A Process Study of Enterprise Systems Implementation in Higher Education Institutions in Malaysia

A thesis submitted to the University of Manchester for the degree of
Doctor of Philosophy
in the Faculty of Humanities

2011

Abdulaziz Ahmad

Manchester Business School

Division of Accounting and Finance

Table of Contents

Word count: 90,753

List of Figures

List of Tables

List of Appendixes

Abstract

The implementation of information technology and its impact on organisational change has been an important phenomenon, discussed in the IS literature over the last 30 years. Treating information system (IS) implementation as organisational change is a complex phenomenon. This complexity is mainly due to its multidisciplinary, socio-technical, dynamic and non-linear nature. This challenging nature of IS implementation complexities has a direct relationship to the IS implementation project outcomes – its success or failure. In view of this complexity, this research aims to understand how process studies can improve the understanding of enterprise system implementation. We argue that the socio-technical nature of IS development is inevitable thus the only way to go forward is to explore and understand the phenomenon. Following this, we adopt the stakeholder's perspective solely for the purpose of identification of stakeholders and their embedded interests and expectations. While prior research concentrated on a limited number of stakeholders of IS, we attempt to adopt Pouloudi et al. (2004) in mobilizing a stakeholder perspective to incorporate non-human stakeholders within the analysis. Within the actor-network perspective, complexity is resolved through simplification (black-boxing) – unpacking or collapsing the complexity. However, during this simplification process, the risk of removing useful description of the phenomenon through labelling was avoided. To support this research, the punctuated socio-technical information systems change (PSIC) model was applied. In this model, interactions and relationships between its components (antecedent condition, process, outcomes and organisational context) play a vital role. This research focuses on the implementation of an integrated financial system in three Malaysian universities through three interpretive case studies. Our findings show that each of our case studies provides a unique IS development trajectory. Following stakeholder analysis, the different cases provide interesting combinations of conflicts and coalitions among human and non-human stakeholders which further dictates the project outcomes or the process of IS black-boxing. The relationship between the three case studies on the other hand provides an interesting illustration of IS technology transfer.

Declaration

Some parts of this thesis have been published in:

Ahmad, A. and Newman, M. (2009) Transfer of technology – the story of an enterprise system implementation, *Proceedings of the 17*^{*th*} *European Conference on Information Systems*, 8 – 10 June, Verona, Italy.

Ahmad, A. and Newman, M. (2010) Computer-assisted qualitative data analysis software: an illustration of limitations and advantages, *Proceedings of the 16*^{*th*} *Americas Conference on Information Systems,* 12 – 15 August, Lima, Peru.

I hereby declare that no portion of the work referred to in the thesis has been submitted in support of an application for another degree or qualification of this or any other university or other institute of learning.

Copyright Statement

Acknowledgement

List of Abbreviations

ANT	Actor-Network-Theory
BPR	Business Process Re-engineering
BRS	Business Requirement Session
CAD	Computer Aided Dispatch
CAQDAS	Computer Assisted Qualitative Data Analysis Software
CAS	Complex Adaptive Systems
DM	Data Migration
EIS	Executive Information Systems
EJIS	European Journal on Information Systems
ERP	Enterprise Resource Planning
FAT	Final Acceptance Testing
GT	Grounded Theory
GTM	Grounded Theory Method
ICT	Information and Communication Technology
IMS	Integrated Management Systems
IS	Information Systems
IT	Information Technology
ITD	Information Technology Department
OPP	Obligatory Passage Point
OR	Observation Report
PM	Project Manager
PMO	Project Management Office
PSIC	Punctuated Socio-technical Information systems Change
RAD	Rapid Application Development
RSDLC	Rapid System Development Life Cycle
SC	Steering Committee
SDLC	System Development Life Cycle
SEM	Structured Equation Modelling
SRS	Software Requirement Specification
TSDLC	Traditional System Development Life Cycle
UAT	User Acceptance Testing
VC	Vice Chancellor
WIP	Work-In-Progress

CHAPTER ONE

1   Introduction

In general, developing an enterprise system is similar to building a house. Some houses are small and simple and some houses are big and grand. Similar to an enterprise system, some systems only cater for basic requirements whilst some systems involve complicated new technologies embedded in the system. However grand a house is and however complex the system, both types of projects involves similar requirements. Both projects involve project managers, contractors and of course clients. The only difference between these projects is the visibility of the project. When building a house, clients can view their prospective houses from the day the contractor lays down the concrete but when developing a system, clients just identify their requirements and it is up to the contractor to design and develop the system. In a traditional approach, only during systems testing, are the clients able to view and feel the system. Any changes required to the system later might involve major changes to its structure and to avoid such time wasting and costly procedures, the users must continue using the system with a major work around and even system abandonment.

1.1   Information system development as organisational change

Information system (IS) development is a complex phenomenon. This complexity was mainly due to its multidisciplinary, socio-technical, dynamic and non-linear nature (Kling and Scacchi, 1982; Walsham et al., 1988; Stacey, 1992; Wheatley, 1992; McKelvey, 1997). This challenging nature of IS development complexities and its failure to acknowledge its existence has a direct relationship to the IS development project outcomes – its success or failure. The intertwined relationship between social and technical (Kanellis et al., 1999) or between technology and work (Alter, 2000) makes IS development a challenging enterprise. Subsequently, when the project involves multiple actors or actants, during the development process unwanted events occur. Thus, in any, or maybe in all of these events that occur, the issues of knowledge, communication, relationship and control might be the precursor of such events. In view of this complexity, this research aims to understand how process studies can improve the understanding of enterprise systems implementation.

Acknowledging the embedded nature of complexity within IS development and evident occurrences of IS project failure, this research attempts to understand the process of IS system development. We argue that the socio-technical nature of IS development is inevitable, thus the only way to go forward is to deal with the phenomenon. Following this, we adopt the stakeholder's perspective solely for the purpose of identification of the stakeholders and their embedded interest and expectations. Prior research only concentrated on a limited number of stakeholders of IS development – mainly being users, top management, project managers *inter alia*, i.e. human stakeholders. In this research, we adopt the idea from Pouloudi et al. (2004) in mobilising a stakeholder perspective to incorporate the non-human stakeholder within the analysis. The introduction of the non-human stakeholder within the IS development research was mooted by Vidgen and McMaster (1996) and followed by Pouloudi and Whitley (2000).

The notion of IS complexity and IS success and failure have been discussed widely within the actor-network literatures. Within an actor-network perspective, complexity was resolved through simplifications – unpacking or collapsing complexity through punctualisation (Sarker et al., 2006). This was supported by Tatnall (2003) where simplification represents infinite possibilities of a complex situation. However, the risk of removing a useful description of the phenomena (Suchman, 1987) through descriptive labelling (Law, 1999) was warned. The notion of success and failure was also being elaborated within the actor-network literatures and the success or failure outcome was made with reference to the creation of a black-box (Kaghan and Bowker, 2001) especially during the process of translation.

It is evident from prior literature (Kling and Scacchi, 1982; Walsham et al., 1988) and our empirical data that information system (IS) development is a complex phenomenon that resulting from its socio-technical composition. According to Kirsch (1996) complexity stems from communication and coordination of socio-technical interactions. These complex socio-technical interactions require a detailed framework that could unpack and at the same time simplify these relationships. We follow Sarker et al. (2006) in adopting actor network theory (ANT) as a socio-technical perspective in understanding IS development projects. The actor-network perspective was adopted to

embrace the duality of social and technical where the IS development is neither purely social nor technical, but socio-technical (Tatnall, 2003). In this study, we attempted to apply ANT as an analytical tool through the identification of human and non-human stakeholders within each project event and the process of translation (Callon, 1986). At the same time, we captured the processual nature of ANT and attempted to understand and explain the process of IS black-boxing (Lanzara, 1999, Cordella and Shaikh, 2006) both within and between our three case studies.

1.2 Punctuated socio-technical IS change (PSIC) model and IS development complexity

To support this research, the punctuated socio-technical information system change (PSIC) (Lyytinen and Newman, 2008) model will be employed. In this model, interactions and relationships between its components (antecedent condition, process, outcomes and organisational context) play a vital role. While factor studies identify the process component as a black-box, process study will open this box and identify the sequence of events that occur during the system implementation process. Further to this, each of these events will be structured using socio-technical elements (Leavitt, 1965) in order to assist in identifying gaps during these events.

Viewing IS development as a complex phenomenon with an attempt to resolve and provide meaningful understanding has been widely undertaken through complex adaptive system (CAS) which view IS as non-linear, interdependent and dynamic (Desai, 2005; Mukherjee, 2008; Hanseth and Lyytinen, 2010) and the synergy with other theoretical lenses (Mukherjee, 2008; Geraldi, 2009; Schoenharr et al., 2010). The PSIC model (Lyytinen and Newman, 2008) provides a mean to understand complexity through a project's trajectory. In this research, our empirical data has not only been capable of establishing a project trajectory but also in providing sound evidence to unpack interactions within levels. While prior research adopting PSIC model combined project and vendor activities in one level being project level, the richness of our empirical data enabled us to segregate between specific project and vendor activities. Through these detailed identification of events, clearer depiction of path dependencies within level and between level – vertical and horizontal analysis - emerges. The PSIC model embeds Leavitt's (1965) socio-technical framework as the engine to understand

change. While prior research had successfully identified detailed relevant elements of change (people, technology, task and structure) (Newman and Zhao, 2008; Newman and Zhu, 2009), in this study, we integrated the stakeholder approach not only as a mean to identify the human (people) and non-human (technology, task and structure) stakeholders and the events, we also identify their respective interests, expectations and actions in each event. Examination of these different aspects exposed the conflicts and coalitions which resulted in gaps and gap resolution. Following the PSIC model, we were able to conduct a detailed event analysis – a micro level analysis and also a macro level horizontal and vertical analysis (Lyytinen and Newman, 2008).

According to Lyytinen and Newman (2008), the most challenging part of understanding the enterprise system implementation process was to identify the critical events that occur during the implementation. Prior to this research, the identification of critical events was mainly based on narrative understanding of the process or through eye-balling of the data. Whilst this method is only applicable to an expert researcher, a novice researcher requires a more methodical process for critical events identification. In view of this, this research applies Strauss and Corbin (1990) grounded theory method (GTM). The application of this method either through a manual or an assistive software process has provided the means of critical events identification that emerged from the data.

1.3   Research questions

This research will focus on the implementation of enterprise systems in three case studies. Because, each of the case studies has a similar base system, similar vendor or contractor and in operation has a similar nature of business or industry, the cases have the characteristics of a naturally occurring experiment.

From the review of literature, we found that ISD complexity has a significant effect towards IS success or failure. However, research on this issue was dominated by factor studies and concentrated on human aspect of the development. Therefore, in this research, we attempt to adopt a process model (PSIC model) in order to better

understand the IS development complexity by incorporating its socio-technical elements.

In understanding IS development, our review of the literature suggested that more research is needed to understand the process of black-boxing rather than studying the effect of the black-box after it has been closed (artefact). Therefore, in this research, we attempt to examine how the process of translation (network creation) and black boxing improves our understanding of the development and inter-organizational transfer of technology during IS development. This enabled us to establish our research questions.

RQ1: How can a process model (e.g. the PSIC model) improve our understanding of complex information system development initiatives.

RQ2: In what ways does the process of translation and black-boxing through stakeholder conflicts and coalitions add to the understanding of information systems development and inter-organizational transfer of technology.

1.4   Structure of the thesis

The details of the notion of IS complexity and success or failure was elaborated in Chapter two through a review of relevant literatures, which also include the introduction to stakeholder and actor-network perspectives. Focus on the implications for IS research was made. In Chapter three, we introduce the process model through an elaboration of its evolution diachronically. In this chapter, the punctuated socio-technical information system change (PSIC) model is introduced in detail together with its empirical adoption.

