of SMS within their units, for example in School A and School B. This *lack of synergy* in related activities at Hekima to produce a more efficient organization resulted in the duplication of efforts and delayed efficiency in the SMS implementation process.

5.4.1.4 Others

During the implementation process, social relationships were created between various actors involved in the process. Such relationships portrayed *mutual dependencies* for the implementation of SMS. For example, during the implementation of the course registration and examination processing modules for the government-sponsored students in School A, the Director requested a solution for the self-sponsored students. The Project Leader could not turn down the request even as a strategy for the self-sponsored students' records was being sought. The *early demonstration of successful adoption and use*, for example, the examination records for government-sponsored students in School A drove the Director to seek similar success for the self-sponsored students. Likewise, the success of the fees processing module for the government-sponsored students formed a basis for ESLTD to seek to collaborate with the IT department even when the company could procure an independent system. This portrayed *trust in the expertise and knowledge* of the IT staff that they could deliver a successful solution just as they had done for the central administration's finance section.

5.4.2 Implementation Process

The analysis of the organizational implementation process, conceptualised as consisting of secondary adoption, organization assimilation and organizational learning is presented in this section. Secondary adoption at the units described in the Hekima case illustrated the events at the unit level that led to the adoption of SMS, he organizational summarised at the organizational level. The assimilation of SMS- the degree of penetration and use of SMS at Hekima is also analysed at the organizational

level. The key experiences from the implementation process that informed both the implementation process and Hekima's context is synthesized, forming the organizational learning analysis. The organizational context's impact analysis of the SMS implementation is summarised in Table 5-2.

5.4.2.1 Secondary Adoption

Secondary adoption at the organizational level can be said to have been driven by various unit managers whose commitment to use SMS was the key decision that smoothed its implementation. The presence of such managers who were keen and committed to implementation efforts provided access to human and non-human resources, thereby building a foundation from which the use of SMS could proceed.

5.4.2.2 Organizational Assimilation

The assimilation of SMS in the university was marked by challenges of the availability of network infrastructure, continuous training, user support, and enhancements of SMS.

The annual student registration process at the start of every academic year was seen as a critical event in the use of SMS and the wide participation by various units in the university signified the level of acceptance of SMS, while the routine use each year moved to the assimilation of SMS, and has been institutionalised as the way of registering students. At the unit levels keen operation users who had ICT knowledge were critical in the initial acceptance of SMS and the knowledge gap that existed no longer was a barrier to the acceptance of SMS due to the acquired skills through training.

Problems encountered by the users and the implementers during these critical events were solved on the run: creating a "fire fighting" scenario, with the cycles of the registration processes coupled with planning and review meetings, illustrating an organization learning from its experiences. Drawing on experiences from the implementation process, changes to practices, SMS, and skills base were implemented. The continued availability of computing resources in the university

exposed potential users to the use of computers in the internet with the easy to use hyperlink system. This continuous interaction with computers reduced the users' learning curve of the web-based SMS resulting in faster adaptation to SMS by the users.

5.4.2.3 Organizational Learning

a) *Knowledge Barriers*: Although training was done, the emerging ICT knowledge gap was evident in the early implementation years. This gap is described as users not being both enthusiastic about the technology and comfortable with SMS as part of the working environment. The knowledge gap was partly because of the history of the university and the history of skills acquired prior to working in the university. Firstly, the use of technology-supported processes was very minimal, confined only to the technical staff of the computer science institute, creating a populace comfortable with manual processes where the use of computers was not priority. Secondly, the majority of the middle managers did not have computing skills which is attributed to the fact that computers were not available during their study in the universities and most were not exposed to the use of computers prior to SMS. The notion of work being insecure in computers displayed the limited knowledge users had about ICT. This knowledge gap seemed to hinder the acceptance of SMS in the early stages but was overcome by frequent training sessions and users exposed to the technology realised the benefits that came with the computerization. Examples of such benefits included the easy access to students' records, the tracking of user transactions and the collection of more funds for the university.

In addition, the previous management of the computer science institute and technologies that were available had created the belief that ICT was a domain only for the experts. Users interacted with the systems only via printed reports. When, all of a sudden, users were requested to get involved and own the system, there was bound to be resistance to the new changes. The resistance attitudes of the users did not deter the implementers, as one of the guiding principles during the creation of the IT function was to devolve MIS

operational activities to the users of the system. Although the users initially perceived the operations such as data entry to be the work of the IT function personnel, on acquiring ICT skills, the users gradually recognised their role in the running of the SMS.

The SMS implementation created knowledge and capabilities for individuals and the university. At the individual level, participants in the process gained knowledge on the role of computer systems in the organization and improved computing, project management and software development skills.

b) *Procedures Changes (Organization Memory Changes)*: Some procedures and policies were changed and embodied in SMS. Once the new procedures and policies became operational, there was a shift from what was known to a new state, and thus a change in the organizational memory. The planning and review meetings especially on the online registration where stakeholders reflected on the experiences of the process, as shown in the Figure 5-2., was an important avenue for changes to the organizational memory.
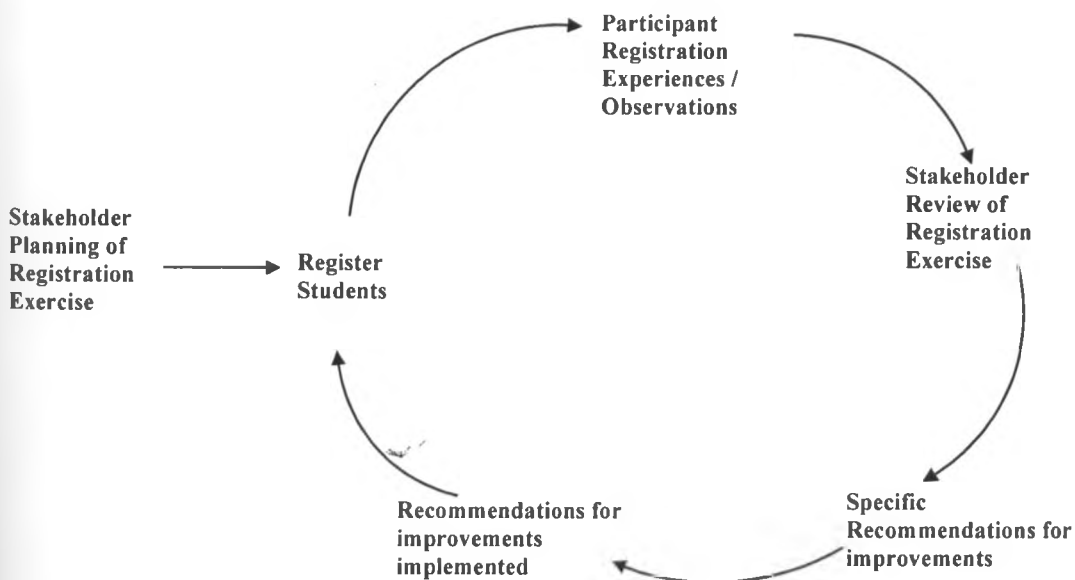
Figure 5-2: Online Registration Process Cycle

Based on these experiences, discussions ensued, and alternative procedures for challenges confronted were discussed and rationalised. In agreement, the modified

actions and procedures proposed were implemented to improve the performance of the systems. This cycle of actions in the online registration process implementation portrayed the university as an organization that was capable of observing its own actions, assessing the effects of the actions and effecting alternative actions to improve its performance. Such changes included the payment of student fees at banks, the allocation of students' rooms to students who had no fees balances, the opening up of student registration two weeks ahead of the opening day, and the devolution of MIS operations to the users.

The Figure 5-2 represents a cycle of events in the process of registration, which were followed annually for five years and became crucial in institutionalizing SMS and thus increasing its assimilation within Hekima. The cycle of events also represented an organization learning to solve implementation problems.

IS Implementation Process Event	Enabling Context	Constraining Context	Managerial Interventions/Strategies for Challenges	Consequences of the Implementation Process Event
In-house IS application development	• IT Leadership • Availability of Technology • Willing participants knowledgeable in business processes	• IS/ICT knowledge barriers • Inadequate technical skills • Inadequate project management skills • Unclear processes • Inadequate ICT human resource	• Participant ICT training • Recruitment of additional human resources • Use of prototyping approach • Participative approaches to application development	• Enlightened ICT literate participants • Participants' commitment to IS application use
Secondary adoption and assimilation at various units	• IT leadership • Technology adoption leadership in some units • Computing infrastructure • Leadership mandating use • ICT technically skilled human resources • Adoption of RBM that	• Lack of technology adoption leadership in some units • Inadequate computing infrastructure within the university • Continuous motivating use of SMS • Lack of an overall monitoring and evaluation schedule of implementation efforts	• Motivating managers (for example, Directors) and middle managers (senior administrators)to be champions in technology adoption • Aligning the secondary adoption and assimilation of SMS to the availability of computing infrastructure in	• IT leadership championing IS development in the university • Disparate levels of assimilation of SMS in the University

IS Implementation Process Event	Enabling Context	Constraining Context	Managerial Interventions/Strategies for Challenges	Consequences of the Implementation Process Event
	placed SMS as a mechanism for providing better services to students	• Lack of synergy between the professional and administrative power systems and the existence of an inefficient working culture	the various units • Continuous education of SMS though workshops and seminars	
Organizational learning	• Top management leadership • Leadership in various units (for example, IT department, Student Housing and Finance Units)	• Prior history of confined use of computers by technical staff only • Culture averse to risks and adoption of new processes • Inadequate project management and ICT skills	• Online registration review and planning meetings as mechanisms to reflect on experiences learned • Continuous SMS education to stakeholders through workshops and seminars	• Implementation of learned solutions arising from learning episodes • Creation of organizational capabilities in the implementation and use of IS

Table 5-2: Impact of Hekima's Context to implementation events and the Interventions used

5.4.3 Outcomes

The outcomes of the SMS were viewed as outputs, impacts, and changes in the organization and SMS. The case participants perceived the outcomes as being positive to the case organization.

At the organizational level, immediate outcomes of SMS were *improved processes in the management of student records*. By the use of computerised systems, the ease of access to student records was seen as transformational, especially for an organization that had long been dependent on manual records. This grasping of the automation challenge also portrayed the university as moving with modern ways of managing in organizations by using technology. The *revenue collection increased* and was attributed to the use of the system that not only kept records for all student related financial transactions but allowed only students with no debts to be eligible for student room allocation. The customization of the fees subsystem for ESLTD to handle specific needs for self-sponsored students also increased the collection of fees by reducing student debts, as the subsystem was linked to the course registration module and the production of examination cards. *Better utilization of the available bed space capacity* within the SHU was achieved, resulting to efficient use of limited bed space while fraudulent activities minimised. A more manageable *transcript production process* by the central administration's examinations section resulted in better services thereby reducing the turnaround time for transcript production and the frequent unrest associated with the availability of student transcripts ended. The *ease of production of student reports*, fees statements and transcripts further improved services to the students, while the availability of the same data for the production of statistical analysis (both financial and student population) made planning for students' services much easier.