In Chapter four, we continue with the method of the research, starting from the research epistemological context to the mode of analysis. This research follows the interpretive research streams within a qualitative methodology. This is followed with an introduction to the case study research method and its application in this study. A detail elaboration of the three cases under study was made available with a project chronology at the start of each case. It is then followed by the data collection strategy, which is

mainly through semi-structured interviews and supported by other relevant strategies. These ensure that evidence is fully supported through triangulation. The mode of analysis section begins with the introduction to the coding process followed by the adoption of Strauss and Corbin (1990) grounded theory (GT) technique. To ensure analytical robustness, this research follows both the manual coding process and a computer-assisted qualitative data analysis software (CAQDAS), and a comparison was made accordingly to support the use of the latter. The result of the coding process is the identification of critical events which were later translated into the PSIC model trajectory following Lyytinen and Newman (2008).

The PSIC model trajectory for each of the cases was erected and critically analysed to ensure its completeness. Based on these trajectories, a narrative was established 1) to describe each of the critical events based on the different levels of analysis, 2) to explain the horizontal and vertical relationship within and between levels of analysis and 3) to elaborate of the emerging patterns of gaps creation and resolution. This detailed narrative explanatory is captured in Chapters five to seven of the thesis. While this describes the above, we extend it using the narrative content to incorporate the notion of stakeholders and actor-network perspective. This idea emerged from our detailed analysis of the PSIC model; in that the combination of these perspectives would provide a clearer explanation of IS development phenomenon. Thus Chapter eight analyses and discusses the process of translation and black boxing; taking into consideration the human and the non-human actors identified. In this chapter, we incorporate a detailed human and non-human stakeholder analysis, their interests and expectations and more importantly, the conflict and coalition that emerged. The application of the PSIC model supports the notion of understanding the process of artefact creation rather than viewing it as a black-box (Lanzara, 1999). Thus this chapter attempts to understand the process of translation, the creation of an actor-network and the process of black-boxing.

Chapter nine summarises and concludes the overall research by revisiting the chapters and accentuating the contribution of the study and its implications. The limitations of the research are presented and ideas for future research are developed.

1.5   Summary

This introductory chapter provides the background of the research that incorporates the rationale for need of this research to be undertaken. The area of concern of this study is to understand the complex nature of IS development through the adoption of the PSIC model as a tool on which to display the empirical data. The process of translation and black boxing within actor-network's perspectives and the stakeholder's concept of conflicts and coalitions were then applied to provide a rich narrative explanation of the phenomena.

CHAPTER TWO

2 Literature Review

2.1 Information system (IS) complexity

In general, complexity plays a vital part in information systems development. The intrinsic nature of IS development makes it impossible to 'escape' the complexities. This is more evident in information systems development projects as complexity emerges unexpectedly and usually abruptly. This unpredictability has resulted in inconsistent measures being developed and employed to deal with it.

The notion of complexity has been discussed in every major research field from natural sciences to social science studies. The vast pool of literature is two-fold. On the one hand, information on complexity is extensive and readily accessible; however on the other hand it also reflects a form of 'information overload.' Thus it is critical to identify research literature that really depicts and complements the research that has been undertaken. In this particular section, we are attempting to develop a more comprehensive understanding of the notion of complexity in general and IS complexity in particular.

	Definitions of complexity
1	…complexity is the quality OR the state of being complex and complex composed of two or more parts. (Merriam-Webster Dictionary)
2	…emergent property of systems made of large numbers of self organising agents that interact in a dynamic and non-linear fashion and share a path-dependent history. (Cilliers, 1998)
3	…comprised of populations of interacting entities where the overall system behaviour is not predefined but rather emerges through the interactions of its entities. (Kim and Kaplan, 2006)
4	…non-linear systems composed of many (often heterogeneous) partially-connected components that interact with each other through a diversity of feedback loops. (Merali, 2006)
5	…the dramatic increase in the number and heterogeneity of included components, relations, and their dynamic and unexpected interactions in IT solutions. (Hanseth and Lyytinen, 2010)
6	…the degree of how multifarious (having different parts), sophisticated, refined and intricate the infrastructure of ES is. (Schoenherr et al., 2010)
7	…'something' undesirable that made a project unique, more complicated and more difficult to execute, manage and control or even an 'excuse' for mistakes. (Geraldi, 2009)
8	…the perceived complexity associated with the analysis and design of a system. (Tait and

	Vessey, 1988)

Table 1: List of definitions of complexity

Table 1 lists the definitions of complexity that have been identified in the literature which have been reviewed. The structure of the list is based on the context of the definition itself. The first definition is a general definition based on a dictionary. Its function is to provide a general idea of the issues under examination.

Definition number two through six provides a different structure and content of definition compared to definition numbers seven and eight. All of the definitions identify some of the characteristics, dimensions or features of complexities. From the definitions, complexity must involve a large number of components (Cillers, 1998), a population (Kim and Kaplan, 2006), heterogeneous (Merali, 2006; Hanseth and Lyytinen, 2010), multifariousness (Schoenherr et al., 2010) of agents, entities, components, parts that interact in a dynamic (Cilliers, 1998; Hanseth and Lyytinen, 2010) and non-linear (Cilliers, 1998; Merali, 2006; Hanseth and Lyytinen, 2010) fashion.

The content of the last two definitions is very much related to the applicability of the notion of complexity but with a different perspective. In the literature, Geraldi (2009) refers to complexity as a 'thing' while Tait and Vessey (1988) refer to it as a perceived idea. This divergence and context suggest that the notion of complexity is broad and not easily defined with a single definition. Therefore, the definition of complexity is most effectively arrived at based on the context of the research undertaken.

The notion of information systems as a complex adaptive system (CAS) is a popular concept within IS research (Desai, 2005; Benbya and McKelvey, 2006; Mukherjee, 2008; Kim and Kaplan, 2006; Hanseth and Lyytinen, 2010; Merali, 2006). Within the literature, the characteristic of CAS and the dimension of complexity is interchangeable and complementary. According to Ribbers and Schoo (2002), the dimension of ISD complexity includes variety, variability and integration. The characteristics of CAS are incorporated within these three dimensions. Variety refers to the multiplicity of elements which complements Benbya and McKelvey's (2006) characteristics of CAS

whereby it includes a large number of components (heterogeneous and socio-technical). On the other hand, within Ribbers and Schoo's dimension of complexity, variability refers to the dynamic or changes and the interrelations of the elements which agree with CAS characteristics of variation, diversity, dynamism, liveliness, interactions and non-linearity.

Over and above these similarities, CAS demonstrates further properties of its dynamics (Mukherjee, 2008) which are self-organisation (Mukherjee, 2008; Benbya and McKelvey, 2006), evolutionary trajectories, punctuated equilibrium (Mukherjee, 2008), adaptation (Benbya and McKelvey, 2006; Merali, 2006) and co-evolution (Merali, 2006). Within CAS, punctuated equilibrium refers to the tendency of the system to have stable patterns of activity for a long period of time then a short transition period of very rapid change of pattern followed by new stable patterns of activity (Mukherjee, 2008). The notion of punctuated equilibrium is also being applied in IS alignment. The punctuated equilibrium model was popularised by Gersick (1991) within the organisational change area.

An information systems development project is a complex occurrence. Each part of it is so complex that each of these contexts is still being researched in terms of their complexity. Information (Kallinikos, 2006), system (Perrow, 1984), development and project (Geraldi and Adlbrecht, 2007) are complex occurrences themselves. Therefore, the combination of any or all of these sections proves to be a complex scenario. It includes IS which is referred to as multidisciplinary and web of socio-technical elements; (Kling and Scacchi, 1982; Walsham et al., 1988) and an information systems development project as an organisation itself, where organisations are defined as complex, dynamic, non-linear systems that do not evolve in a steady, predictable way (Stacey, 1992; Wheatley, 1992; McKelvey, 1997). In view of this, prior research on complexity established different types of complexity which are mainly relevant to their context of research conducted. In this section, we will try to analyse the type of complexity that is available.

Types	Description
Technological complexity	System specification, design and implementation – user requirement and translation into software (Benbya and McKelvey, 2006)
	Number of and relationship between, input, output, task and technologies (Baccarini, 1996)
	A composite measure of diversity of technologies, database intensity and system integration effort (Meyer and Curley, 1991)
	The complexity of technological environment of the ISDP (Xia and Lee, 2005)
Organisational complexity	Business processes, communication and networking (Benbya and McKelvey, 2006)
	Number of and relationship between hierarchical levels, formal organisational units and specialisation (Baccarini, 1996)
	The complexity of organisational environments surrounding the project (Xia and Lee, 2005)
Task complexity	Uncertainty and ambiguity that surround the practice of business which originate from the user's environment (McKeen et al., 1994)
System complexity	Uncertainty and ambiguity that surround practice of ISD which are originated from the developer's environment (McKeen et al., 1994)
	The difficulty in determining the information requirements of the system, the complexity of processing and the overall complexity of the design (Tait and Vessey, 1988)
Project complexity	Number of varied elements and the interdependency between elements (Baccarini, 1996)
Uncertainty	The extent to which the project goals and means are ill-defined and are subject to future changes (Turner and Cochrane, 1993)
Structural complexity	Originated from the underlying structure of the project (Williams, 1999 cited in Xia and Lee, 2005)
	1) Variety, multiplicity and differentiation of project elements and 2) interdependency, interaction, coordination and integration of project elements (Xia and Lee, 2005)
Dynamic complexity	Uncertainty, ambiguity, variability and dynamism which are caused by changes in organisational and technological project environment (Xia and Lee, 2005)
Uncertainty-based complexity	Originates from changes in project environment (Williams, 1999 cited in Xia and Lee, 2005)

Table 2: Types of complexity

In summary, all types of complexity relate back to their characteristics and dimensions. This includes, diversity, integration, relationship, heterogeneous elements, interdependency, differentiation, interaction, dynamics or changes.

A further point would be that any IS development involves multiple stakeholders. According to Kirsch (1996), complexity stems from communication and coordination problems inherent in managing these stakeholders, since these stakeholders have differing sets of goals. Prior research indicates that in order to improve the

understanding of this complex phenomenon, synergy with other theoretical lenses provides an improvement. For example, system theory (Mukherjee, 2008), contingency theory (Geraldi, 2009) and STS theory (Schoenherr et al., 2010) have all proved useful.

Finally, within studies on complexity, researchers intend to reach certain objectives. These objectives range from developing a framework (Xia and Lee, 2005; Snowden, 2002) or developing a theory (Hanseth and Lyytinen, 2010), to understanding the phenomenon in order to better manage and to resolve the problems (Owen and Linger, 2009).

2.2 Information systems success or failure: critical issues explored

Over the years, research on information system success and failure factors has increased dramatically. This is shown by the high number of hits and citation counts on success and failure of IS literatures. However, there is an emerging trend of reviewing published articles which according to Finney and Corbett (2007) caused duplication of frequency analysis.

The review of IS literature on failure factors indicates that prior research has covered various aspects in the IS field: IS failure within IS processes; IS evaluation, IS integration, risk management, IS design and IS requirement *inter alia*. Within the stakeholder perspective, it covers the IS designer, project manager, end-user, IS developer, top management and organisation. It also captures several major issues, including leadership, culture, power, politics/ethics, communication, relationship, knowledge and commitment, IS complexity, IS outsourcing, among others. This indicates that the notion of IS success or failure is a continually-evolving phenomenon. However, some prominent issues remain unresolved.