Several *envisaged changes, as outcomes of the process* took place. One of the anticipated changes was in work roles of some stakeholders. The changes included the devolution of operational related activities for example the shifting of examination marks entry from the central administration's examinations section to the schools, the update of the nominal roll from the IT function to the admissions section, and the schools taking charge of course registration data. These changes resulted in

other desirable outcomes such as reducing human related errors and efficiency in data update operations. The processes of registration, transcript processing, and tracking of fees paid by students also happened as planned. The auditing of actions done through the system changed the users' culture from one of not caring what was done to accountability for actions, thus changing their attitudes as planned. To facilitate these planned changes, the various users were trained and retrained and, with continued use, effected the changes. A further anticipated change in the planned phase II of SMS, that of lecturers directing interacting with the examination system and entering marks directly, did not occur. This phase II was not implemented and was overtaken with focus shifting to the third phase of the implementation plan, the customization of SMS for self-sponsored students.

During the implementation process, several opportunity-based changes were identified and implemented effectively, resulting in unplanned outcomes. A key opportunity was the integration of the halls administration module to SMS. This opportunity provided a more comprehensive solution for student records management with the results of *enforcing student room allocation policy*, which was a loophole for students who prior to SMS would get away without paying accommodation fees. The idea of receipting fees through SMS was identified by management in a workshop, an item that the development committee had overlooked, and on implementation resulted in *changes in the processes of auditing and fees payments*. The working style of the auditing section of the university with respect to monitoring and auditing fees collected changed from manual processes of counterchecking receipts to computerised auditing, while the fees payment practices in the university also changed, with students depositing fees into specific bank accounts and the information downloaded directly to SMS. A further emergent issue because of improvements in SMS was the updating of the nominal roll during the registration process. Initially the school staff performed the role of updating student status as having registered a role that was eventually phased out and automatically embedded in the fees subsystem. The emerging web-technologies accorded SMS developers with an opportunity to change the system from client-server to a web-based system, which was an easier interface for the users to learn. The continuous enhancements of SMS during the implementation provided an easy-to-use system, customized to unit

needs that resulted in a *higher satisfaction* with the system and an *increased acceptance* of the system.

Increased human capabilities within the university were acquired as a result of SMS. Members of staff who were ICT illiterate acquired new *computing skills*, while the various people who participated in the implementation gained *implementation skills* in the development and the management of computer-based projects. These new skills not only enhanced their personal developments but also gave the organization a more skilled human resource competent in use and management of computer systems, a foundation which future IS implementations could learn from.

Although Hekima substantially improved and benefited by using the SMS, the full benefits of SMS had not been realised because of several limitations that were noted by the close of the case study period. The case study covered three schools and implementation efforts were ongoing on other schools not covered in the case period. These included:

a) The use of SMS for the production of management reports.
b) The modular development approach implied that some aspects of SMS had not been implemented yet such as the examination processing for all the schools in Hekima.
c) The lagging behind of some of Hekima's schools in the use of SMS.
d) The focusing on the processes of the undergraduate students necessitating the phasing for the postgraduate students' requirements, such as in course registration and examination processing in most of the schools at Hekima

5.5 Interpretation

We sought to analyse and understand IS implementation in the universities. In this section we further contribute our understanding by interpreting our analysis done in the preceding section, contributing to our understanding of IS implementation in the case university.

5.5.1 Contextual dynamics and the implementation process relationship

5.5.1.1 Culture and power systems

A first factor that contributed to the variations in adoption and use of SMS was the *culture and power systems*. The existence of professional and administrative culture and power systems displayed three different views of the implementation process. The professional managers, who are administrators and participated as functional officers were more rational and valued administrative power. With their participation in the development and review meetings, conflicts of interests were reduced and the ambiguity of the system became clearer as use progressed. The participation of the professional managers created an atmosphere that only required the appropriation of sufficient resources for the desired outcomes to be achieved. However, in academic units where the Directors, as unit managers, were not supportive, as observed in School A, the administrators valuing the chain of command, were reluctant to proceed with the process. The actions of professional managers and administrators in schools displayed the first perspective of the implementation process – implementation *of SMS as an administrative process* caused by the values of the administration managers, and worked well with the support strategy adopted by the top management. At the schools, under the leadership of academic managers, the implementation of SMS displayed a negotiation process between the IT function and the schools, which was influenced by the professional power authority and culture of the academic, who value dialogue. This process of negotiation has been identified by Markus and Mao (2004) as an emergent activity in participative approaches to IS implementation. The negotiation process, especially with the earlier school adopters, portrayed the second perspective of the implementation process, a *network perspective of the*

implementation process, whereby existing and emerging relationships between the Directors and the ICT team come to focus. This perspective emphasises the mobilization of actors within an organization who control sufficient information and resources as important in the implementation process as observed in Borum and Christiansen (2006). Additionally, due to differing course regulations in the various schools, the schools were uncertain if the SMS had the functionality to cater for their specific requirements and only after demonstrations would they envisage how the SMS worked. Coupled to this was the general lack of interest in SMS by the academic managers that did not work well with the support strategy adopted by management.

The IT department advocated the adoption and the use of SMS through demonstrations in workshops and school academic boards mobilizing the Directors to commitment to SMS use which would smooth the adoption process in the units. Commitment, especially the shifting of opinion by the Directors on the importance of SMS in their schools was important to a school's leadership support as it was displayed in the ensuing actions that resulted in the allocation of resources (human resource, computers at his disposal, space/rooms), time, motivating/mandating staff in the school to adapt and use SMS. The advocacy strategy thus adopted by the IT department was more appropriate to the schools as they would learn from the few which had already adopted SMS. This strategy worked well especially where leadership was not technologically perceptive and was conservative, thereby lacking a champion to promote the use of SMS. The use of the advocacy strategy is cited by Agarwal et al. (1997) to be a proactive mechanism of integrating technological innovations to regular work behaviours of the targeted audience through imparting knowledge about the technology, training and providing hands-on- experience.

The third perspective of the implementation process was the *political perspective* that occasioned initial resistance to or delayed the adoption of SMS in some of the units. The political perspective assumes that the implementation of an IS affects the stakeholders involved in different ways, and that some stakeholders take actions to protect their interests which may affect IS implementation positively or negatively. This perspective is based on the assumptions that IS often embody a distribution of organizational power and hence IS are capable of changing power distribution in the

subunits of an organization, invoking political behaviours during the implementation process, such as resistance or acceptance behaviours of stakeholders, that is driven by the perceived loss of power or gain of power. This political perspective was displayed by a few schools that wanted to have variants of SMS, causing conflicts of interest between the organization objective of having a university-wide SMS and a unit's interest of maintaining its own version of SMS. As described in the case, the conflict was caused by personal motives (for example, the intention to hire private consultants) and may be construed as political obstacles to the successful adoption of SMS. These vested interests were indeed obstacles as the actors involved feared to lose the perceived power they had if the SMS was implemented. In the units that illustrated this perspective, the departure of the conflicting actors paved the way for the successful adoption of SMS, while in other units the acceptance of SMS was driven by the general management change within the university, with the conflicting leaders aligning themselves to be seen to be politically supporting the general changes. The political view of the findings corresponds to various studies that have adopted a political analysis to the implementation of IS (Doolin, 2004 ;Jasperson et al., 2002;Markus, 1983).

5.5.1.2 Leadership

A second factor in the variations of SMS adoption was *leadership* at the units. Assimilation gap — the gap in time between the adoption and implementation of an innovation, was visible in the case and is attributed mainly to the *leadership gap* in the case site. Although the various CEs were keen to have computerised processes, it took long for the various persons in leadership positions, especially the leadership in schools, to grasp the importance of SMS. Leadership has been closely tied to culture and power discussed in the previous section. The general culture in the case organization was described as averse and conservative to new ideas. In schools where the leadership was willing to take the "risk" in the technology, commitment ensued and this facilitated the implementation process. Such leadership was notable by the presence of various heads of sections across Hekima acting as champions for the SMS use; for example, the SHU had its management team champion and was committed to the development and use of the hostel administration module of SMS. The presence

of such champions was important as it played a role in creating an environment for the SMS acceptance.

As events and consequences of SMS in the various schools spread among the university community, Directors of schools, driven by mimicking the early adopters sought to have benefits that their counterparts were reaping from successful assimilations. However, a second force, conformance to management requirements was driven by external pressures. Previously known to be a culture of lazy and not caring workers, the general change in the Kenyan HEI sector required the adoption of RBM systems. CE3, being the first implementer of the RBM system in Hekima, exhibited a leadership that expected cooperation and commitment to the cause of improving service delivery and hence mandated adoption of SMS for the late adopters. The actions of the late adopters can be considered to imply that the various leaders in the schools were keen to maintain their leadership positions and adopted the required change as a mechanism for maintaining the status of their positions.

Overall the general leadership was provided by the IT Director, who reporting to the CE, held quite a powerful position, and was deemed to be pushing for technological changes within the university. The context of Hekima's planning practices was carried over to the SMS implementation, resulting to the absence of a university – wide SMS implementation plan, a scenario changed as Hekima institutionalized planning practices.

However, the improvisational management of changes that the leadership adopted was a more pragmatic approach to managing the implementation process in the absence of a university-wide SMS implementation plan and the presence of strong cultural and power systems. The concept of organizational improvisation has been argued to be the unfolding action drawing on available social, cognitive, affective and material resources (Cunha & Da Cunha, 2003) and applied to the IT field in Orlikwoski and Hoffman(1997) improvisational framework of planned change framework. These improvised strategies to cope with emerging challenges were used for the benefit of the organization, to bring about success. The use of improvised strategies is in line with improvisation-supporting approaches which have been

suggested such as group working, user involvement, modularity and incrementalism in the implementation process (Heeks, 2002). The use of improvisational techniques is exemplified in the dynamic formation of implementation committees, which can be likened to project implementation teams. The emergence of the various teams to handle the implementation of SMS in the various units is not only cognizant of the independence of the units but also comprised of school, functional and IT staff. The structure of the unit-based committees enabled the committees to focus on a specific unit and its needs, leaving little room for conflict in coordinating the process at the unit level. This approach also enabled functional decisions to be implemented smoothly because the presence of the Directors who were part of the unit teams enabled the creation of a favourable environment by facilitating the availability of resources while the other functional officers involved enhanced acceptance at units.

5.5.1.3   Organizational Computing History

A third factor was the organizational computing history. The *history of computing* in Hekima was inclined to the centralized approach that led to a general population that was computer illiterate. The expansion of infrastructure brought about changes, making computing available to the larger population, and with it the need by Hekima's larger community to acquire a new skills set—computer skills and participation in computerising processes in the university, through training offered by the university. The training improved the computing skills and opened participation and involvement in the process. Although the participants had little knowledge of the technical aspects of SMS, they knew the business processes and related the business need of the system with their areas of responsibility very well. The participation of users enhanced the quality of the system to fit into their business needs, with their participation becoming crucial in the commitment to the use of SMS.

The growth of infrastructure is also a slow process, tied mainly to the financial budgets within which the university had to operate, resulting in the parallel deployment of SMS that depended on the availability of infrastructure. The shift from the manual processes at the unit levels to using the newly acquired computer skills and the expansion of the infrastructure marked a significant change in Hekima and influenced the pace of computerization of the students' records. Also, the managerial

users, although trained on SMS, including the top management that was formally trained once on the SMS, did not quickly associate with SMS due to a lack of a clear role for them, with SMS displaying characteristics of transaction-based systems, suitable for operations. The general lack of management reports skills and the translation of operations information to executive information needed to be addressed for SMS to be relevant to all the key stakeholders.

5.5.1.4   Context as Enabling and Constraining Managerial Actions

The deliberate actions to mitigate challenges within the implementation context and manage change within the case demonstrated a closely intertwined relationship between the actions of the managers on one hand and the general context on the other hand. Indeed, the intervening actions emerged out of the need to reshape the context and make it more suitable for the adoption and the assimilation of SMS to occur, while the context constrained those actions. This relationship was illustrated by the training and support interventions which, while geared to enhance the user skills set, were constrained by the availability of computing resources. Likewise, the development and enhancement of the computing resources was driven by the availability of financial resources. Due to this, managerial decisions such as the phased implementation which was aligned to the development of the infrastructure, continuous scheduling of training as a result of continuous enhancements of access to computing resources was shaped, driven and influenced by the context. Workshops and seminars were fundamental change intervention mechanisms effectively used in Hekima. These created forums where discussion about SMS were carried out and may be viewed as forums that created windows for consensus building. Indeed, negotiation and consensus building have been identified as social logics embedded in the cultural values of African societies (Olivier de Sardan, 1999), and observed at Hekima through the decision-making processes, and especially in the management structures that are largely composed of the academic.

This relationship between the actions of the managers and the context displayed a dynamic interaction between the various organizational structures, especially resources, culture and managerial actions, thereby linking factors and the process. In Gallivan's theory, this dynamic relationship is linked to facilitating conditions, where

the context is viewed as both enabling and constraining the technology implementation process. From this interpretation, we hypothesize that the organizational context shapes managerial interventions and decisions. This hypothesis is indeed similar to the findings of various studies that exemplify the importance of the implementation context such as Walsham (1993), Walsham and Waema (1994), Avgerou (2001), Walsham (2001), Krishan and Walsham (2005), and Walsham and Sahay (2006).

5.5.2 Process-Outcome Relationship

Outcomes in processual analysis are interpreted events or consequences. We therefore interpret outcomes as emerging consequences that occur during the process of adoption and assimilation of technological innovations. We identify the role of the outcomes (especially intermediate outcomes), as consequences of the process as emerging relationships between the outcomes, the process and the context. These relationships signify not only the dynamic relationships between the context and the process but also the complexity of the implementation process, especially the role of intermediate outcomes as mechanisms for organizational learning.

5.5.2.1 IS Development–IS Implementation Approach Relationship

The outcomes of the approach to SMS development, although not our focus, cannot be ignored as an influence to changes in the context and opportunities that led to events to improve the process. The use of in-house development necessitated a prototype approach that facilitated requirements confirmation and acceptance testing. Although such an approach takes long before product realization, it offered more control to enhancements and customizations of SMS to individual units' requirements, thereby over time creating an application that was suitable for the specific context, and created a collaborative approach to the development of IS. The participation in the development and the customization by units enhanced the acceptance and the use of system. The phased customization of requirements led to a phased implementation of SMS. The use of a phased approach implied other areas SMS had not been fully developed, such as the handling of postgraduate students examinations. The result of the phased approached was a situation where although a

lot had been achieved by the use of SMS, the total efficiency in handling students' affairs was not yet achieved. Indeed the approach to the development of SMS showed the intertwined relationship with the development processes and the implementation processes at Hekima, bringing together the software engineering perspectives and social perspectives to the process of SMS develomenet. Indeed this is in agree,enmt with Avgrerou (2002) thematic issues of IS, which identifies both engineering and social perspectives as themes in IS development processes research.

5.5.2.2 Consequences as Motivating Factors for Assimilation

Several outcomes that were perceived as positive acted as motivators for the continuation of the process and the assimilation of SMS. The realization of immediate *efficiency gains* from a computerised automated system as described in section 5.4.3 became motivators for the assimilation and the institutionalization of SMS procedures. This was especially evident in various units, such as the central administration's examinations section, School A, School C and the SHU where the realization of reduction of workloads, increased revenue collection, and better utilization of resources were beneficial to both individuals and the organization by becoming efficient. Therefore in addition to long-term objectives of IS assimilation, implementers need to be aware of intermediate positive outcomes as short-term objectives are important for enhancing IS success in organizations.

5.5.2.3 Consequences as Lens for Organization Learning

Learned experiences informed both the process and the context of implementation, as exemplified in the annual registration event in Hekima. The event interpreted as a learning activity, occurred over time, with the associated outcomes used as a basis to alter the process and the context of implementation. The earlier registration events demonstrated knowledge barriers, unskilled users and developers and inadequate infrastructure. These registration events provided opportunities for Hekima to learn from experiences of users interacting with the technology. By reliving these experiences in the planning and review meetings for the online registration as illustrated by Figure 5-2, solutions for solving the problems that were identified formed the next set of actions in the process. Basing recommended actions (such as

continuous training, enhancing SMS and infrastructure, and enhancing procedures associated with the event) on the shared understanding of participants' experiences provided a mechanism for integrating lessons learned. Also, the implementation of the recommended actions before the next cycle of registration enhanced acceptance of SMS. This sequence of actions in the organization may be viewed as organization learning in the course of the implementation process to solve implementation problems and illustrated that organizations can overcome implementation challenges by learning from the challenges and finding solutions through teamwork.

Apart from the online registration, another learning activity was the customization of SMS in the various units. While the initial committee did not have a university-wide plan, or even a plan from the central administration units, the implementers learned to have "project plans" for the schools' customizations and the SHU. The use of school-based project plans can be explained as a consequence of gaining experience in project management. By having clearly spelled out plans and allocated responsibilities reduced possibilities of conflict of interest within the committees.

The learning and the actions thereafter, while continuous, are difficult to separate from the implementation actions. We therefore support the view that organizational learning is part of the implementation process, especially when used as a lens to mitigate emerging knowledge and experience barriers. The learning aspects as described displayed leadership, communication and teamwork as key components that facilitated learning from the ongoing implementation process.

6 Conclusions and Recommendations

6.1 Introduction

This chapter concludes the research by presenting an evaluation of the achievements of the research in relation to the aim of the study, conclusions and implications from the research.

We sought to contribute towards understanding the process of implementation and change interventions used to bridge the implementation of IS innovations in universities. By adopting an interpretive case study approach, a deeper understanding of factors in the context, such as barriers and challenges to the effective implementation of IS in a case university was achieved.

In the first section of the chapter, we recap on the research by reviewing each chapter. The second section discusses the contributions of the research, which is followed by an assessment of the research in the third section. We then make general conclusions of the findings in the fourth section and discuss emerging implications for IS practitioners in the higher education sector in the fifth section of the chapter. The final section of the chapter completes the thesis by pointing out the research limitations and opportunities for further research.

6.2 Research Overview

The first chapter of the thesis, chapter one, gave a background to the general challenge of IS implementation in organizations, thereby introducing the broad problem area, and continued to the research aim, objectives and questions. The adopted research methodology and strategy were given, and the adopted definitions and perspectives of IS as used in the research outlined. The chapter illustrated that different perspectives of organizations lead to differing perspectives of IS in organizations, and hence the different theoretical lenses applicable to each. The concept of organizational IS implementation in reference to the process of introducing IS innovations was explained as encompassing the several subsystems within an organization and consisted of all activities that the organization performs to ensure the

innovation is appropriately used and beneficial to the organization. By acknowledging the unpredictability of implementation outcomes, and the subjective nature of the success concept, we adopted a more generalised view of IS outcomes as encompassing intermediate outcomes and consequences as perceived by the stakeholders. We concluded the chapter with an outline of the thesis structure.

Chapter two provided theoretical foundations to the organizational implementation of IS. The chapter provided a review of the literature on the broad themes of the IS discipline and illustrated the different foci of the systems development theme upon which this thesis is based.

The shifting perceptions of the IS concept in organizations from technical deterministic systems to STS and social systems were presented.

The review of the organizational implementation process hinged on two underpinning theories, the organizational learning and organizational innovation was presented. The organizational learning perspective to the implementation process and the relationship to organizational change were covered. The theory's explanatory limitation in explaining the dynamic interaction between the context and the process was explained.

The innovation diffusion perspective, a key underpinning theory for the research was covered, and included factors, process and hybrid frameworks to innovation research. The associated limitations and benefits were identified. Recognizing the richness of hybrid frameworks, and based on the wider social-contextual perspective of IS that is the nature of the research, Gallivan's hybrid theoretical framework was presented and critiqued. A synthesized theoretical approach, theory constructs and operationalized definitions were then outlined.

The research strategy was outlined in chapter three. The aim of the research was to create a better understanding of the interplay between the organizational context and the implementation process of IS innovations, which rendered the research suitable for a case study. An in-depth case study approach was chosen to gain rich exploration

insights of the process. A research design, the case design, data collection techniques and analysis tools employed were outlined as used in the field study.

Chapter four presented a detailed description of the case study conducted. The social systems of the organizations context identified as the management structures, cultural systems, and technical systems were described. The events, actors and actions of the implementation process were identified and described for the case period.

In chapter five, data collected from the case organization was analysed. The analysis adopted a multi-level approach that was achieved by first analysing the adoption process in individual units within the case organization. Guided by the theory constructs of the adopted framework, the second stage of analysis at the organizational level was then presented. Gallivan's theory, being a multi-level theory was particularly useful in analysing the contexts of both the unit level and the organizational level, thereby facilitating a complete understanding of the case as described in chapter four. The analysis was followed by the researcher's interpretation as presented in chapter five. The interpretation represented explanations for the actions and the consequences of the process. The findings indeed were in agreement with extant literature, and a key finding was the cultural context that shaped the managerial actions, especially in dealing with the three different emerging perspectives of the implementation process. The interpretation, and discussions were then used to make conclusions presented in the section 6.6 and formed a basis for the emerging implications for practitioners in HEIs presented at the end of this chapter.

6.2.1 Revisiting the Research Questions

We set out to address our research concern, outlined in chapter one, to understand and illustrate the impact of context and management actions on the implementation of IS innovations. To achieve this, two research questions were presented and we review these in relation to the findings presented in chapters four and five.