Findings have suggested that there are gaps in the extensive literature on IS success or failure. While researchers build models and frameworks to understand complex phenomena, research indicates that the concept of IS success or failure research suffers from a lack of congruent understanding and poorly defined (Wilson and Howcroft, 2002; Agourram and Ingham, 2007; Finney and Corbett, 2007) and still contains a number of 'grey areas' (Gargeya and Brady, 2005). According to Checkland and

Holwell (1998), the study of IS is a crucial but confused field. Therefore, a streamlined and appropriate understanding is vital for future research on IS development projects. The following table shows the diverse definition of IS failures:

Definition
Failure to match organisational needs to system capabilities to solve business issues (Brynjolfsson and Mendelson, 1993)
IS failure is when the system as a whole does not operate as expected and its overall performance is sub-optimal if, on implementation, it does not perform as originally intended or it is rejected by users and under-utilised if the cost of the development exceeds any benefits of the systems ISD abandoned due to complexity or management of the project (Flowers, 1996)
Systems should be considered as a failure if there is a development or operation termination. (Sauer, 1993)
…cessation of all work related to the systems. (Yeo, 2002)
Failure does not mean that the system needs to have been abandoned altogether OR is even falling apart BUT simply not used in the way intended. (Laudon and Laudon, 1998)
Failures may… express exactly the same dynamics, motives, interest and logic as successes. The different between the two comes about when the system does not meet the goals set for it by the actors who define it as failure. (Robinson, 1994 cited in Wilson and Howcroft, 2002)
Failure – lack of fit between factors. (Heeks, 2002)
…unforeseen complications disrupt the smooth running of project – deadlines, cost, objectives and benefits unsure. (Doherty and King, 2001, Robertson and Williams, 2006)
IS failure is when project is abandoned before it is completed
Any project that is set to support the operations of an organisation by exploiting the resources of IT but 1) fails to deliver a) the intended output within the cost, time, schedule, b) the initially approved functionality, 2) fails to satisfy the stakeholder, 3) fails to being accepted and largely used after deployment (Al-Ahmad et al., 2009)
The unwillingness of the user to depend on systems – not helped in development of IS. (Lynch and Gregor, 2004)

Table 3: List of definitions of IS failure

Definition
Achieve substantial proportion of its potential benefits. (Davenport, 1998, Oden et al., 1993)
System achieves the level of ROI identified in the project approval phase (Ptak and Schragenheim, 2004)
System quality, system usage, user behaviour and attitude and user's satisfaction IS success – satisfactory resolution of conflicts among stakeholder of IS development (Robey et al., 1993)
Success – congruence between factors (Heeks, 2002)
System success is achieved when an IS is perceived to be successful by the stakeholder and other observers (Lynch and Gregor, 2004)

Table 4: List of definitions of IS success

From Table 3 and Table 4 it can be clearly seen that the divergence of IS failure and success definitions are related to different perspectives (Wilson and Howcroft, 2002) due to its multidimensionality (Lucas, 1975 cited in Lyytinen, 1987) and interpretation

(Lynch and Gregor, 2004; Myers, 1994) that each of the authors undertake. Seddon et al. (1999) further argue that definition and measurement of IS success (or failure) is problematic and an ambiguous concept which is contingent upon different stakeholders and according to Lyytinen and Hirshheim (1987), is an expectation failure (or success).

The divergence of terms, concepts and notions within IS success/failure was also reflected during the attempts to categorise IS failure. IS failure categorisation is considered to be difficult if not impossible to make (Lyytinen, 1987) due to its subjectivity and dynamic nature of change (Heeks, 2002). Even the term IS implementation and stages in IS implementation are diverse and incongruent. Among popular IS implementation stages which are applied include Cooper and Zmud's (1990) six-stage implementation (see Somers and Nelson, 2001) and Ross and Vitale, (2001) five-stage implementation, Markus and Tanis's (2000) four-stage implementation, and Bancroft's (1996) five-stage implementation.

The difficulty in understanding and aligning IS success/failure corresponds closely with the complexity of the IS project itself. The socio-technical nature (Kanellis et al., 1999) of IS development and the intertwined relationship that exists between technology and work (Alter, 2000) makes it challenging to establish an acceptable concept of IS success/failure.

Beyond the year 2000, several of the articles published have either adopted an existing list issues critical to a case study or survey (Akkermans and Helden, 2002; Gargeya and Brady, 2005; Plant and Willcocks, 2007) or a review of literature to establish a list of prominent critical factors (Somers and Nelson, 2001; Somers and Nelson, 2004; Umble et al., 2003) with certain changes, such as referring it to a relevant stage of implementation. It indicates that the research on identifying and applying IS critical success/failure factors is becoming saturated and uninteresting. Ironically, although a vast literature exists which corresponds to IS success/failure critical factors, far less research has focussed on the role of stakeholders within the critical factors identified. The inadequacy is such that Finney and Corbett (2007) have identified that there is limited or even no regards to stakeholder perspective within the existing literature.

Through reviews of the literature on IS success or failure, we found out that each of the critical factors or issues has its stakeholder, whether it is a human or a non-human stakeholder. Thus it is particularly important for future research to incorporate the perspective of the stakeholder during critical issues identification. According to Welti (1999), focus should be placed on the person who does not perceive the implementation as being successful; the one with the negative perception. Within these literatures, the stakeholders were seen as either the problem, the culprit or the redeemer during an IS development project. Interestingly, these stakeholders are both human and non-human actors. This in turn, supports arguments on the complexity of IS development projects which are the result of its socio-technical nature, which in this case is the human and non-human stakeholders.

From a review of these literatures, only Cule et al. (2000) mention or identify managing the relationship with a stakeholder as one of the critical factors. Further to this, although there are several articles (Cule et al., 2000; Somers and Nelson, 2001; Somers and Nelson, 2004; Keil et al., 1998; Lesca and Caron-Fasan, 2008) that identify management of expectations to be a critical factor, they only restricted it to the end-users' expectations and neglected other stakeholders. Within these literatures, we identified several non-human stakeholders affected by the different critical factors. The identified non-human stakeholder can be further divided in relation to its context, which is the environmental, organisational and technological context. According to Cule et al. (2000), changes in the business and organisational environment would create project instability. Within the organisational context, the project budget was considered as important to ensure project success. Limited budget (Sauer et al., 1997) and underfunding (Cule et al., 2000) are considered as culprits during IS projects. Other factors include goals and objectives, infrastructure and resources. Within the technological context, the base system is one of the main factors to be considered. Careful selection of the base system (Somers and Nelson, 2001; Somers and Nelson, 2004; Ehie and Madsen, 2005; Motwani et al., 2005) to ensure the system matches organisational requirement is vital. Legacy systems, new technology and system integration are other non-human factors that require detailed consideration. Within the context of the project itself, business processes and business process re-engineering are

found to be most pertinent. Others include understanding, education (Somers and Nelson, 2001; 2004), analysis of current process (Motwani et al., 2005) and redesigning the business processes (Sumner, 1999; Nah et al., 2001; Gargeya and Brady, 2005; Finney and Corbett, 2007). Other important factors also include business requirements, data, change management, *inter alia*. The segregation of the stakeholders according to their context indicates the importance of identifying them before and during an IS development project.

2.3 Stakeholder analysis

From the previous section of this chapter, it was found that the socio-technical nature of IS development has a multitude of effects towards project complexity. Other than its complexity, IS development projects are also dynamic and non-linear where they do not evolve in a steady and predictable way (Stacey, 1992; Wheatley, 1990; McKelvey, 1997). Therefore, in order to understand the complexity, the dynamics and non-linearity, the socio-technical aspects of projects need to be explored. Following this, the complexity, dynamics and non-linearity of these IS development projects have also caused major issues due to the increasing patterns of project failures. The review of project success and failure literatures in previous sections has shown gaps within the identification and management of these stakeholders.

2.3.1 Stakeholder - overview

The stakeholder concept has been popular within a variety of different management areas, including corporate planning, systems theory, corporate social responsibility and organisation theory (Freeman, 1984). Freeman was responsible for popularising the notion of stakeholders within the strategic management area. His definition was adapted from Stanford Research Institute's memorandum in 1963. Although the term 'stakeholder' was used previously within management, for example Rhenman's (1964) as cited in Coakes and Elliman (1999), it was not as popular as Freeman's conceptualisation of a stakeholder. This was evident with the widespread adaptation of Freeman's definition of a stakeholder compared with that of Rhenman's definition.

2.3.2 Stakeholder - Definition

There is a significant gap between the different definitions that describe a stakeholder. A narrow definition given by the Stanford Research Institute in 1963 explains a

stakeholder as "groups without whose support the organisation would cease to exist." These groups include shareowners, employees, customers, suppliers, lenders and society. Another example of the term stakeholder has been provided by Clarkson (Clarkson, 1994 cited in Mitchell et al., 1997) which differentiates between a voluntary and involuntary stakeholder. Following this, there are two major concepts in place. The first and the most obvious concept is the notion of 'stake.' According to Mitchell et al. (1997), within stakeholder theory, a stake refers to "legal, moral, or presumed" claims or anything with the capacity to affect "behaviour, direction, process, or outcomes" of organisations. According to Carroll, a stake is an interest or share in an undertaking (1989, p. 56). In all, anyone or any group who has a vested interest in the organisation is considered to be a stakeholder. Secondly, these definitions are unidirectional in nature and only consider how these stakeholders can be affected by the organisational activities.

Compared with the broader definition of a stakeholder, while still considering the notion of stake or vested interest, the definition is bi-directional. The most widely adapted definition of stakeholder by Freeman considers this aspect. According to Freeman, a stakeholder is "any group or individual who can affect or is affected by the achievement of an organisation's purpose" (1984, p. 53). This definition considers not only how the activity of the organisation can affect the stakeholders, i.e. those who have a stake or a vested interest, but also how the activities or the behaviour of these stakeholders can affect the organisation's activities.

The popularity of Freeman's definition of a stakeholder was evident even in the IS research literatures. From the twenty-four IS chosen research articles that applied a stakeholder concept in their research, fifteen adopted or at least referred to Freeman's (1984) definition of stakeholder. The generality and broadness of Freeman's definition makes it easier to adapt. Following Freeman's and other authors' definitions (e.g Mason and Mitroff, 1981), the IS authors have come up with a new set of stakeholder definitions relevant to their research context. Table 5 illustrates the adaptation of stakeholders definition from management research to fit into IS research. The

arrangement of the definitions was made chronologically to show the evolution and applicability of the concept.

Definition of stakeholder
Those involved in the actual development, operation and use of the system (Mendelow, 1984)
Those whose expectations go beyond the requirements, since only a fraction of a stakeholder's concerns are usually formulated in the requirements. (Lyytinen and Hirschheim, 1987)
"People who will be affected in a significant way by, or have material interests in the nature and running of the new computerised system" (p.79).
Internal personnel with a vested interest in the IS (Lyytinen, 1988a)
Different internal interest groups – TM, user management and IT management (Ruohonen, 1991)
The stakeholders are a group of people sharing a pool of values that define what the desirable features of an IS are and how they should be obtained. (Ahn and Skudlark, 1997)
Individuals and org. who are actively involved in the project or whose interests may be positively or negatively affected as a result of project execution/successful project completion. (Cleland, 1998)
Someone who has an interest in a CIS development and can affect the success of that development (Coakes and Elliman, 1999)
Those who share a particular set of understandings and meanings concerning the development of a given technology; each group will be identifiable through the different views they have about the artefact, or even whether it is a desirable technology at all. They will thus each perceive different problems and potential solutions to them (McLoughlin, 1999)
Individuals, groups/organisations that have an interest in the project and can mobilise resources to affect its outcome in some way (Smith, 2000)
Stakeholder is an individual, team, or organisation with interests in, or concerns relative to, an Enterprise Architecture.
Anyone who is concerned for the system to succeed (Alexander and Stevens, 2002, p. 7)
Those involved in its operation, those affected by it and those who have an effect upon it. (Davison et al., 2003)
People with a direct internal involvement or investment in a software project. (Henry, 2004)
An entity that has an interest in the situation under examination and has the ability to play a role in its evolution. (1) The actor must be interested and (2) it must be influential. (Bendahan et al., 2005)
An individual person or other legal entity able to act like a person playing one or more roles (Alexander, 2006)
Any individual, group or organisation that can affect or be affected (positive/negative) by the system and have direct/indirect influence on its requirements (Ballejos and Montagna, 2008)

Table 5: Definition of stakeholder

As found in the management literature, a stakeholder is (referring to the openness of the definition) anyone or anything that can affect or can be affected by the organisation objectives, purposes or activities. Compared to the IS definition of stakeholder, a stakeholder is anyone or anything that can affect or be affected by the IS related project or system. The IS project or the system artefact is the nucleus of the overall concept. In other words, anyone or anything that has an interest or is involved in the project or the system artefact can be considered as a stakeholder. This suggests the importance of a

relationship between stakeholders and the organisation. In the literature, Carroll (1989) has explained stakeholder management to be a two-way interaction or exchange of influence between the stakeholder and the organisation.