1. *How does the university context affect the implementation process of IS in the university?*

The question was asked to understand the

a) organizational actions and events that constituted the implementation process, those of adoption and assimilation, and

b) factors within the implementing context that either facilitated or constrained the implementation process.

The case study results showed how the IS innovation was adopted, the forces that facilitated or hindered the adoption, and the experiences and actions of the various actors in the course of the acceptance and the assimilation of the innovation; and how these actions were responsible for the outcomes.

The analysis and the interpretation of the results as provided in chapter five revealed that the implementation process was both a managerial process and a social process that involved learning at the individual and the organizational levels. Firstly, implementation as a managerial process illustrated factors that were critical to the process. These were demonstrated in the relationship between units' leadership and the process. Supportive leadership influenced the actions and the commitment of users/implementers and actions such as the provision of necessary resources, training and provision of user support, motivating, mandating, and monitoring progress were managerial actions that were carried out that influenced the process. Secondly, the analysis and the interpretation showed that the implementation process happens within the social subsystems such as the management subsystems, formal rules and procedures, and informal subsystems (culture and norms) of organizations. These structures in the case organization constrained and facilitated the implementation process and, by reflecting on the intermediate outcomes, changes to both the social subsystems and the process happened thus displaying the dynamic interaction of the various subsystems and the process. Such a dynamic interaction was displayed for example by the unit based formation of project committees and the relationship of the observed culture and power system to the process.

The study also established that the context of implementation was important to understanding any implementation effort especially the historical and the cultural contexts.

Barriers and challenges within the context were also identified and their impacts on the implementation process explained. The case organization illustrated several barriers and challenges that impacted the implementation process negatively. From a workforce culturally embedded in manual processes, and not valuing computerised processes, the implementation process was faced with inadequate ICT skills to use, implement and manage the IS in addition to the lack of experience of implementing huge IS projects. The inadequate numbers of ICT professionals also impacted the process, especially the development process. The availability of infrastructure in the organization was crucial in driving the primary adoption; it also slackened the deployment process, especially where no such network and computing infrastructure was available. A lack of commitment in key leadership as was observed in several academic managers at the unit levels also slowed the assimilation of SMS. Indeed, the variation in leadership in the case organization was a key contributing factor for the long duration that the assimilation of SMS seemed to take in the organization. However, in contrast there was also the presence of factors that facilitated the process and helped mitigate the challenges. Such factors included the presence of willing participants and users knowledgeable in business processes, and the presence of IS leadership from the IT function.

2. *How were changes associated with the IS implementation process in the university managed?*

To understand the management of the changes during the implementation process, challenges in the context were identified and the strategies to counter the challenges were identified. Most of the challenges were within the social context, and intervention and managerial actions were the key strategies used. As summarised in Table 5-2, key managerial actions, the training and on-site support, the recruitment of additional staff, the enhancement of computing facilities, in addition to change interventions mechanisms using seminars, workshops, demonstrations, and participative development approaches were all efforts geared to creating an enabling environment for the process. Improvisational management to unfolding consequences, as was observed in the case of the annual online registration event, such as "crash-on-site-training," grasping opportunities to implement unplanned changes, and the

annual registration review meetings displayed an organization learning from its experience, creating confidence in a community that was very averse to technology.

The consequences of the implementation process and the management of the process led to the emergence of an organization that learned to solve implementation problems as they arose, thereby creating new organizational capabilities, knowledgeable in IT systems and in how technology improves performance. The replacement of manual processes with computerised processes, which was a requirement, has brought with it the benefits of efficiency in serving the customer, the student, by the provision of services such as accurate fees balances and timely production of transcripts. The creation of a data bank for statistical analysis, reduced students' debts, increased collection of funds, and an efficient utilization of resources are examples of other positive outcomes from the implementation process.

6.3 Research Contributions

6.3.1 Theoretical Contributions

Framework Constructs	Construct Categories	Explanation
Implementation context	Managerial interventions	a) Managerial actions that are geared to creating an enabling environment
		b) Change management strategies and actions taken to counter resistance and enhance the adoption and assimilation of computerised application system at unit and organizational level
	Subjective norms	The social influence to adopting computerised application systems
	Facilitating conditions	Factors that may enhance or hinder the implementation process
	Others	Aimed at capturing emerging factors or issues

Framework Constructs	Construct Categories	Explanation
		that may emerge from the case studies
Implementation process	Secondary adoption	Events at the unit level that lead to the adoption of the computer application system
	Organizational assimilation	The degree of the penetration and use of the IS in the various units within the organization
	Organizational learning	Key experiences of the implementation process that inform both the process and the context of implementation
Outcomes	Outputs and impacts	Both planned and unplanned intermediate consequences and results of the implementation process

Table 6-1 : Summary of Theory Constructs

Avgerou (2001) argues that all IS studies are contextual since they address issues of IS implementation and use within organizations rather than in a laboratory setting. IS studies have been done that take a contextual perspective to analyse the process of implementation, and our study is a contextual study in the broadest sense, as it has emphasised the internal context, the process and the linkages between process and context. Although the scope of the context did not include the external context, the data analysis did exhibit the influence of the external environment, albeit minimally. The study is categorised as a processual as it tackled the question of how the process of IS innovations unfolded over time, within the implementing context (Pettigrew, 1997).

Gallivan's (2001) framework, adopted in this study, was developed to explain adoption of authority-based innovations, where both the organization and individuals adopted the innovation and specifically a top-bottom implementation approach to technology adoption and diffusion. By conceptualizing the key constructs of the framework, and informed by extant literature, two additional constructs were incorporated into the framework, as detailed in Table 2-2 in chapter two, and summarised in Table 6-1. The first concept was the change management strategies

and actions, under the managerial interventions category. The second concept was organizational learning, as a construct category within the implementation process framework construct.

The research provided an empirical testing of Gallivan's (2001) framework, a hybrid framework that incorporates a process approach to complement factor-oriented research to an organizational innovation process. The use of the framework enabled a better understanding of the process by illustrating key features of the context, the interaction of the context and the process, and the interaction of the emerging consequences as outcomes of the process. Gallivan's (2001) framework was developed to explain adoption and assimilation processes in authority-based innovation the adoption scenarios (where both primary adoption and secondary adoption occur). However, the research resulted in the application of Gallivan's (2001) framework , to a different scenario, where primary adoption occurred with delayed deployment, and bottom-up approaches used to bridge the assimilation gaps once deployment began. Expanding the theory constructs to include change management strategies and actions and organizational learning enabled the identification of events and factors that were used as intervening mechanisms in the process of implementation and illustrated the dynamic nature of the process. For example, the identification of actions to counter resistance to the implementation efforts such as the approaches of using workshops and participative approaches in the implementation process of SMS at Hekima was achieved using the added construct of change management. Another example, the identification of consequences of the processes as tools for organization learning was enabled by the identification of experiences as learning activities in the process using the organization learning construct. This enhanced the explanation of the annual registration activities over the period of the case study and the influence the activities had both to the university context and the process. In addition to the examples above, the inclusion of feedback loop to the implementation context made it possible to explain the influence of the process to the context, and especially the management interventions within the context, discussed in section 5.4.1.

Another theoretical contribution is the illustration of how management actions impact IS in organizations. The management of the unfolding challenges as the process

progressed emerged as a key theme in the study. The use of bottom-up approaches to bridge the emerging assimilation gap in the case study, especially at the unit levels, the use of phased implementation approach aligned to the availability of computing infrastructure portrayed the importance of strategic actions during the implementation process. The concept of organizational learning, as a key concept in the implementation process, also was displayed by the importance of intermediate outcomes and process consequences as tools for reflection and agents for opportunistic changes in the course of implementation.

The theory and the findings of the study contributed to the researcher's understanding of the organizational implementation of IS innovations in public higher education institutions. By building on IS innovation studies to describe issues unique to Kenyan universities, the study contributed to a better understanding of the roles of appropriate management interventions and organizational learning in the implementation process. Management interventions as intended actions within the context portrayed actions and efforts towards a successful implementation of IS. These actions and efforts continually changed the implementation context by enhancing the implementation environment, applying appropriate strategies such as aligning deployment with an availability of computing infrastructure, and managing the emerging challenges as the process continued. Organizational learning, as application of knowledge gained from the implementation process experiences that triggered the implementation of changes in the context and the process, and the success of the implemented learned solutions not only motivated the use of the IS but also enhanced the organizational capabilities in the implementation of IS, thereby recreating the implementation context. These two factors illustrate the context as the medium and the outcome of human action, actualised through the interaction of the context with the process. This interaction of the context with the process is indeed in agreement with Gidden's Structuration Theory that proposes a duality of structure: that social structure is both "the medium and the outcome of the conduct it recursively organizes: the structural properties of social systems do not exist outside of action but are chronically implicated in its production and reproduction" (Giddens, 1984). This observation, of the context being the medium and outcome of human action has indeed been made by other IS researchers, (Walsham 1993; Walsham & Waema, 1994; Barrett & Walsham, 1995,

Montealegre 1997; Walsham 2001), who have utilized Gidden's Structuration Theory in their research.

6.3.2 Methodological Contribution

The main methodological contribution of the research has been the operationalization of the framework and the development of the detailed coding structure from the theory's constructs in appendix I. The operationalized framework and the coding structure guided the data collection and the data analysis as described in the case description and analysis in chapters four and five, respectively.

Other researchers can use the theoretical constructs and the accompanying coding structure as a basis to enhance their own understanding in the data reduction techniques using codes, a rarely documented process. The thesis can also serve as an example of how qualitative data is used to arrive at categorizations of observed data using the coding schemes. Additionally, the case data collected may be reused by other researchers interested in case studies from developing countries to inform their studies.

6.3.3 Practical Contributions

The research aimed at understanding the implementation of IS at the organizational level in HEIs. The study generated considerable understanding and illustrated the relationships between the process, the context and the consequences from the process by focussing on not only technical issues but also social issues.

The practical contribution of this study is especially to practitioners in HEIs, as detailed in the implications for IS management in chapter six. However, despite the focus of the study being the HEIs in Kenya, which largely lag behind in the development and the use of ICT, the findings and implications may be applicable especially to public institutions in Kenya.

6.4 Research Assessment

We use the set of questions developed for judging the theoretical contribution by Whetten (1989) as a general framework to assess the whole research.

1. *Does the study make significant value-added contribution to current thinking?*
Walsham and Sahay (2006) in reviewing IS research in developing countries bemoaned the lack of articulate details of technology and how technology affected the context and outcomes. This research, while recognising the interrelationships between the context, process and outcomes, gave a detailed account of the interplay between the context, process and outcomes in a case organization of the higher education sector. It provided empirically based case analysis and interpretation based on a rich case description, culminating in understanding how organizational contexts and organizational learning impact the implementation process.

The research, broadly contextual, a characteristic of IS implementation studies, explored the implementation of SMS- an IS application in a HEI case organization to gain insights and understanding of how actors within the case organization adopted the application and the factors that constrained and enabled the assimilation of the application. To achieve this understanding, Gavillan's (2001) framework was extended by adding two additional constructs, the change management and organizational learning to create an enhanced theoretical framework which was used as theoretical lens in the processual analysis and interpretation.

2. *Will the study change the practice of IS implementation in HEIs?*
The findings of this research have the potential to change IS management in HEIs, especially in developing countries, and specifically in Kenya. The analysis and the interpretation presented in chapter five, revealed that both technical factors and non-technical factors had varying impacts on the implementation process. However, appropriate intervening managerial actions were also revealed. By drawing implications from the case specifically for the HEI sector, it is expected that the empirical evidence produced by the study will assist the practitioners to learn from the case. For example from the implications drawn from the case in section 6.6, practices that are useful to IS practitioners in HEIs for successful IS implementations include

a) The use of IS development and implementation approaches that involve wide participation such as prototyping

b) The presence of top management support

c) The management mandating use of the IS

d) The alignment of IS projects with strategic business plans and targets and

e) The presence of IS leadership at the IS function, user units and management levels.

3. *Are the underlying logic and supporting evidence compelling?*

The research objective and the research questions developed were presented in chapter one. The underlying theory, organizational innovation theory and framework adopted, drawn from existing literature, focused on the "whats" (constructs) and "how" (relationships between constructs) aspects of theory that were the key pillars of the research. These were illustrated in Table 2-2 and Figure 2-3, respectively, providing the subject of our theory and clarifying our approach to the research, and the basis upon which the interview guide and questionnaires presented in appendix III were developed to collect relevant data. An in-depth case study was adopted whose data was collected through interviews and transcribed. Data triangulation was achieved by use of documentation review and data reduction achieved by the use of a coding strategy presented in appendix I. Data analysis was guided by the adopted framework and unit-level analysis done separately before the organizational level analysis, as elaborated in chapter five. The multi-level approach to analysis formed a solid base of evidence for the case analysis interpretation, thus achieving a stable underlying logic and grounded in reasonable data.

The case description and analysis presented in chapters four and five respectively may be considered as a report of the fieldwork thus forming the evidence for the entire study, upon which the interpretation, conclusions and the implications from the research are drawn.

4. *How well does the research convey completeness and thoroughness?*

The research carried out covered all the key goals of a research study. The research problem and questions outlined in chapter one, covered the "what to study" aspects of

a research by delineating what we set out to achieve. By outlining the relevant theories, as well as our theoretical approach to the problem and the research methodology in chapter two and chapter three, respectively, we set the direction of the research by framing the theoretical basis and methodological steps followed in seeking answers to our questions, illustrating "how do we answer" the research problem aspect. Chapter four described the case which displayed the data collected and set the basis for data analysis and the interpretation guided by the adopted theory, as illustrated in chapter five, thereby answering "the what to do with the data aspect" in the research. The final aspect, the evaluation of the research, is the last chapter of the thesis that seeks to draw conclusions from the research, while reviewing the research in relation to the research questions, and contributions.

5. *Is the thesis well written and does it flow logically?*

The thesis is used a medium for communicating the research carried out and the findings thereof. It has thus been structured and written to communicate to other persons not involved in the research. The thesis, as a research report has been written in a way that upholds case research ethics by disguising the case organization and their participants.

The thesis structure, as laid out has maintained the flow of ideas. Starting with the research background and topic, which led to the formulation of research objectives and questions, set the direction for the thesis. A relevant literature review and theoretical lens guiding the study were then laid down, and the methodology section described how the research was carried out. The results of the in-depth case study were then represented, analysed and interpreted. This structure as presented shows that a logical flow was maintained throughout the research period.

6. *Why now? Is the topic of interest to scholars and practitioners in this area?*

The use of IS applications, ranging from traditional applications to the more sophisticated applications that encompass whole organizations (such as Enterprise Resource Planning and Customer Relationship Management systems), has long been linked to effectiveness and frequently used for strategic advantage. Despite the envisaged strategic benefits of IS applications in organizations, the implementation of IS in organizations has been associated with failure, with research in IS failures

documenting problems such as failure to meet expectations of users, escalating costs, failure of IT professionals to properly engage with all stakeholders, Kreps and Richardson (2007). In public institutions, large IS projects have been observed to persistently end in failure, leading to waste of public money, Kreps and Richardson (2007). Therefore the implementation of IS is a critical management aspect of an organization, hence the importance of continued research on the topic of IS implementation. The research was done to contribute to the understanding of the interaction of IS technological innovations and the context of universities, especially universities in Kenya. The results of the research are of interest to scholars and professionals in the IS field. Scholars interested in processual analysis of the implementation process, and particularly in applying the Gallivan (2001) hybrid framework, will find the work interesting, in addition to scholars studying the usefulness of hybrid frameworks. The research is also of interest to academic readers pursuing failures research of IS implementation. The research adopting a social perspective documents the influence of social structures around an organization such as organizational culture, leadership structures and the technological environment to the implementation process, thereby facilitating better understanding and strategising on appropriate interventions to counter failure .

7. *Who else including academic readers is interested in this topic?*

Besides scholars and researchers, the organizational implementation of IS is of interest not only to IT employees but also to other senior managers in organizations. The case study has illustrated that IS implementation is not the preserve of ICT professionals only. For example, from the case study, the participation of top management in aligning IS projects with strategic objectives of the organization was important in enhancing adoption; the active participation of middle management and users enhanced ownership, provided leadership and motivated use of IS processes; IS management needed planning for adequate ICT infrastructure and human resources, development of user ICT capacity in addition to provision of IS leadership. Therefore for effective implementation of IS in organizations, other senior personnel within an organization, and participants in IT-related projects, need to be knowledgeable about the implications of embracing technology, and the key roles of ICT professionals in enhancing the adoption and the assimilation of IS innovations.

6.5 Conclusions

One general conclusion is that the *implementation process must be understood in the context within which it occurs.* This is in agreement with the literature which has stressed the importance of context (Walsham and Sahay, 2006;Heeks, 2002;Avgerou, 2001). The context in the case study was illustrated to both constrain and enable the implementation process varyingly. Five conclusions are specifically made from the case study.

The first conclusion is that the *use of IS applications as strategic tools enhances adoption of IS applications.* In the case of HEkima, schools were not keen on adopting SMS, and the implementers had no mechanisms of mandating academic managers to adopt and initiate use of SMS at their schools. This challenge was caused by the presence of an organization structure that upheld a culture that valued authority where bureaucracy in reporting structures was highly observed. The implementers resorted to the use of an advocacy strategy, in addition to the general support strategy adopted by Hekima's management to mitigate the emerging challenge of authority to mandate adoption of SMS. However, when SMS was tightly linked to the RBM systems, SMS was seen as a mechanism that could create efficiency. This clear communication towards efficiency by university authorities and the use of SMS as one tool resulted in compliance and conformance to the use of SMS by the later adopters.

The second conclusion is that the use of *participative approaches enhances commitment to use.* This conclusion has also been observed in extant literature by other researchers (Aubert et al., 2004; Markus and Mao, 2004;Mumford, 2006). The inclusion of stakeholders, first in the development committees and later in the planning and review meetings, enhanced commitment to the use of IS. Middle managers have been singled out as a cause of resistance in implementation efforts, especially when they are not involved. The appointment of middle managers by their heads of sections to participate in the development of the application made them part of the process, leaving no room for resistance. Moreover, their presence and the later involvement of the various heads of sections had implications on changes that the IT professionals were not in control of. Such changes became acceptable by virtue of

the involvement of the middle managers. For example, the use of computer receipts requiring the downloading of fees transactions from bank accounts into SMS needed liaison between the university and the banks - an issue that fell outside the IT section's jurisdiction, and which was facilitated by the involvement and ownership of the fees subsystem by the Finance Officer.

The third conclusion is that the implementation process involves *organizational learning and results in organizational change that requires continuous change management mechanisms*. This conclusion, again, is indeed in agreement with observations in literature (Orlikowski and Hofman, 1997; Macredie and Sandom, 1999; Cunha and Cunha, 2003) that organizations often require continuous actions in response to change outcomes associated with IS implementations, typically due to the continuous interaction of the technology and the social context that result in planned and unplanned changes. An illustration of continuous change management interventions was observed in the adoption and the use of online registration. From the onset of the adoption of online registration, changes that were anticipated were more associated with the replacement of the manual process. However, as the process was ongoing, opportunities for the improvement of the online registration process were identified, illuminating organizational learning from experiences, and enhancements were made from the lessons drawn from the process. For the learning to have an effect on the following cycle of the process, changes that were necessary for implementation were identified and the units required to implement the changes ensured changes were implemented by the next registration cycle. The planning and review meetings in addition to their use as change mechanisms could also be perceived as mechanisms for monitoring and evaluation in the absence of a university-wide monitoring and evaluation framework.

The fourth conclusion is that *the presence of a favourable context of the organization to adopt IS is crucial*. This has been cited in previous studies (Klein et al., 2001; Klein and Sorra, 1996; Land, 1999) as critical success factors for IS implementations. A favourable context comprises the presence of champions, the readiness of the people, the available on-site support and an enabling network infrastructure. From the case study, the phased adoption by schools, based on the readiness of the schools to embrace SMS, emerged as an intentional strategy by the implementers. As was

demonstrated in the schools A, B and C, where the implementation of SMS was aligned to not only the availability of infrastructure but also the commitment and cooperation of school's leadership which facilitated access to resources, thereby increasing the chances of the success and avoiding the failure of SMS implementation. The provision of on-site support in the schools enhanced the acceptance of SMS.

The fifth conclusion is that IS *implementers must "sell" IS in organizations to increase an awareness of the benefits of and reduce the chances for resistance to IS innovations.* This conclusion is especially important in a university environment where involving the school in planning and implementing administrative systems fosters campus-wide engagement and support as has been observed by Pennock and Bunt (2005). The case illustrates that the use of various forums, such as school academic boards, management meetings and workshops for stakeholders provided environments for the interaction between the implementers and the stakeholders, resulting in increased awareness, and the creation of social relations, which were followed up for the continued marketing of SMS.

6.6 Implications for IS Management in HEIs

The implementation of IS in the higher education sector is an expensive venture in terms of financial resources investments, time and human resource and thus its effectiveness is critical. A general observation from the case study is that *the process of implementation is lengthy and complex.* From the case organization in which IS implementation was tracked for ten years (1996 to 2006), it was noted that at the close of the study period the implementation of SMS was still incomplete as outlined in section 5.4.7. Drawing from the case study, general implications for the higher education sector in Kenya are made. These implications may be applicable to other HEIs outside Kenya.

Firstly, *adopting an IS development approach that is aligned to the context enhances the adoption of the IS* in an organization. As was observed, the implementation of SMS in Hekima adopted various alternatives such as prototyping, participatory approaches and phased implementation that suited their context, and enhanced the

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SMS adoption. The presence of IS leadership that is cognizant of the various software development approaches, and their applicability in the organization, while mitigating risks associated with the approaches, is one mechanism that can be used to achieve the alignment between the IS development approach and the context.