2.3.3 Stakeholder analysis stages/phases

The purpose of stakeholder analysis is to help provide a better understanding of the stakeholder group's stakes in a form of interests, (Crosby, 1991; Burgoyne, 1994; Donaldson and Preston, 1995), experiences, thoughts and feelings (Burgoyne, 1994). The stakeholder analysis has different stages or phases. The first stage is the stakeholder identification. Stakeholder identification refers to the process of identifying who the stakeholders are and what their stakes are in the organisation. There are various approaches to this but the most common and simplest is the listing of a potential stakeholder (Freeman, 1984; Gamman, 1991 cited in Crosby, 1991) and depicting in a stakeholder map (Freeman, 1984). Others identify stakeholders through the resources they control (Brinkerhoff, 1991), through a matrix of actors, their related impact (Honadle and Cooper, 1989) and their capability to mobilise resources (Liddenberg and Crosby, 1981 in Crosby, 1991). Findings report that there is no specific or practical approach or technique for identifying a stakeholder (Pouloudi and Whitley, 1997).

The second stage involves stakeholder classification. During this stage, each of the identified stakeholders will be weighted with their power to influence (Mitchell et al., 1997; Burgoyne, 1994; Starik, 1994) in order to mobilise resources, the legitimacy of their interest (Mitchell et al., 1997; Donaldson and Preston, 1995) and the urgency of their claims (Mitchell et al., 1997). Backed by their stakeholder salient theory, Mitchell et al. (1997) have made further classifications of a stakeholder based on their combined attributes. According to this classification, a stakeholder who has all of these attributes (definitive stakeholder) should be considered a priority in decision making. Other methods of stakeholder classification include primary, critical or strategic and secondary stakeholders. According to Clarkson (1995), primary stakeholders refer to those who play a vital role in the survival of the organisation. Secondary stakeholders on the other hand have the capacity to mobilise interest in favour or in opposition to the organisation.

The final part is the stakeholder management stage. It is critical for an organisation to manage its multiple stakeholders' stakes and interests. While each stakeholder classification can consist of multiple groups or individuals, it would be damaging to the organisation to ignore their intricate relationships. To assist in this stage it is vital to understand the organisational process which involves political, environmental, social and managerial dimensions (Freeman, 1984). Freeman (1984) goes further with a strategy formulation process in managing this relationship. It is done through behavioural analysis which identifies or detects the actual, co-operative (coalition) and competitive (conflict) aspect of each stakeholder and further explains the subjective nature of the reasons through empathy (Freeman, 1984). The notions of relationship management between stakeholder and organisation were elaborated on by Starik (1994) who relates relationship with mutuality of interest.

2.3.4 Stakeholder – emerging issues

One concern within the existing stakeholder analysis research is the concentration of roles or interests of groups collectively or individually. According to Wolfe and Putler (2002), not all stakeholder group members have identical interests. Each of the members possesses their own self-interests. In relation to this, Freeman (1984) identifies that stakeholder analysis has to overlook the specific-generic differentiation of stakeholder interest. He added that there are possibilities of heterogeneity of interest with the stakeholder group which needs to be uncovered and managed.

Another critical yet undermined question of stakeholder is: who and what can be considered as stakeholder? What form can a stakeholder take (Starik, 1994)? There is a divergence of ideas relating to this basic question. There are scholars that limit stakeholders to living human beings (e.g. Donaldson and Preston, 1995) and there are scholars who would consider non-human physical entities (Bucholz, 1993; Stead and Stead, 1992; Starik, 1993 cited in Starik, 1994). There are also those who accept mental images, without physical forms through the organisational mind (Mitroff, 1983). Approaching stakeholders with the notion of 'affect or is affected' Starik (1994) suggested that a natural environment should be considered as a stakeholder. He added that consideration needs to be given towards the subjective and value oriented nature of

stakeholders. With a non-human, natural environment and mental images in consideration, the concern over the representation, proxy and embodiment arises.

2.3.5 Stakeholder and information systems (IS) research

A review of IS literature on the application of the stakeholder concept indicates an encouraging result. Analysis of a major database on the use of the term stakeholder within abstract, keywords and subjects for top ten IS research journals from 1993 to 2010 (July) resulted in 109 hits. In general, over these 18 years, the number of articles that employ the use of the term stakeholder fluctuates, but in a positive trend it reaches its peak in 2005 with 15 articles. Unfortunately, of these 109 articles only seven IS research articles cited at least one stakeholder related article. The others only applied or used the term stakeholder liberally (Coakes and Elliman, 1999) to identify groups or individuals involved in the IS project. This analysis shows the positive trend of IS related articles that consider the notion of stakeholders. As mentioned earlier, the socio-technical aspect of IS is causing project complexities and needs to be explored in detail; this increasing trend reflects such needs.

Within IS research, stakeholder analysis is defined as a tool, a technique 1) to examine, 2) to identify and understand, 3) to identify and record, 4) to determine a) external environment, b) inside and outside needs and expectations, c) perceptions, d) who is important (influences) for decision making purposes (Bailur, 2006; Pouloudi and Whitley, 1997; Freeman, 1984; Smith, 2000; Atkinson et al., 2001). Collectively, stakeholder analysis can be summarised as an approach that can serve to identify and understand the internal and external environment of an IS project or a system artefact in order to ensure sound planning and decision making are achieved.

2.3.5.1   Why IS needs a detailed stakeholder analysis
Similar to the management approach, stakeholder analysis in IS consists of three major phases, which are stakeholder identification, classification and management.

Pouloudi and Whitley (1997) have come up with four stakeholder identification principles to assist in this process. These principles were derived to satisfy the concern over prior stakeholder identification approach (e.g Freeman (1984) stakeholder list and

map). This is in agreement with Lyytinen and Hirschheim's (1987) concern over the "too coarse" and "inadequate" classification of a stakeholder.

Lyytinen and Hirschheim (1987) and Lyytinen (1988) have also developed stakeholder criteria to assist in the identification of the stakeholder, which is somewhat different from Pouloudi and Whitley's (1994) approach but possesses a certain degree of relationship. While Pouloudi and Whitley (1997) are looking at stakeholders in a context-specific manner, Lyytinen and Hirshheim (1987) and Lyytinen (1988) are looking at it in the IS context, which is more general. Lyytinen (1988) adds a new criterion that involves not only considering internal but also external groups of stakeholders, who also possess their own expectations towards IS, similar to Pouloudi and Whitley's. Based on their earlier stakeholder criteria, Lyytinen (1988) has also drawn a comparison between the traditional and the current approach of stakeholder identification. This is in addition to the original four dimensions of stakeholders identified by Lyytinen and Hirschheim (1987).

Firstly, according to Pouloudi and Whitley, the stakeholder must be identified in a specific context within a time frame. Different things carry different meanings in different time frames. The notion of context specificity or the environment has also been addressed in organisational theory and inter-organisational literatures (Pouloudi and Whitley, 1997).

Secondly, each stakeholder cannot be viewed in isolation. Each stakeholder interacts with other stakeholders through co-operation, competition, 'coalition' or 'conflict.' These complex interrelations within and between stakeholders groups are an interesting occurrence in stakeholder analysis (Pouloudi and Whitley, 1997). The concept of interaction and interrelation between and within stakeholder groups identified by Pouloudi and Whitley resembles Lyytinen's stakeholder identification through the level of stakeholder's aggregation. While previous research identifies stakeholders into general groups, further identification of stakeholder within each group is required to ensure each of their interests and expectations are taken into consideration, since within

each group there are members that have different expectations and interests in the IS that need to be resolved to avoid conflicts.

This is in relation to Pouloudi and Whitley's (1997) next dimension. Each stakeholder has different interests or expectations towards a project outcome and they will take action in order to achieve these expectations. Since these stakeholders possess different levels of power and influence on the project, their wishes may not be realised. As a result, they need to adapt within the available contexts. There are other reasons for these unattainable wishes which include having an unrealistic vision or lack of resources (technology or human) (Pouloudi and Whitley, 1997).

The next dimension reflects the dynamics of the stakeholders during the IS project, where the position of the stakeholder may change over time (Pouloudi and Whitley, 1997). As discussed above, each stakeholder is being identified according to specific contexts and these contexts change diachronically. The dynamic nature of these contexts will also affect each of the stakeholder's structure and position. According to Pouloudi and Whitley, these stakeholders may at any point in time participate in multiple categories, or changes in the context may result in conflicting stakeholder group objectives and priorities (1997), and vice versa. It is thus agreed that the position of the stakeholder changes over time in order to adapt to changes in its environment context.

On the other hand, Lyytinen and Hirshheim (1987) and Lyytinen (1988) suggested a more fundamental dimension. The first is the nature or the view of the IS. According to them, IS should be viewed from a more symbolic, communicative and organisational dimension rather than as a static technological artefact. Second is the type of relationship between the stakeholders to the IS. In other words, who are the owners of the IS? It was the producer or the developer who was actually involved in the IS before being identified as a stakeholder. With more user involvement in IS development and the greater impact of IS towards the organisation, more claimants are being considered as stakeholders. This is in relation to the next dimension, where, according to Lyytinen (1988), the depth of impact towards the IS project needs to be considered. The

identification of direct or immediate impacts posed by the developers or the users towards the project are critical, but as discussed earlier, other stakeholders who also have expectations towards the IS are indirectly impacted, such as the government and sponsors.

In all, these stakeholders are identified within a complex environment and sub-environment (Lyytinen, 1988). Davison et al. (2003; 2006) also created categories which are similar to Lyytinen and Hirschheim (1987) and Lyytinen (1988) that include direct, indirect and interfacing stakeholders. Both of these principles and criteria are complementary and thus their combination (Lyytinen and Hirshheim, 1987; Lyytinen, 1988; Pouloudi and Whitley, 1997) will ensure a robust approach in stakeholder identification.

The next phase of the analysis is stakeholder classification. Within IS research, there are several approaches for classifying the identified stakeholders. Based on the articles that have been reviewed, adoption or the reference that was made to the stakeholder, salient (Mitchell et al., 1997) attributes were encouraging. This approach classifies the stakeholders based on their combination of the attributes which are, power, legitimacy and urgency. The application of this salient approach provides information on the stakeholder roles and insight into the stakeholder's possible actions (De Vries, 2003) during the IS process. Another approach to stakeholder classification was through the ranking (Pfeffer and Salancik, 1978 in Tan et al., 2005) of the identified stakeholders. These stakeholders were classified according to their impact and the extent to which it moderates its consequences (Tan et al., 2005). In the literature, Tan et al. (2005) have also referenced Clarkson's (1995) classification schemes that categorise identified stakeholders into primary and secondary stakeholders. The primacy of the stakeholders is based on the vitality and the influence of the roles that they play (Clarkson, 1995).

The third stage involves the management of the stakeholders. Planning for the efficient management of the stakeholders is only worth considering if the identification and classification stages are robust. We refrain from using the word 'complete' due to the dynamic and iterative nature of stakeholders. The term 'robust' encapsulates the

observation of stakeholder principles or criteria or a combination of both during identification and classification.

There are multiple aspects of a stakeholder's stake (Mitchell et al., 1997; Carroll, 1989; Reed, 1999). It includes interest, expectations, perceptions, needs, roles, behaviour, power, influence (Smith, 2000; Lyytinen, 1988b; Pouloudi, 1999; Freeman, 1984; Coakes and Elliman, 1999) that need to be managed. The success of satisfying the multiple interests of stakeholders constitutes the ultimate test of corporate performance (Donaldson and Preston, 1995) or in our case, the IS.

Above all, a critical understanding should be placed on the *dynamics of different aspects of the environment*. As pointed out by Lyytinen (1988) stakeholders act on a complex environment with their own sub-environment. Thus understanding towards the dynamics of the organisational processes surrounding the stakeholders, where interests are formed and realised, expectations shift and the formulation of commitments are vital (Lyytinen, 1988). The author adds that detailed analysis of environments are critical to clarify different outcomes within IS projects for a given stakeholder group (Lyytinen, 1988).

The *dynamics of stakeholder groups* are also important to consider. Understanding the group's formation, its objectives, norms and roles are complex but critical (Ruohonen, 1991). Consideration on objectives and interests should also be placed not only at, but also within the group that is in an individual member's interests and objectives. Another important aspect of group dynamics is the relationship between groups of stakeholders. Understanding how they interact and their communication and collaboration strategy are critical (Ruohonen, 1991). According to Hirt and Swanson (2001) the relationship or interaction between the internal and external groups, within and between group participants is crucial in determining management strategy.

Another major issue within stakeholder management is the *dynamic nature of IS* itself. Changes in the IS environment may create a ripple effect for stakeholders' expectations.

Stakeholders' expectations are evidently dynamic (Lyytinen, 1988). It is established through verbalisation and ongoing concern of the stakeholders (Kling and Scacchi, 1982). Failure to manage these expectations will create a gap between the expectations and actual IS performance (Lyytinen, 1988). Changes in the IS environment will shift individual stakeholders interests and expectations. They will create a conflict, competition or sense of opposition (Smith, 2000) between stakeholder group members, thus changing the composition, objectives, norms and roles.

Trends within stakeholder analysis on IS research also identified the aspect of stakeholder relationship conflicts and coalition of expectations and perception (Ruohonen, 1991; Newman and Sabherwal, 1996; Lyytinen and Hirschheim, 1987; Lacity and Hirschheim, 1995).

2.3.6   Non-human stakeholder and IS research

As previously mentioned, prior research on stakeholder management only considered living individuals. Emerging notions to include non-human and to some extent non-living stakeholders was touched upon within management research. The notion of non-human stakeholders, however, is drawing increasing attention in the literature (Vidgen and McMaster, 1996; Vidgen, 1997; Pouloudi and Whitley, 2000; Pouloudi et al., 2004; Gandecha et al., 2004; Alexander, 2006). Therefore, before we proceed further, the nature of the stakeholder needs to be identified. Who and/or what can be considered as a stakeholder?

During the initial discussion of what or who makes the term stakeholder, we ended with the notion of considering a non-human, natural environment and mental images as part of a stakeholder. Vidgen and McMaster (1996) have identified the use of non-human stakeholders within the IS research. They propose adapting Mitroff and Linstone's (1993) definition of a stakeholder to include the non-human component within it. Stakeholders are "any human or non-human organisation unit that can affect as well as be affected by a human or non-human organisation unit's policy or policies" (Vidgen and McMaster, 1996). In this definition, the authors introduce the notion of representation, proxy or allies, where the identification of a non-human stakeholder is through "appointments of human stakeholder as representatives". The identification of

the non-human stakeholders not only entangled the complexities of IS relationship issues but also enabled the aspect of technology to be considered during organisational change (Vidgen, 1997). Pouloudi (1999) criticised the notion of a non-human stakeholder, raising concerns about identifying such stakeholders where they are not an advocate for treating the human and non-human components symmetrically. This is in agreement with Walsham's (1997) argument that non-human stakeholders are not neutral since they inscribe human values. Pouloudi and Whitley (2000) identified that different stakeholders attribute different values and interests to the non-human stakeholder. Since multiple human actors are trying to be a representative or a proxy for the non-human stakeholders, this has created another issue on whose representation should be taken into consideration, i.e. the salience of the representation. Pouloudi et al. (2004) further elaborated on the notion of non-human stakeholders through the use of actor-network theory, where they assert that humans and technology (non-human) collectively act to create an actor-network. The notion of non-human stakeholder representation was further developed through stakeholder surrogacy (Alexander, 2006).

Comparing IS research with other management research, IS research is bounded with the duality of technology and society. It was agreed that these social and technical aspects of a system need to be amalgamated to ensure in-depth understanding of the complex phenomenon. According to Gotterbarn and Rogerson (2005), mis-identified or unidentified stakeholders are a major contributory factor to the ineffectiveness of an analysis method. According to Lyytinen (1988), failure to understand different expectations of stakeholders are the main factors behind IS failure. Therefore, to ensure proper understanding of IS projects, stakeholders and their explicit or implicit interests and expectations must be identified and catered for.

There are several complementary factors that have been identified between actor-network theory (ANT) and stakeholder analysis. It is advocated that the application of ANT and stakeholder analysis entails a richer understanding of the IS complex phenomenon. It also enhances ANT methodologically due to stakeholder analysis, the robust identification of stakeholder and its agendas, interests and values (Pouloudi et al.,

2004). Additionally, the principle of stakeholder behaviour and ANT premises on its dynamic and iterative process is complementary and aligned (Pouloudi et al., 2004).

2.4 Actor network theory (ANT) and Information Systems (IS) research

2.4.1 Overview of ANT

ANT is grand and multi-faceted. It serves many purposes in dealing with complex IS phenomena. The multi-faceted nature of ANT can be found through its multiple concepts emerging from the theory itself. Among the most popular concept of ANT are the translation process (Callon, 1986), stability and closure (Law and Bijker, 1992; Bijker, 1993) and black-boxing (Walsham, 1997). In general ANT can be applied through either a methodological or theoretical framework. Within the IS field, research that applies ANT views it more as a methodology which includes data collection (following the actors) and data analysis rather than as an explanatory theory. This is argued to be due to the qualitative nature of most IS research which complements the interpretive stance of ANT. Breaking away from ANT as a method of data collection and analysis would mean opposing the norms. This was further argued by Cordella and Shaikh (2006) which stressed that ANT in IS research is more of a method than an ontology to inform IS research.

In view of the above juxtaposition, Heeks and Stanforth (2007) suggest a more appropriate term of actor-network "perspective" to encapsulate the world view in the application of ANT. This notion of actor-network as a "perspective" rather than a theory was also being used by Sarker et al. (2006) in their article on understanding business process change failure. This concern is supported by Callon (1999) who labelled the term 'theory' in actor-network theory as problematic.

IS development is a complex socio-technical phenomenon. It involves multiple stakeholders with competing interests in achieving their deliverables. Thus it accentuates the need for the use of ANT, which provides analytical clarity to the complex IS development (Bloomfield et al., 1992), improves understanding of the design and use of technology (Hanseth et al., 2004) and also provides the opportunity to understand complex social interactions through the interpretation of social processes

(Hanseth et al., 2004; Walsham, 1997). As normally applied, ANT provides a language for describing how the process of translation occurs (Monteiro and Hanseth, 1996; Hanseth et al., 2004). Research that applies the ideas and terminology of ANT but fails to apply a specific framework to its analysis are becoming more widespread (Heeks and Stanforth, 2007). In addition, it also assists in the understanding of the negotiation process during translation through the redefining and appropriating of interest (Monteiro and Hanseth, 1996). According to Walsham (1997), ANT attempts to address the complex socio-technical world by examining the motivation and actions of heterogeneous elements. This was in relation to Callon's (Callon, 1999) concern of the difficulty to separate these entities. Tatnall and Gilding (1999) assert that it is through the lifting of the social and technical boundary that ensures an in-depth understanding of their interwoven relationship, and thus denies a pure technical and social relationship.

According to Whitley and Pouloudi (2001), ANT provides a technique for viewing, identifying and understanding different kinds of translation scenarios with its accompanying reasons and effects of such translation. These scenarios can be divided into different extremes of alignment of interest or problem identification. On one extreme, there is a perfect alignment of interest or similar problems identified between the innovator, the user and the developer. At the other extreme, the innovator will persuade the users that they have problems and they have the solution to the problem. Between these two extremes is the most common problem of translation, where the innovation or solution provided by the innovator did not solve the users' problems and that they need to be persuaded. The user has to either change their identity or reshuffle their interest to match the innovation (Pouloudi and Whitley, 2000). In another way, ANT allows the understanding of the creation and sustainability of collective activities (translation) through time and space (Kaghan and Bowker, 2001). Looking through a theoretical perspective, Mahring et al. (2004) stressed that ANT provides a rich approach in understanding the creation of actor network or its aligned interest.

Going back to the basics, ANT was pioneered by Michel Callon and Bruno Latour through their inception of ideas within the sociology of science and technology in 1986

and 1987 respectively (Callon, 1986 ; Latour, 1987). The idea was later extended by other researchers that include John Law and John Hassard.

ANT has a number of interesting as well as controversial features. Within its features lie its three principles (Tatnall and Gilding, 1999) where Doolin and Lowe (2002) refer to it as an ontological aspect of ANT. First is agnosticism or impartiality or being neutral towards the nature of the actors, whether they are technology or social. Secondly is the generalised symmetry which means that actors are being described using the same framework without special explanatory status or, according to Callon (1986), there should not be a change of registers when referring to either the human or the non-human actors. Lastly, there should be no *a priori* distinctions between the actors. All actors must be free of all prior association. As mentioned earlier, ANT is multifaceted and provides multiple concepts and features to understand the complex phenomenon of IS. Among pertinent ANT features are included actors (actant), actor-network, interest, translation, alignment, inscription, irreversibility, black-boxing.

Actors (actants) in general can include both human beings and non-human actors (Walsham, 1997). The non-discrimination between the human and non-human actors is the most pertinent and controversial features of ANT (Sarker et al., 2006). According to Law (1992), an actor is not just a point object. It is an association of heterogeneous elements which constitute a network. In other words, an actor is a simplified network (Hanseth and Braa, 1998), or a network of hybrid objects (Hanseth et al., 2004). Actors are the sum of their interactions and associations with other actors and networks (Tatnall, 2003). Within the network, the actor will bend space around itself making others dependent on them, thus translating their will towards the actors (Callon and Latour, 1981 cited in Tatnall, 2003). According to Latour (1991), all actors co-evolve among each other to create the network. This is what Law (1999) refers to as relational materiality, where actors achieve their form and attributes as a consequence of their relationship with others (Cordella and Shaikh, 2006).

According to Brooks et al. (2008), non-human actors are powerful in establishing irreversibility or network stability and at the same time can influence the catastrophic

deconstruction of the network or as a traitor (Hanseth and Braa, 1998). Hanseth and Braa (1998) in their articles looking at SAP implementation found that a technology which has successfully created an alliance and successfully installed and integrated becoming a traitor by resisting organisational change. To this note, actors also acted as agents or intermediaries working as a translator or spokesperson for an efficient interaction and translation (Weick, 1998; Callon, 1986 ; Law, 1992) whereby these actors would improvise their responses in order to create more sensible and acceptable output (Weick, 1998).

An actor-network is where human and non-human actors are linked together into an actor-network (Monteiro and Hanseth, 1996). In other words it is a heterogeneous network of aligned interests (Walsham, 1997; Sarker et al., 2006). All networks are different due to their different composition of actors (Hanseth et al., 2004), with different levels of flexibility which constitute diverse forces (Cordella and Shaikh, 2006). The durability of the network will depend on the heterogeneity of the actors (Doolin and Lowe, 2002) with its diverse forces, and any resistance to the network will cause modification or even disintegration of the network (Callon, 1986).

The notion of interest plays a pivotal part within ANT. Discourse on ANT is concerned with the translation of interest. According to Callon and Law (Callon and Law, 1982) interest is not only considered as a force for explaining the social action but also for considering an outcome of the action. It is also a means of persuasion or appeals or even coercion during the enrolment of other actors (Callon and Law, 1982). It is during creation of the network or during the process of translation that converging interests are aligned, thus creating stability and order (Hanseth and Braa, 1998). Disorderly and unreliable allies evolve into a black-box (Latour, 1987). In addition, during these translations, the actor's interests are matched (Whitley and Pouloudi, 2001) or reshuffled, where goals are replaced with newly-aligned goals (Latour, 1987).

Enrolment and translation are two interconnected pertinent features within the ANT concept and literature. Translation is the process of aligning an actor's diverse interests which converges into one through acceptance, thus creating truth and stability (Callon,

1991). In his original work, Callon (1986) identified translation as a process of enrolling others where other actors are giving consent for a detour of their original interest towards the focal actor's, to show support or willingness to participate in a particular ways of thinking and acting in order to maintain stability of the networks (Walsham, 1997). According to Bloomfield et al. (1992), persuasion plays an important part in the enrolment process of network building where the exercise of power is manifested. At the same time, other actors have the opportunity to refuse the translation. This idea is supported by Latour (1987), who explains that by identifying that the success in translation occurs when the focal actor represents or appropriates the interest of other actors to his/her own. It is critical for a researcher keen on applying ANT to understand this critical process of consent which is given during these translation processes. This is in conjunction with Latour's ideas of studying ANT in action. Other researchers applying ANT are congruent to the ideas of translation and enrolment of actors' diverse interests (see Monteiro and Hanseth, 1996; Whitley and Pouloudi, 2001; Hanseth et al., 2004; Sarker et al., 2006).