Secondly, *the challenge of infrastructure development affects negatively* on the rate of the application systems implementation. As was observed in the case study, the availability of infrastructure continually affected the effective implementation of SMS, resulting in a time lag between the completion of modules and the actual use of the system. Interlinked to available infrastructure is the life span and capacities of technologies implemented. The importance of infrastructure was evident in the registration processes that illustrated the limitations of the capacity of available computing infrastructures that in the second registration compromised the usefulness of the system. Thus, there is need for ICT practitioners in the sector to simultaneously plan for the infrastructure development and capacity as they plan for the application development as a mechanism of ensuring quality IS services.

Thirdly, *planning for human resource and devolving ICT support to units must be considered as it enhances the process of IS implementation.* From the case study, it is evident that the university benefited from the computer science institute, whose students prototyped systems that were later adopted and enhanced to meet the requirements of Hekima's users before their implementation. Both the students and Hekima benefited, with the students gaining practical skills while Hekima bridging the lack of adequate human resource in the early years. Despite this advantage, retaining and attracting good human resource in universities need sound strategies to avoid frequent staff turnover due to competitive terms in the other sectors of the economy. At the time when Hekima relied on one IT member of staff, especially in early development phase, the project would have suffered huge delays among other effects if the person had left. The decision by the IT function to devolve user activities such as data entry and the processing of transcripts was critical as users participated and gained ownership of the information in the system. The IT function was then focused on providing user support services at the unit levels, enhancing the acceptance of SMS. Given the continuous nature of student processes, practitioners should consider institutionalising ICT support at the unit level, creating functional

areas, and enabling units to progress from focusing on basic operational use to advanced customized functional application of ICT technologies in their units.

Fourthly, *the presence of leadership at the corporate, schools and IS function levels that support IS technologies and the associated changes* brought by their implementations is important. The perceptions and importance which the various CEs in the case study had for IS technologies shifted goals for the SMS implementation. During the tenure of CE1, the use of IS technologies was confined to the IS function, with the larger university community isolated from technology use. However, under the leadership of CE2, changes from manual processes to computerised processes in the university were evident, especially with the adoption of SMS. This was enhanced by CE3, who not only supported the changes but also championed the use of SMS. The involvement of the Deputy CE (Academic Affairs) in SMS workshops, planning and review meetings indeed meant that the corporate leadership viewed SMS as important within the university. Leadership at the schools as illustrated in the case study had direct effects on the implementation process. Academic managers are elected for a given period; and changes in the managers can pose a setback in the implementation process, as illustrated in the case of School C's adoption of SMS. Therefore, more inclusive participatory strategies at the schools' level are needed to ensure continuity well after the term of a given academic manager ends. Furthermore, as universities move away from traditional management frameworks to entrepreneurial frameworks, there is need for managerial capabilities to create value from technology by producing relevant information from systems, creating a need for the acquisition of innovative leadership skills that are less conservative and more accommodating to technological innovations. The leadership of the IS function in the case emerged as important in the implementation process. The capability of the leadership was displayed by the use of various strategies and actions that enhanced the use of SMS. The case illustrated the use of a bottom-up approach to bridge a possible assimilation gap,[15] by involving the middle management and advocating the use of SMS in the schools. The strategy, a consequence of the context, illustrated the need for the recognition of possible challenges and aligning tactics of the process with the changing context of the organization. The implication is that *the management of*

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[15] The case displayed the classification where the adoption of SMS at the organizational level occurred, with some time lag for the adoption of the innovation at the unit level, referred to as assimilation gap.

IS innovations in HEIs needs leadership that is innovative and proactive to complementing top-down approaches to deal with the social, organizational and technical challenges that may arise. It thus emerges that IS leadership is not the sole responsibility of the IS function leadership, but a functionality of all managers at all levels in an organization, in communicating the purpose, participating, supporting and monitoring IS-related issues. Additionally, comparing the progress made when Hekima conformed to reforms required by the government and started to implement RBM, and SMS was seen by Hekima as a strategic option for enhancing students' services to progress made prior to this, it is clear that the organizational adoption and assimilation of SMS to the schools and other units that had not adopted SMS was smoother and took a shorter time. The presence of favourable external factors influenced Hekima's perception of SMS as a strategic tool and hence CE3's direct leadership. Based on this we argue that if Hekima had provided direct strategic linkage of SMS to its operations, the implementation process could have been shortened significantly.

6.7 Research Limitations and Further Research Opportunities

The organizational implementation process of IS is not only lengthy but complex, involving several human beings who by nature are complex. Moreover, the organizational context within which implementation happens is dynamic, adding to the complexity of the development and the use of IS. Two limitations of the research are outlined below.

a) During the study, the primary adoption of SMS by the organization was taken as a given. However, the dimensions of the adoption process were not exhaustively covered and hence the conclusions made from the case study represent the researcher's perspective and reveal only a dimension of the process.

b) The case study covered a period of ten years, and towards the end of the case period structural changes that were taking place and their detailed impact on the post-implementation of the IS innovation, SMS, were not considered. It would be interesting to find out about the interaction between the changes and the process.

Given the above limitations further opportunities for research are suggested.

a) Further research in the areas of the limitations mentioned above would be interesting to conduct.

b) The implementation of an IS involves various groups of people. In the case study the IT department was viewed as the implementer and sometimes referred to as internal consultants by the rest of the interviewees and the management. In the collaborative implementation approach used in the SMS project, relationships between the implementers and the users were formed and continued to exist. Although the study did not capture or analyse these relationships, the management of these mutual relationships for the success of the IS projects need to be further investigated. For example, what kinds of relationships are created that influence the implementation process, how are negotiation processes between the implementers and the users carried out and how do these relationships influence the implementation process.

c) The use of a bottom-up approach was used to bridge the gap in assimilation. Further studies in other institutions are needed to enhance the applicability of the method as a practicable and flexible method in HEIs.

d) Changes in the leadership in Hekima and the observed adoption of the later adopters may indicate a shorter timeframe for the implementation of SMS with the more direct leadership of the university chief executive. Given the semi-detached nature of decision making in universities at the school levels, and the external factors of complying with RBM, the hypothesized relation need to be investigated further in HEIs.

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Appendix I

Coding Code Strategy

	Code	Definition
A) IMPLEMENTATION CONTEXT CATEGORIES		
A1)Managerial Interventions		
Resources		
Human resources (staff)	MI-HR	manifestation of actions geared to a) staff recruitment b) staff availability for IS innovation in terms of development/support to users/task allocations
Computing infrastructure	MI-INFRA	Indices to actions on the acquiring/distribution/maintenance of a) computers b) printers c) network Infrastructure
Innovation Use		
Mandating use	MI-MDT-USE	Pointers to either the required/authorised/encouragement to use of the IS innovation
Motivating use	MI-MTV-USE	Indices to provision of a) incentives for usage b) disincentives for avoidance
Negotiating use	MI-NEG-USE	Pointer to actions of a) negotiating for usage b) persuading for use
Training		
Training by employer Adequacy of Training Satisfaction of provided Training	MI-TRN-EMP MI-TRN-ADQ MI-TRN-STFCN	Indices to provision of a) corporate-sponsored training b) adequacy of training c) satisfaction of training

	Code	Definition
Monitoring		
Monitoring and evaluating events	MI-MTR-EVE	Pointer to actions of a) monitoring progress b) evaluating implementation progress
A2) Change Management Interventions		
Initial user experiences	CMD-USER-EXP	Indications to managing initial user experience with IS innovation
Changes in innovation	CMD-INVT-EXP	Indications to change in innovation for whatever reason and managing the results of the change
Changes in organizational culture	CMD-ORG-CLTR	Indications to change / managing in the way of doing things mental framework/ authority levels, bureaucracies etc
Critical events	CMD-CRT-EVNT	Indications on how the critical events identified were handled
Problem solving	CMD-PRB-SLV	Indications on problem solving events identified
User expectations	CMD-USER-EXPCT	Pointer to the management of user expectations of their requirements and of what they perceived the system to do
User ownership	CMD-USER-OWN	Indications/ Perceptions to user ownership of the IS innovation
A3) Facilitating Conditions		
Innovation Attributes		
System quality	FC-IS-QUAL	Pointers to describing quality of the system pointers to describing security features of the system
Organization Aspects		

	Code	Definition
Information flows/feed back systems/ communication	FC-ORG-IF	Information flows to help interrelated process to be completed
Infrastructure	FC-ORG-INFR	Availability of computing infrastructure within adopting unit/near user
History of organization	FC-ORG-HIST	Pointers to perceptions about the history of the organization
History of previous IS innovations	FC-ORG-PREV-IS	Indications to use or mention of any previous IS by both users
Organization culture	FC-ORG-CLTR	Statements /Indications mentioning the way things are done,, authority levels , Bureaucratic;
Leadership	FC-LDRSHIP	Pointers to leadership issues
Top management support	TOP-MGNT-SPRT	Pointer to issues on top management support
Previous ICT knowledge	FC-ORG-IT	Pointers to general knowledge about ICT
Social cultural Insecurity	FC-ORG-FEAR	Social culture fear and insecurity to use of computer application systems
Implementation Climate		
Policies	FC-ICL-PLCS	Reported experiences and or observations in policy issues
Procedures	FC-ICL-PRDCS	Reported experiences and or observations in business procedures or practices issues
A4) Subjective Norms		
Relevant others influence a) peer b) supervisor c) client d) subordinates	 SN-PEER SN-SPVR SN-CLNT SN-SUBND	Indications to beliefs/views about what a) peer b) supervisor c) client d) subordinates think they should do

	Code	Definition
Social Influence a) imitation b) mutual Discovery c) conformance	 SN-SI-IMIT SN-SI-MDIS SN-SI-CFRM	Indications towards usage due to a)imitation moves b)mutual discovery moves c)conformance moves to the use of IS
A5) Others Other Influences a) mutual dependency b) trust	 OO-MD OO-TTM	Indications towards influences to cooperation due to a)mutual discovery moves b)emerging trust in expertise
B) IMPLEMENTATION PROCESS		
B1) Secondary Adoption		Events at a unit level including when and how a unit reached a decision to embrace and use the IS innovation
User problems	SA-PRBLM	Problems encountered that render themselves to adoption of IS innovation
User decisions	SA-DEC	Indication towards decisions that invest resources at the unit to facilitate use of IS innovation
B2) Organization Assimilation		
Adaptation		Actions to install/customize IS innovation, train members and facilitate use of IS innovation
Event chronology (file version)	ADP-CHRON-DOC	Documented chronological of events
Event chronology (user version)	ADP-CHRON-USER	Chronological of events from user perspective
Unit level event	ADP-UNIT-EVNT	Events unique to a unit
Motives	ADP-MTV	Views related to adoption motives