The process of translation can be further detailed through the four moments of translation identified by Callon (1986), which are: problematisation, interessement, enrolment and mobilisation. This process of translation was frequently applied as a mode of analysis in most of the literature applying ANT, including the IS literature of Lee and Oh, 2006, Whitley and Pouloudi, 2001, Mahring et al., 2004, Sarker et al., 2006 and Brooks et al., 2008. Heeks and Stanforth (2007) mentioned the four moments of translation advocated by Callon (1986) but mainly to stress the over-usage of the framework and failure to open up to other analytical frameworks suggested by ANT, like the local or global network framework.

These four moments of translation are structured in a table below to assist in the clarity, and important details on each moment will be discussed in detail. The descriptions will be based on the most frequently used in IS literature (assuming that frequent uses reflect understanding). Multiple descriptions to similar process were due to different approaches, perspectives or views taken by a different researcher.

Moment of translation	Description
Problematisation	One focal set of actors seeks to define problem of other actors in their own and suggest a solution to problems, considering themselves as an indispensable resource to the solution, namely Obligatory Passage Point (OPP)
Interessement	The focal actor acts to lock or to convince other actors into their place in the network by attempting to break competing relations
Enrolment	The focal actors seek through physical actions and negotiations to define and co-ordinate roles of other actors
Mobilisation	The focal actors seek to ensure that the specific representation of the other actors are accepted whereby the focal actor is accepted as the main voice, speaking on behalf of the network

Table 6: Moment of translation (Callon, 1986)

Within these four moments of translation, the most critical notion is the focal actor. According to Law (1987), a network is determined by actors that are able to make their presence individually felt (Tatnall, 2003). In other words, the focal actors can be anyone with an interest in which he/she feels that others are also interested. His/her work can become much easier if others' interest is consistent with theirs (Callon, 1986), or alternatively, he/she will identify the others' interests and corner it to fit to their own. This notion of focal actor was critiqued by others stating that it is focused on a single actor who seems to be heroic or Machiavellian (Heeks and Stanforth, 2007) and on a winning actor only (Radder, 1992).

In a related and also pertinent notion is the Obligatory Passage Point (OPP). OPP are the focal actors who, initially creating the problems, have also established a solution. Thus they were being considered indispensable for other actors to achieve their goals or objectives. Callon's original work on ANT depicts clearly the notion of Obligatory Passage Point (OPP) (1986).

	The Three researchers	Pecten maximus	The fishermen	Scientific colleagues
Entities				

OPP

Obstacle – Problem predators	Obstacle – Problem Short-term profit	Obstacle – problem Total lack of information about Pecten Maximus

Goals of entities	Advance knowledge and repopulate the bay to the profit of the fisherman	Perpetuate themselves	Assure a Long-term profit	Increase knowledge About Pecten MAximus Without calling previous Knowledge into question

Figure 1: Callon's OPP (Callon, 1986)

The above figure (Figure 1) clearly shows how three researchers (focal actors) positioned themselves as the OPP. In this case they attempt to understand the pectin maximus (the scallop) capability to attach and grow. The three researchers therefore develop a strategy to improve its population which is declining and creating problems to other actors. Their research interest on these pecten maximus (the scallop) would provide a solution to the other actors' problems and interest – the fisherman and the scientific colleagues.

During interessement, the focal actor will try to convince the other actors the similarities and to negotiate the differences of their interest and concerns. This process is not as straightforward as it seems. During this process, the focal actor will present their justification towards the issues or problems and stress the possible success of the solutions. This is similar to a process during an election where each party leader will advocate their issues or concerns and suggest a point of action that will be taken upon success. The other actors with similar interests will support the concerns. But there will be voters who are still unsure of their decision and need to have more confidence towards certain parties. To an extent, it is up to focal actors, in this scenario the party leader, to provide incentives to those who are willing to take a detour from their own

interests (Sarker et al., 2006) or to corner other actors who have yet to be co-opted into their interests (Mahring et al., 2004). According to Callon (1986), the process of interessement will be considered a success where the problems and the alliances are confirmed to be valid. This is the point where actors are locked into their places in the network of alliances (Mahring et al., 2004; Heeks and Stanforth, 2007; Brooks et al.; 2007).

Once all actors are locked into their places, their roles will be defined and co-ordinated in a manner which is congruent to the goals and objectives of the network - enrolment. While the aligned heterogeneous multilateral network is still taking its shape, further negotiations and the setting of strategies with other actors will take place (Callon, 1986) until these other actors accept the interest defined by the local actor (Lee and Oh, 2006). This is the point of enrolment where according to Latour (1987), the point of successfully translating others' interest towards their own through critical representation and appropriation or the point of consolidation (Whitley and Pouloudi, 2001) is reached. While this phase requires the full commitment of other actors to embrace and to take an active part (Callon, 1986) in the network, the other actors can at any time betray the others by taking contradictory action (Sarker et al., 2006) against the agreed roles. One example is when the IT project management and the systems options, who have initially being enrolled by the Chief Executive of the London Ambulance Service into the network of Computer Aided Dispatch (CAD) system implementation, have betrayed through their inadequate performance and poor design respectively (Brooks et al., 2008).

Mobilisation is the point where the focal actor establishes themselves as representative or spokesperson of the network. The alignment of interest by other actors assumes legitimacy (Whitley and Pouloudi, 2001) and power to act on behalf of the network. Stability of the network will only be achieved through the alignment of interest and continued support. In order for these ideas to be institutionalised, the interest is inscribed into material forms which are embodied in texts, machines or skills (Callon, 1991). According to Sarker et al. (2006), inscription is the recording of commitments that dictates stability within the network through texts and technical artefacts. Mahring

et al. (2004) further elaborate that inscription can be established through the formation and placement of technology in the network and by prescribing a program of action for other actors. In return, the other actors may or may not follow these inscriptions which will be based on the strength of the inscription itself.

Another important feature of ANT is irreversibility. Callon (1991) describe irreversibility as the degree to which it is impossible in a certain situation to go back to a point where alternative possibilities exist. In other words, irreversibility is the result of the inscription of interest into an artefact where it is hard (Hanseth and Braa, 1998) or difficult to change. Two interrelated emerging concepts of irreversibility are black box and immutable mobile. The concept of immutable mobility was introduced by Latour in 1987 through his book Science in Action. Latour (1986) further defines immutable mobile as the object that holds its structure or composition as it move through a network. Following Latour, Cooren et al. (2007) clarifies that immutable mobile is an element or object of network that can travel from one point to another without distortion, loss or corruption on its features. They stress the importance of the energy and forces that are required to sustain the immutability during mobility that is through space and time.

From a review of the literature, the concept of a black box is more general. According to Walsham (1997), black box is a frozen network element with properties of irreversibility. An actor is a very good example of a black box (Callon, 1986) since an actor comprises a whole network of complex association (Tatnall, 2003) which is difficult to change. Therefore to consider a network as a black box, it must have the characteristic of irreversibility or difficulty to change. In relation to the notion of irreversibility and black box, Cordella and Shaikh (2006) introduce an alternative use of actor-network theory as a means to understand the process of network stabilisation or black box formation rather than studying the effect of the black box itself. This is very much consistent with Lanzara (1999), where she advocated the notion of tracking the process "before the box actually gets closed" rather than "opening the black-box". Therefore, the notion of irreversibility, immutable mobile and black-box is very much

consistent with the concept of obduracy or stubbornness of the network (Law and Bijker, 1992).

The understanding of ANT was based on the review of several empirical and theoretical literatures in IS (Bloomfield et al., 1992; Monteiro and hanseth, 1996; Walsham, 1997; Hanseth and Braa, 1998; McMaster et al., 1999; Tatnall and Gilding, 1999; Whitley and Pouloudi, 2001; Kaghan and Bowker, 2001; Doolin and Lowe, 2002; Tatnall, 2003; Hanseth et al., 2004; Mahring et al., 2004; Sarker et al., 2006; Cordella and Shaikh, 2006; Hanseth et al., 2006; Lee and Oh, 2006; Heeks and Stanforth, 2007; Brooks et al., 2008; Mitev, 2009). From the above analysis of the literature, ANT is very much in line with the nature of a processual approach. As a summation, depicted below is the processual nature of the actor-network creation.

Figure 2 illustrates that the process during actor-network creation is not as straightforward as depicted. In general, there are two main processes: translation and inscription. Translation which has been discussed at length includes four phases or moments (Callon, 1986). Each of the moments of translation incorporates its own unique, complex and iterative processes. Upon stabilisation of these networks, it is inscribed with multiple forms of tangible material and intangible skills.
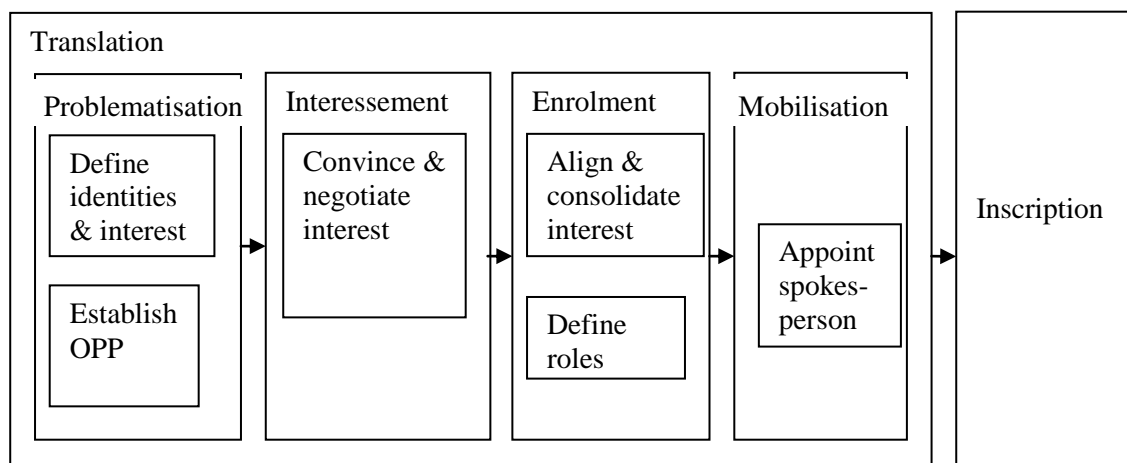
Figure 2: ANT as process research

From the review of the relevant literature, the notion of understanding IS success and failure through ANT is becoming widespread (Kaghan and Bowker, 2001; Brooks et al., 2008; Mitev, 2009). Empirical research shows that ANT can be applied to identify factors that lead to failure and are followed by success (Brooks et al., 2008). According to Mitev (2009), project failures tend to reveal or unravel hidden processes and complex relationships which are taken for granted during successful projects. She added that applying ANT, it was found that actors carry out unpredictable translation which fails to follow predetermined and natural or best route, therefore there are no inherent factors that can lead to either a success or failure. This correlates with the notion of emergent in ANT that was advocated by Cordella and Shaikh (2006).

Another stream of research that contextualises ANT and the notion of IS success and failure is the creation of black box. Black box is the inscription of a stable network alignment. To reach this stage the network has to go through the process of translation which is dynamic and emergent. Several researchers have advocated the need to analyse the interplay in creating the black box (Cordella and Shaikh, 2006) or before the black box is closed (Lanzara, 1999) rather than simply studying the effect of the black box or opening the black box. In other words, the analysis of process that leads to possible stabilisation or irreversibility can be considered as an alternative use of ANT (Cordella and Shaikh, 2006). Computer-based information systems are complex socio-technical entities (Longenecker, 1994). The notion of a black box is also very much related to the complexities in an IS development project. ANT in general provides the means to interpret and understand the socio-technical complexities of organisation change (Brooks et al., 2008). In ANT, to handle complexity, the notion of simplification is introduced where it represents infinite possibilities of complex situations (Tatnall, 2003). Punctualisation, unpacking or collapsing of the heterogeneous network into an actor is considered as black boxing (Callon, 1986).

ANT is concerned with the creation of facts such as black boxes, technologies and innovations (McMaster et al., 1999) and the success or failure of the translation process will be embodied in multiple means to support the executive (focal actors) (Callon, 1991). It can be in texts (user manual, technical documents), machine (running systems)

or skills (programming, system usage). In other words, ANT is both a theory and a method. It is a theory since it provides theoretical concepts that illuminates the ways of viewing elements in the real world and it is a method since its provides ways to conduct and elements to trace during empirical work (Walsham, 1997).

2.5   Summary

This chapter attempts to identify the context of this research through the review of relevant literatures. Through the review of the literatures we found out that the notion of complexity has been widely discussed and attempts to mitigate its effect were unsuccessful. Further to this we have noted that the IS implementation successes and failures were largely due to this issue of complexity that is its socio-technical, multidisciplinary, dynamic and non-linear nature. Following this, we have also identified that research on IS success and failure attempts to identify the stakeholders involved during IS implementation. However, their findings focus more on human stakeholders and omit the non-human stakeholders. We then introduce the concept of stakeholder which includes the stakeholder analysis incorporated in the process of stakeholder identification. Considering the socio-technical elements of the IS implementation phenomena, we further introduce the concept of actor-network perspective as the explanatory narratives for the events that occurs during the IS implementation. Following actor-network perspective, we highlight the notion of translation and black-boxing which in our case is the implementation process of integrated finance systems.

CHAPTER THREE

3 The Evolution of a Process Model – Positioning the PSIC Model

3.1 Understanding organisational change

The implementation of information technology and its impact towards organisational change has been an important phenomenon for discussion in IS literature over the last 30 years (Markus and Robey, 1988). The two most commonly used definitions of change encapsulate its modes of explanation (Van de Ven and Poole, 2005). With the definition of change as *"an observed difference over time in an organisational entity on selected dimensions"* (Poole et al., 2000) this correlates with the variance theory. Where as, *"a narrative describing a sequence of events on how development and change unfold"* (Poole et al, 2000) highlights the notion of process theory. The development of both variance and process theories was mainly for explaining the emergence of this complex phenomenon, especially in organisational change studies (Van de Ven and Poole, 2005; Poole, 2000). It is to establish the logical argument (Markus and Robey, 1988) through distinct modes of explanation (Mohr, 1982).

In variance studies, "precursor", "antecedent" or "independent" variables are identified and causally linked with measures of outcomes (dependent variables) (Sabherwal and Robey, 1995; Mohr, 1982). In this type of research, change is represented as dependent variables (Van de Ven and Poole, 2005). In process studies, rather than consider the effect of variables, they focus on events that occur over time and attempt to explain how and why these events occur and how they affect the outcomes (Mohr, 1982; Sabherwal and Robey, 1995). In this type of study, change events occur based on a story or historical narrative (Pentland, 1999; Van de Ven and Poole, 2005). Variance and process theory have always been debated. Their function as an explanatory theory of human behaviour is always being challenged. According to Mohr (1982), although there is a prominent use of variance theory within the organisational studies, especially for its power of prediction and control, it does not dominate theory in practice. I would suggest that their differing methods of viewing and analysing the data contribute to fuelling the debate. With variance theory, the inclination is to view static relationships between

variables, whereas process theory suggests a more diachronic nature of events (Mohr, 1982).

	Variance Theory	Process Theory
Definition	The cause is necessary and sufficient for the outcome	Causation consists of necessary conditions in sequence; chance and random events play a role
Assumption	Outcome(s) will invariably occur when necessary and sufficient condition are present	Outcomes may not occur (even when conditions are present)
Basis of explanation	The basis of explanation is efficient causality.	The basis of explanation is final, formal and path dependent.
Elements	A variance theory deals with variables.	A process theory deals with discrete states and events. (discrete outcomes)
Role of time	Snapshots, cross sectional and static	Longitudinal and dynamic
Generalisation	Depends on uniformity across contexts. Statistical.	Depends on versatility across cases
Time-ordering (sequence)	Immaterial to outcome	Critical to outcome. Path dependency.

Table 7: Characteristics of variance theory and process theory (Mohr, 1982; Markus and Robey, 1988; Poole et al., 2000)

There are several main differences between variance and process theory. The main difference is the association between inputs and outputs or in other words, the precursor and outcomes respectively. In variance theory it is agreed that the precursor is a necessary and sufficient condition for the outcomes (Mohr, 1982) where in a process theory the precursor is a necessary condition for the outcomes. While both of the associations engage with understanding how outcomes are achieved, variance theory incorporates variables while process theory accommodates necessary conditions (Mohr, 1982). It is where outcomes can be understood from the information on the process or the sequence of events that occur rather than prediction of variance (Markus and Robey, 1988).

The following differences relate to efficient cause and rearrangement of elements (probabilistic processes). Efficient cause is the heart of the variance theory identifying that *"the force that makes it what it is or change it from what it was"* (Mohr, 1982).

This notion of causality creates an understanding of the association between the necessary and sufficiency of precursors to produce outcomes of an explanatory theory (Mohr, 1982). Within process theory, the rearrangement of elements (necessary conditions or objects) to achieve outcomes is empowered as its explanatory power. Rearrangement refers to the joining or separation of two or more specified elements (Mohr, 1982). The joining or separation of the elements constitutes a probabilistic process. These combinations are to some degree affected by the external forces or the context. The notion of probabilistic processes refers to the path of events which are subject to the probability of the outcomes (Shaw and Jarvenpaa, 1997).

The final difference between variance and process theory is the issue on time-ordering. The nature of variance theory is to focus only on snapshots of event or a specific state of event rejects time ordering (Mohr, 1982). The idea of prediction and testing at times requires certain variables to remain constant which rejects time ordering (Mohr, 1982). Process theory supports the ordering of time where events or activities (joining or separation of elements) that occurs happen after one another.

Why should we engage in process study? Past research indicates that most studies conducted follows variance theory (sometimes referred to as a factor study approach) that shows the relationship between variables and looks at the degree of interaction between critical factors with outcomes. For example, variance studies look at the impact of ERP systems on the outcome of system implementation through surveys. This type of research is not able to address the nature and complexities of the change process. In contrast, process studies provide an in-depth analysis of events within a specific context. Markus and Robey (1988) further identify the benefits of process theory. Process theories make identification of new patterns within empirical data possible. The identification of the events, their paths and their sequences permits pattern generation. Also, the prediction of these patterns over time is also one of the goals of process theories (Markus and Robey, 1988). The relevance of process theories towards real life or actual events makes prediction of patterns applicable.

Mohr (1982) identifies attempts to combine both models in explaining organisational behaviour. Mohr (1982) also suggests co-existence rather than combination, which is supported by Newman and Robey (1992). They agreed that variance and process theory are mutually informative but not suitable for integration (Mohr, 1982; Newman and Robey, 1992). According to Newman and Robey (1992), a factor study and a process study are complementary where findings from each study can be further elaborated through other research. This complementary feature of the variance and process study was captured and further elaborated on by Sabherwal and Robey (1995) in their attempts to reconcile both types of studies. In their paper, they discuss the feasibility for reconciliation, method of reconciliation and the benefits of such reconciliation (Sabherwal and Robey, 1995).

3.2 Evolution of a process model

The notion of process model in information systems research was first instigated by Newman and Robey in 1992. In their research, they are looking at the relationship between the user and the analyst during an information system (IS) development project. They have made an analytical comparison between the factor- or variance-based research and also process-based models in understanding IS development projects. They have concluded that the factor model and the process model are complementary but should be combined into a single model due to their differing forms (Newman and Robey, 1992). Mohr (1982) further deliberates on the incompatibility of combining the two models.

They further deliberate the benefits of process model and proceed from there. The nucleus of the model is its difference with the factor model that treats the process as unknown and unknowable (Newman and Robey, 1992). With process research, focus is placed on the sequence of events (Mohr, 1982) within the process. This approach enables a better understanding on the dynamics of social change and also provides an in-depth explanation of how and why results are achieved (Van de Ven and Huber, 1990; Mohr, 1982). According to Kling (Kling, 1987) and Markus and Robey (1988), this type of model provides a faithful account of actual experiences of what really happens especially during a IS development project.

Factor

Independent Variables

•Resources

•User involvement

•Technical quality

•Top management support

| Inferred processes of development (Closed-box) |

Dependent Variables

•Use of system

•Economic benefit

•Better decision

•User satisfaction

Process

Environment

Antecedent conditions

Critical Event 1 → Critical Event 2 ┄┄ Critical Event N → Critical Event N+1 → Outcomes

Time

Figure 3: Factor and process model of system development (adapted from Newman and Robey (1992) and Lyytinen and Newman (2008)

As the name suggests, the development of the model follows the process theory approach (Van de Ven and Poole, 1990). It starts with the notion of events derived from observation of incidents (Newman and Robey, 1992). In this model, there are two types of events: encounters and episodes. Encounters are at a specific point of time at the beginning and the end of an episode, whereby an episode is a set of events which travels across time and space (Newman and Robey, 1992; Robey and Newman, 1996).

To understand the nature of the IS change, this model further elaborates on the concept of punctuated equilibrium (Gersick, 1991). According to Gersick (1991), there are two levels of IS change which are described as first- and second-order change. First-order change occurs when the change is continuous and incremental over time or during periods of stable infrastructure with incremental adaptations (Gersick, 1991). Second-order change involves episodic punctuations or brief periods of revolutionary upheaval (Gersick, 1991).
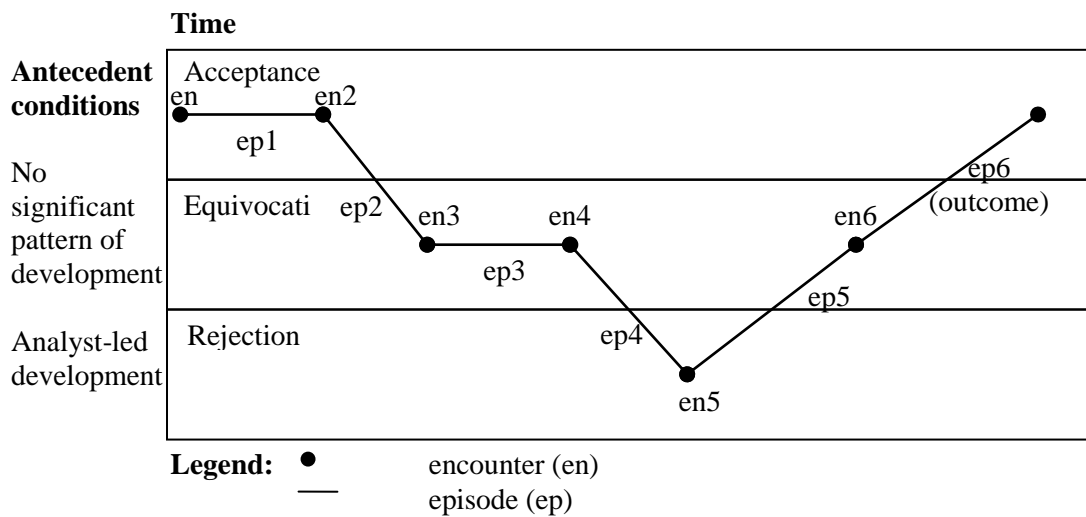
Figure 4: Mapping events in a social process (Newman and Robey, 1992)

Although it is not specifically stated in the article, since this model tries to understand the relationship between users and analyst, it indirectly elaborates the different process of work between the users and the analyst and shows how one's activities affect others within the project (Figure 5).
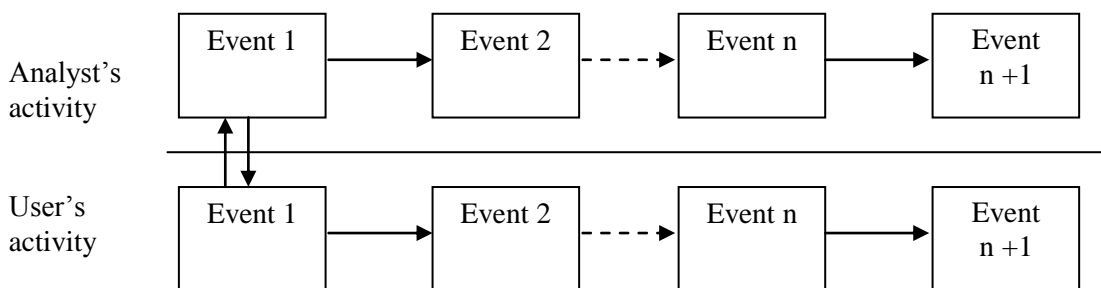
Figure 5: Interpretation of Newman and Robey (1992) user and analyst relationship

Viewing the model in a more general form (Figure 4), also involves an understanding of the antecedent condition or the history of the IS development project and how it will affect outcomes in relation to the users and the analyst sequence of work. Antecedent conditions usually encompass prior projects outcomes and their relative nature towards the new existing projects (Newman and Robey, 1992). In other words, users and analysts who are involved in the current project transfer their experience and expectations from prior projects which in turn affect how they perceive their current project.