	Code	Definition
Plans	ADP-PLAN	Planning events
Strategies	ADP-STRGY	Strategies used from user perspective
Readiness	ADP-READNESS	Events indicating or testing readiness for an event
Critical events	ADP-CRIT_EVNT	Critical events that had damning repercussions to the users / innovation /units
User participation	ADP-USER-PCPTN	Pointers and indices to participation of users in the process
Acceptance		Actions that point to inducing user to commit to use IS Innovation
User acceptance	ACT-USER-ACCPT	Events pointing to user acceptance
User commitment to use	ACT-USER-COMT	Events pointing to user commitment or negotiation of commitment to use of IS Innovation
Routinization	USER-ROUTINE	Indication of routine use of IS innovation by a)making it part of business process b)monitoring use c)having rigour in using system d)cutting off 'old' ways of achieving tasks
Infusion	USER-INF	Indications to a)extended use b)integrative use c)emergent use of IS innovation to increase effectiveness
B2) Organization Learning		
Effects on implementation context on both a) polices	CMD-ICL-PLCS	Indications to change a) in the policies

	Code	Definition
b) procedures	CMD-ICL-PRDCS	b) in the procedures
c) capabilities	CMD-ICL-CAP	c) in organization capabilities
d) structures	CMD-ICL-STRUC	d) in the organization structures
C) OUTCOMES		
Outcomes from the perspective of interviewees	OUT-USER-PERS	Outcomes and consequences from the perspective of individuals interviewed
Anticipated outcomes (could be at all levels from user/ managerial/ unit / organization)	OUT-USER-PLN OUT-ORG-PLN	a)indications to planned/envisaged b)impacts from the process at user levels and the organization level
Unanticipated outcomes	OUT-USER-UNPLN OUT-ORG-UNPLN	Indications to spin offs from the process at a)user levels and b)the organization level
Emergent outcomes	OUT-USER_EMER OUT-ORG-EMER	Indications to spin offs from the process at a)user levels and b)the organization level which were windows of opportunities for the process
Side effects (to other institutions and also to the organization)	OUT-OTHER-INST	Indications to liaison of issues that had to be solved by a third party to enable the process

Appendix II

Sample Letters and Non Disclosure Agreement

UNIVERSITY OF NAIROBI
SCHOOL OF COMPUTING AND INFORMATICS

Telephone:	4447870/4444919/4446544	**P. O. Box 30197-00100 GPO**
Telegrams:	"Varsity" Nairobi	**Nairobi**
Telefax:	254-2-4447870	**Kenya**
Email:	director-sci@uonbi.ac.ke	

OUR REF: SCI/D/PhD/   13th September, 2006
        √SCI/APM/ANW/

Prof.   ,
The Vice Chancellor,
                University.
P.O. Box   ,
NAIROBI.

Dear Prof.   ,

RE: REQUEST FOR RESEARCH AUTHORIZATION

Ms. Agnes N. Wausi is registered Ph.D. student at the School of Computing & Informatics, University of Nairobi. She is carrying out research under my supervision on information systems in the Higher Education Sector in Kenya. Her specific topic is "IMPLEMENTATION OF INFORMATION SYSTEMS: SELECTED CASE STUDIES OF UNIVERSITIES IN KENYA". She has already carried out a case of the implementation of a student management information system at

The purpose of this letter is to kindly request access to your University as a case study site in the endeavour of this research. Your university is deemed critical to the research as in the recent past it has implemented the Academic Management System. We would wish to focus on the implementation of this system in our research. I can assure you that all information obtained through this case shall remain confidential and be used exclusively for the purpose of the research.

We look forward to a positive response.

Yours sincerely,

PROF. TIMOTHY M. WAEMA
SCHOOL OF COMPUTING AND INFORMATICS

c.c.   Director, School of Computing and Informatics

NON-DISCLOSURE AGREEMENT

I, Ms Agnes Nduku Wausi, agree that, in return for access to confidential information, I will not publish, disseminate, or reproduce such information (nor allow others to do so) for a period of three years following the date of disclosure of such information to me, without the permission of the undersigned company following its review of the information that I request permission to disclose.

"Confidential information" is that information, in whatever form or medium (including quotations from individuals), that is disclosed to me in return for my agreement and that is not otherwise available through non-confidential sources. It excludes my evaluation, analysis, or characterization of that information which is not confidential or which I disclose with permission.

In the event of disagreement over whether information is confidential, I agree not to disclose such information until its status is resolved, and to cooperate with the University in seeking good faith resolution through discussion and, if appropriate, mediation or arbitration on terms to be agreed.

This agreement does not apply to information whose disclosure is compelled by legal process or judicial order. In the event that such compelled disclosure is sought by third parties, I agree to notify the company promptly of such efforts and to cooperate in the company's lawful and good faith efforts to prevent disclosure of confidential information subject to this agreement.

Name (PRINT) __AGNES NDUKU WAUSI__

Signature and Date __24th January 2007__

University Acceptance of Agreement

Name of University (TYPE or PRINT) _____

University Representative Signature _____

Date
_____

Appendix III

Interview Guide

Interview guide For Assessing IS implementation in Public Universities

A. Introduction

Purpose

To asses IS implementation views and perceptions of the participant involved the implementation efforts

Respondent

Name: _____ Designation:_____

Category: IS/ICT professional/ Management Staff/ Operational (User) Staff

B. Interview Questions

1. From your perspective, what is your opinion on the outcomes/consequences of the IS implementation?

    Probe for

    - Business Outcomes
    - IT/ICT/IS outcomes
    - Consequences (intended & those not intended) with a view of capturing change and its management
    - Satisfaction with the outcome/consequence so far? If yes, why? If not, why not?

- Probing for use of implemented IS, and if new working environment and procedure has been institutionalized. Further probe on perception of the changes effected by new working environment

2. How was the decision to implement the IS project communicated? Who communicated? Who made the decision for IS project to be implemented? Who was involved?

   Probe for

   - Primary adoption by whom?
   - Mandatory / voluntary decision to use /participate in implementation?

3. As a participant in the implementation process, in your opinion please explain any Interventions on the implementation process?

   Probes for

   - What different interventions used?
   - Probe for the different managerial interventions
   - Any technical interventions?
   - what the role of these interventions were in facilitating adoption and producing desired outcomes or otherwise
   - Specifically probe for training, the quality and duration, its presence or absence and adequacy
   - Specifically probe for user support, level and quality of support , its presence or absence and adequacy
   - Any intervention deemed necessary but was lacking

4. In your opinion, what areas of the University are more or less responsive to IS implementation efforts, any ideas or speculation on why this may be so?

   Probe for

   - University culture (aspects of the culture that were supportive and strength to the process; those that were not, and how they hindered the process and how they were overcome if at all)

- Does it (the new working environment) have elements you view as hindering in achieving your objectives or on your attempts to using it?

5. What is your opinion about other conditions on the IS implementation effort?
   Probes for
   - Policies and practices and standards followed?
   - Strategies used if any?
   - Politics involved in the process if any?
   - Any specific individual effort?
   - Presence of structural elements such as
     o Steering Committees?
     o Implementation teams?
     o Change management teams?
     o Roles played by these teams/committees
   - Leadership roles, who played it in the implementation process/project? Was it effective? If so how? If not, what is your opinion on why it was not?
   - Probe how these conditions affected the outcome of the project implementation

6. What kind of initial training did you have? In your opinion was it sufficient? Was additional training provided by whom? Do you have additional support? Do you see yourself as skillful? In your opinion how relevant was the training to the project or operational system

7. Did the new system or project bring out changes? If so what kind of changes? Were there changes in working procedures? How did you go about institutionalizing the new working procedures in place? Were there any difficulties? If so can you describe? If not, what particular aspects of the University made institutionalizing the procedures a smooth one?

8. Please give your opinion on the whole implementation process

Probe for any additional information interviewee willing to divulge

Sample Qualitative Questionnaire

This questionnaire is to collect data as part of Ph.D. research on the implementation of information systems in universities in Kenya. The purpose is to obtain your views and perceptions of the implementation of Academic Management System at the University. Data obtained will be used for the purposes of this academic research with the aim of contributing to the practitioners involved in Information Systems Projects in the Higher Education Sector.

As a respondent, confidentiality is assured and no data shall be associated with any individual who participates in this data collection exercise. Please feel free to write as much as possible when answering the questions, attaching additional sheets where necessary.

Abbreviations used

IS – Information System

ICT – Information and Communications Technology

A. Respondent Information

Name: _____

Academic Qualification: _____

Professional Qualification: _____

Current Designation: _____

Department: _____

Years worked for the University: _____

Staff Category: **Management /Supervisory Staff**

B. Questions

B1. IS Objectives & Outcomes

1. a) What is the acronym for the academic management system at your university? (e.g. Student record system)

    a. When was the system implemented?

        i. If the implementation of the system is ongoing at what stage is it in?

        ii. If the implementation of the system is complete how long did it take to complete the implementation process?

    b. What were the objectives of the implementation of the system?

    c. What outcomes (e.g. business, technical outcomes) were expected from the implementation of the system?

    d. What are the actual outcomes of the implementation of the system?

    e. Of the outcomes mentioned above, which ones were not expected?

    f. Were there any difficulties in realising the outcomes?

Yes ☐

No ☐

        i. If yes, please list the difficulties and briefly elaborate by examples.

        ii. If not, what particular characteristics of the University made the realisation of the outcomes above possible?

2. a) What do you/ would you consider as a successful implementation of an IS?

    b. How successful is the implementation of the system at your university?

    c. Please explain your answer to b) above

    d. Are you satisfied with the outcome of the implementation of the system?

Yes ☐

No   ☐

      i. If yes, why?

      ii. If no, why not?

B2. Management Aspects of the implementation of the system

3.   a) Who was involved in deciding that the IS be implemented?

      b.   Who communicated this decision to you or your department?

      c.   What role did you participate in the implementation of the system?

      d.   Who nominated you to the role?

      e.   What was the composition of the implementing team?

4.   a) Was there a documented plan for the project?

      Yes   ☐

      No   ☐

      i. If yes, through what mechanisms was it available to all participants?

      ii. If no, through what mechanisms were the contents of the plan communicated to the participants?

      b) Was the documented plan followed?

      Yes   ☐

      No   ☐

      i. If no, how were changes to the plan handled?

5.   In the course of the implementation of the system;

      a) What key business process decisions were made?

      i. Who made them?

     ii.   Were the decisions implemented?

     iii.   What impact did they have in the implementation of the system?

  b) What key policy decisions were made?

     i.   Who made them?

     ii.   Were the decisions implemented?

     iii.   What impact did they have in the implementation of the system?

  c) What key technical (ICT) decisions were made?

     i.   Who made them?

     ii.   Were the decisions implemented?

     iii.   What impact did they have in the implementation of the system?

6.   a) Were there any interventions (i.e. deliberate actions) that were present or evident to enhance the process of the implementation of the system?

       Yes   ☐

       No   ☐

  b. If yes, please list them and elaborate each.

  c. If no, what kind of intervention(s) do you think would have been important and were missing?

     i.   what is your opinion on the absence of the interventions listed in c) above?

7.   a) What personal initiatives were present or evident in the process?

  b. What kind of departmental initiatives were present or evident in the process?

  c. What kind of organizational initiatives were present or evident in the process?

B3. Training and Use of System

8.   a) Were you trained on the new information system?

       Yes   ☐

No ☐

b. If yes, who provided the training?

c. If no, how did you acquire the knowledge on how to use the new information system?

d. Please outline the overview of initial training that you got.

e. In your opinion, was this initial training sufficient for you to use the system skilfully?

Yes ☐

No ☐

ii. If yes, please elaborate.

iii. If no, please explain the weaknesses.

f. After the initial training, was additional training provided?

Yes ☐

No ☐

i. If yes, who provided it?

ii. From your perspective, was this additional training sufficient for you to use the system skilfully?

iii. If no, do you think you needed more training and on what aspects?

g. Please give your general opinion on the training.

h. Are there any recommendations you would give about the training?

9. a) Do you see yourself as a skilful user of the system?

Yes ☐

No ☐

i. If yes, why?

ii. If no, why not?

10. a) Is your department (or section) required to use the system?

Yes ☐

No ☐

   i. If yes, what processes do you use the system for?

   ii. If no, why not?

11.   a) How often do you use the information system?

Frequentl ☐
y

Rarely ☐

Never ☐

   i. If you frequently use the system, please explain how the system impacts your work

   ii. If you rarely or never use the system please give reasons

  b. Do you have any difficulties while using the system?

Yes ☐

No ☐

   i. If yes please list the difficulties /problems

   ii. Please suggest how the university may overcome the problems listed above in i)

12.   a) Did (Do) you get additional technical and operational support on the system?

Yes ☐

No ☐

   i. If yes, who provides this support?

   ii. If no, do you think you need it? And from whom?

B4. Organizational Aspects

13. a) How can you describe the general work environment at the university?

    b. How responsive was/is the work environment towards the implementation of the system?

    c. Please give your perspective on why this may be so?

    d. What areas (e.g. policies, attitude, procedures etc) of the University are (were) less responsive to implementation of the system?

    e. Please give your perspective on why this may be so?

14. a) What conditions or factors in your view were/are important in the IS implementation effort? (e.g. structure, strategies, leadership etc)

    b. Were these conditions present in the university?

       Yes ☐

       No ☐

    c. If yes, please explain for each condition/factor how the presence of these conditions affected the implementation effort.

    d. If no, please explain how the absence of the conditions/factors affected the implementation effort.

    e. From your perspective how can the university acquire or improve the conditions/factors listed above?

15. a) Are there any changes at the university as a result of the implementation of the system?

       Yes ☐

       No ☐

      i. If yes, please list out the changes.

      ii. If no, could you speculate as to why no changes have been effected?

16.   a) What weaknesses do you think were evident in the course of the implementation of the system?

      b. How do you think these weaknesses could be overcome?

      c. What strengths do you think were evident in the course of the implementation of the system?

      d. How do you think these strengths enhanced the implementation of the system?

      e. What opportunities were evident during the implementation of the system?

      f. How did the implementers of the system take advantage of these opportunities?

      g. How can you describe the general perception about the implementation of the system in the university?

17.   a) In your own words please describe your experience on the implementation of the system

Document Summary Form

Site: Hekima

Document No:1

Date Picked: Feb 22, 2006

Name or description of document:

Allocation schedule of PCs

Event or contact, if, any, the document is associated

Support of SMS in various schools

Significance or importance of document

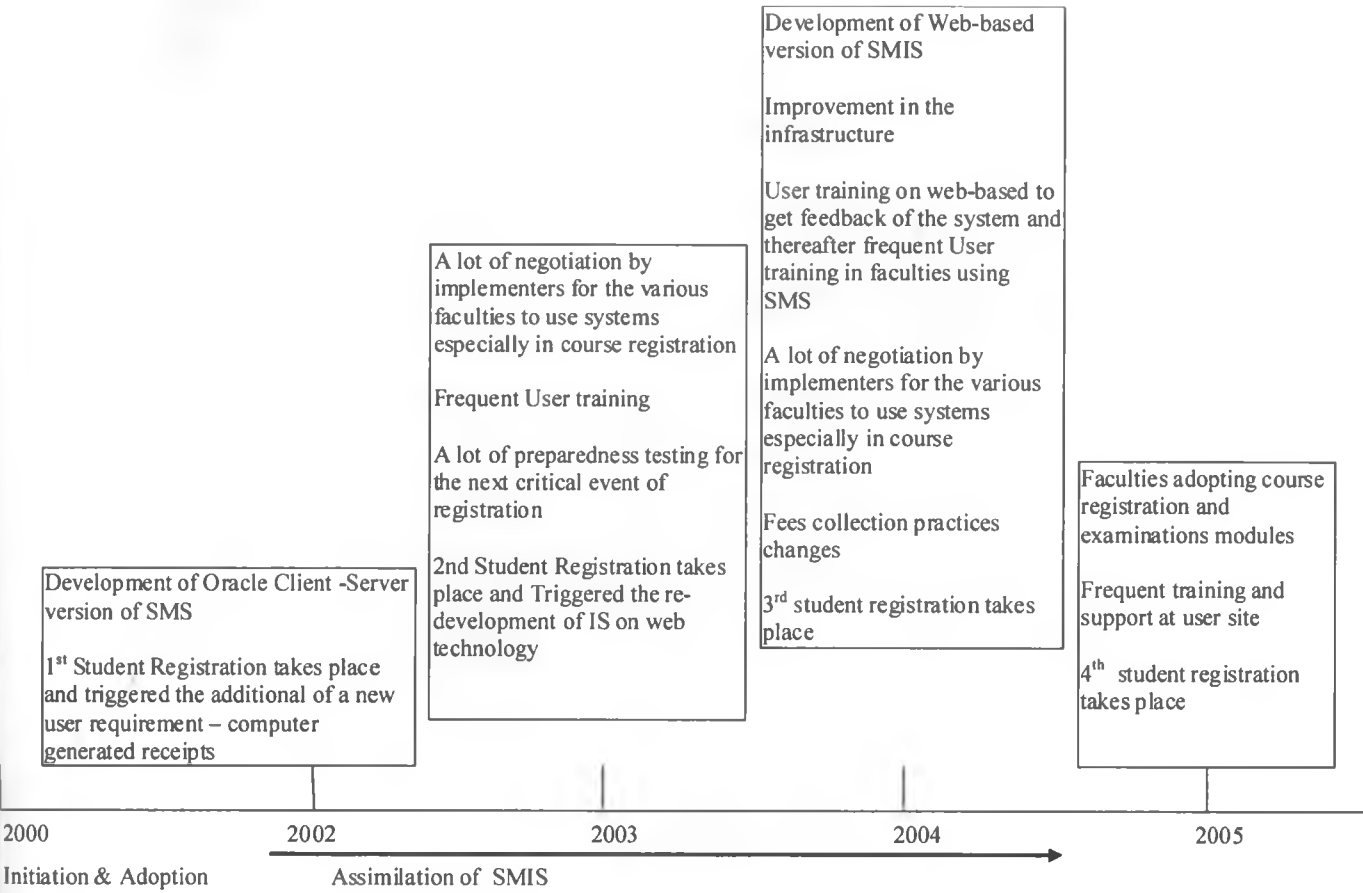Gives schedule of allocation of PCs to different campuses

Brief Summary of contents

Schedule of school and number of PCs allocated for the specific purposes outlined.

Schools allocation were to directly enable data capture and update of SMS

Timeline Chart

Development of Web-based version of SMIS

Improvement in the infrastructure

User training on web-based to get feedback of the system and thereafter frequent User training in faculties using SMS

A lot of negotiation by implementers for the various faculties to use systems especially in course registration

Fees collection practices changes

3rd student registration takes place

A lot of negotiation by implementers for the various faculties to use systems especially in course registration

Frequent User training

A lot of preparedness testing for the next critical event of registration

2nd Student Registration takes place and Triggered the re-development of IS on web technology

Faculties adopting course registration and examinations modules

Frequent training and support at user site

4th student registration takes place

Development of Oracle Client -Server version of SMS

1st Student Registration takes place and triggered the additional of a new user requirement – computer generated receipts

2000   2002   2003   2004   2005

Initiation & Adoption   Assimilation of SMIS

Emerging Timeline of critical events in the SMS implementation process

Sample Document collected

Schedule of Activities and Responsibilities for Sep. 2003 Registration

Activity	Responsibility	Duration	Starting
1. Identification of staff for training and registration (SMIS)	College Registrars, Bursars	1 week	Aug 22
2. Identification of staff for training and registration (SWA)	DFO (SWA), CHO (SWA)	1 week	Aug 22
3. Training (SMIS)	C. Chepkoech, H. Kamau	1 week	Sep 8
4. Training (SWA)	P. Kariuki, J. Mwangi	1 week	Sep 8
5. Identification of PCs, UPSs and printers in Colleges & SWA	Network staff	1 week	Sep 1
6. Preparation and testing of registration sites	Network staff (ICT), SMIS & HAMIS teams	1 week	Sep 8
7. Installation and testing of software	SMIS & HAMIS teams	1 week	Sep 15
8. Migration of loans and bursaries	DFO(Students), Cost Sharing, Chege, Chepkoexh, HELB	1 week	Sep 1
9. Promotion of students to the next level (academic, fees)	Deans, Ass. Registrars, A. Muasya, L. Akaranga, Bursars, UNES, C. Chepkoech	1 week	Sep 1
10. Migration of 1st year students (JAB) to SMIS	M. Adura, C. Chepkoech	1 day	August
11. Updating Inter-university transfer data	J. Muraguri, A. Mbithi	1 day	August
12. Updating of 2002/2003 accommodation and finance data	DFO (SWA), CHO	2 weeks	Aug 15
13. Preparation of Halls reference data	CHO (SWA), P. Kariuki	1 week	Sep 15
14. Preparation of manual backup (fees balances, nominal rolls, room vacancies, etc.)	Bursars, Assistant Registrars, SMIS & HAMIS teams, Cost Sharing, ...	1 day	Sep 19
15. Availing patch and power cables for sites	Network staff (ICT)	1 week	Sep 1
16. Labelling registration desks	Assistant Registrars	1 day	Sep 19
17. Procurement of necessary items (printers, paper, CAT 5 cables, extension cables, UPS, accessories, etc.)	Director/ICT, Procurement Manager, DVC (A&F), VC	3 weeks	Aug 18
18. Upgrade of UNIX servers	ICT	1 week	Immediate
19. Provide security in registration centres	CSO	1 week	Sep 19
20. Provide transport	Transport Coordinator	1 week	Sep 19