57

Any episodes of user-led, analyst-led or joint development will be considered as first order change where the development is incremental and ongoing. Changes from user-led to analyst-led or even joint development will still be considered as first order change if it does not create punctuation or upheaval, e.g. resistance by either users or analyst towards the project. This brief period of punctuation will result in either the project continuing incrementally or even equivocation and further possible abandonment.

In relation to the outcomes, this model restrains itself from viewing it through success or failure dichotomy due to the inconsistency of the term itself. Rather, the outcome is conceptualised as state of relationships either user-led, analyst-led or joint development (Newman and Robey, 1992). When state of equivocation occurs, the future project will be surrounded by high level of risk or uncertainty due to lack of commitment from project team (Newman and Robey, 1992).

It is observed that there is no specific method or approach identified as a means of events identification rather than through observation of incidents. It is up to researchers' own perceptions and interpretive judgements of what an event should be (Newman and Robey, 1992; Robey and Newman, 1996). The authors added that since this model represents a simplification of reality, the identification of these events is a critical process.

Robey and Newman (1996) further elaborate on the model by focusing on the capability of the project trajectory built from the model to support theoretical interpretations. Based on Kling's (1980), theoretical perspectives on social analysis of computing, Robey and Newman (1996) discuss the findings from the model. There are two main perspectives introduced by Kling (1980); these are the rational perspective and segmented institutionalist perspective which has no superiority over the other. The rational perspective was further divided into three main approaches. In the rational approach, technologies are seen as tools to achieve goals, and the failure to attain these goals is due to technology inefficiencies rather the users. The structural approach includes the social context of the technology and evaluates its fit within the environment. The human relations perspective incorporates the social and technical

criteria into the analysis, where goals are jointly achieved and optimised (Robey and Newman, 1996).

The segmented institutionalist perspective covers the integrationist and organisational politics approach. The integrationist approach looks at the symbolic meaning of technology. Within this approach, system development is considered as a social process where social meanings are created and preserved through the interaction between sub-cultures. In organisational politics, the identification of the stakeholders and their interests are crucial, therefore focus is given to the conflicts between subgroups. In this approach of resolution of conflict, only an unstable compromise is achieved (Robey and Newman, 1996).

The application of these perspectives within the process model extends its applicability in making sense of the complex social process of IS development (Robey and Newman, 1996). According to Sabherwal and Robey (1995), the process model suggested by Robey and Newman (1996) "enables preservation of detailed information about specific events and their temporal order." This observation is made in comparison to the stage model which is argued restricts the details of the unfolding events replacing them with prescribed events (Sabherwal and Robey, 1995).

The application of the social process model illuminates its benefits. The social process model was methodologically used as a 'lens' for understanding the relationship structure between project team members (Holmstrom and Henfridsson, 2006; Holmberg et al., 2008) and assisting in viewing large datasets by capturing it in a project trajectory (Heiskanen et al., 2008; Holmberg et al., 2008).

3.3 The punctuated socio-technical information systems change (PSIC) model

An extension of this model, later named the punctuated socio-technical information system change (PSIC) model was elaborated by Lyytinen and Newman through various working papers from 2004 to 2006 and completed in 2008 with their article published in EJIS in 2008 (Lyytinen and Newman, 2008). This model has been empirically applied

in a variety of settings (see Newman and Zhu, 2007; Newman and Zhao, 2008; Newman and Zhu, 2009).

The most critical extension of the model was the incorporation of Leavitt's (1965) socio-technical model (see Figure 6). The incorporation of the socio-technical model was based on Lyytinen's prior work on software risk management (see Lyytinen et al., 1996). In this article, the application of the Leavitt organisational model involved framing the structure and scope of the context of software development (Lyytinen et al., 1996). The application of the socio-technical theory in the extended process model was *"to characterise the content and the engine"* of the IS change (Lyytinen and Newman, 2008). Within the Leavitt model, it is assumed that at anytime, the relationship, alignment or interrelation (Keen, 1981) between the four organisational elements (task, structure, technology and people) are always in equilibrium and mutually adjusting (Keen, 1981). According to Leavitt (1965), the four elements are highly interdependent and a change in any one of the elements results in a compensatory (or retaliatory) change in the other elements.
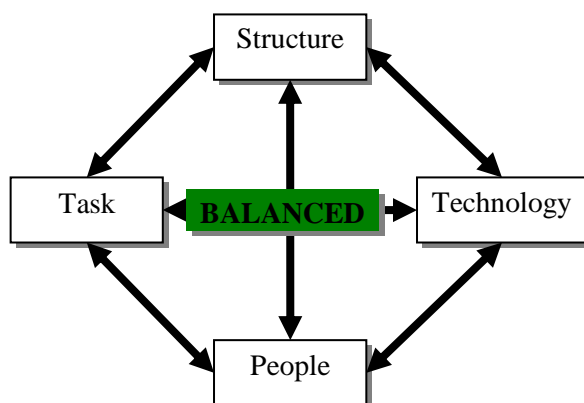
Figure 6: Leavitt (1965) socio-technical model

For Lyytinen and Newman (2006), the reason for adopting the Leavitt model was due to its *"open system model of change"* that is "simple, extensive, well defined and grounded in the extant theory" (Lyytinen and Newman, 2008). The model can also be easily extended or adapted across different contexts to include other categories for a richer vocabulary (see Kwon and Zmud, 1987). The Leavitt model also easily connects or adapts to other related concepts within the model. The elements interaction, alignment and adaptation to changes correspond to Gersick's (1991) punctuated

equilibrium concept (Lyytinen and Newman, 2006). Following Lyytinen et al. (1996), the adoption of the Leavitt model provides a more systematic way to identify events and their socio-technical components.

The extended model has also further elaborated the work system concept. A work system is a view of work occurring through a purposeful system (Alter, 2002) and IS development as a change agent will re-configure the work system (Lyytinen and Newman, 2008). Within the IS development process there are multiple and complex processes. According to Alter (2002), information systems constitute a special case of a work system which was developed to support the work system. Alter (2002) further provides the relationship and form of such systems to provide the overlap between work and information systems and suggests that information systems can be characterised as part of work systems. Alter's (2002) consideration involves existing information systems within the organisation. Process models which try to capture the development of the information systems thus cannot be considered as part of the work system. Therefore, following Alter (2002) on the concept of work systems, and building on recent research (Lyytinen and Newman, 2006; Lyytinen and Newman, 2008; Newman and Zhu, 2009) a new work system that specifically illustrates the IS development is erected. Like a work system, this building system will require resources and carry out the change activities and overcome the challenge of system development.

The idea of multi-level (Lyytinen and Newman, 2008), parallel processes (Newman and Zhu, 2005) or a hierarchical (Lyytinen et al., 1996) approach in IS development process originated with Newman and Robey's (1992) paper. In their paper, they segregated the task of the user from the task of the analyst through the identification of boundary conditions (Newman and Robey, 1992). Referring to figure 7, in Lyytinen et al. (1996), a three-layered software development framework was employed to depict its environment, intertwined by change processes which are systems, project and management environment.

The extended model (Figure 7) incorporates/introduces the external environment or the organisational environment (Lyytinen and Newman, 2008) of the project. The

environment was further divided into organisational contexts which include resource, authority, culture and political systems and environmental context that includes the organisation's social, economic, political, regulatory and competitive environment that affect and can be affected by other systems levels (Pettigrew, 1990; Lyytinen and Newman, 2008).

```
                         ┌─────────────────────────────────────────────────┐
                         │                  ENVIRONMENT                     │
                         └─────────────────────────────────────────────────┘
                                        ↑              ↓
              ┌─────────┐   ┌─────────┐   ┌─────────┐   ┌─────────┐
Building      │ Event 1 │→→ │ Event 2 │---→│ Event n │   │  Event  │
system        └─────────┘   └─────────┘   └─────────┘   │  n +1   │
                  ↑↓                                     └─────────┘
──────────────────────────────────────────────────────────────────────
              ┌─────────┐   ┌─────────┐   ┌─────────┐   ┌─────────┐
Work          │ Event 1 │→→ │ Event 2 │---→│ Event n │   │  Event  │
system        └─────────┘   └─────────┘   └─────────┘   │  n +1   │
                                                        └─────────┘
```
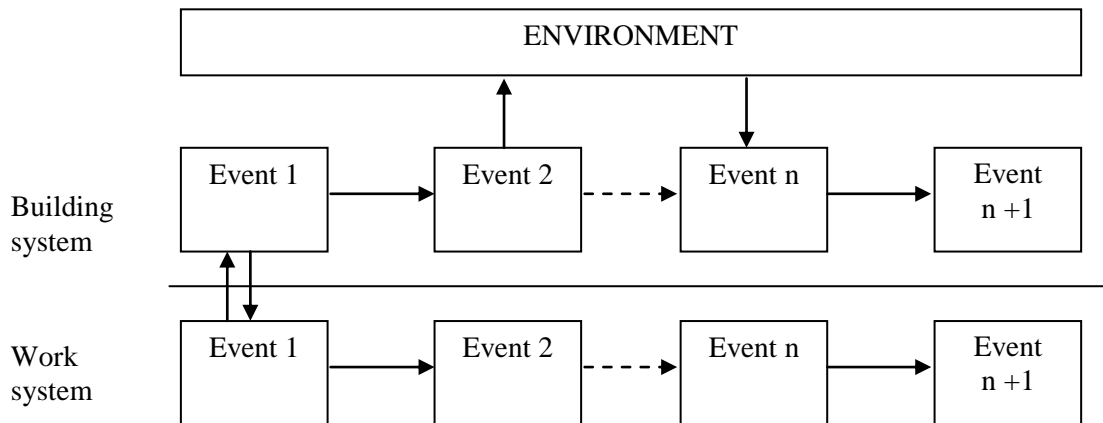
Figure 7: Multi-level IS change (adapted from Lyytinen and Newman, 2008)

The development of these multi-level systems suggests another analytical opportunity that would improve the understanding of IS change. Lyytinen and Newman (2008) suggest two levels of analysis be incorporated into the model, that is, vertical and horizontal analysis. Vertical analysis captures the interactions and interdependencies between different levels of systems. It also answers the question as to how the activities or events that occur in one level subsequently affect other levels. The horizontal analysis permits the temporal interactions (Lyytinen and Newman, 2008) that capture the path dependencies of events and activities within the work and the building systems.

Following this notion of multi-level systems, in this current research we have introduced or erected another analytical layer called vendor level (refer to Figure 8). The introduction of the vendor level in the model was to reflect the actual activities and the critical events that occurred during development projects. This was made possible by the vast amount of data which was gathered from the vendor representatives. Therefore, rather than embedding the vendor specific activities within the building/project level, we have added another layer in order to gain a more in-depth understanding of the interaction between the vendor's activities with the other levels.
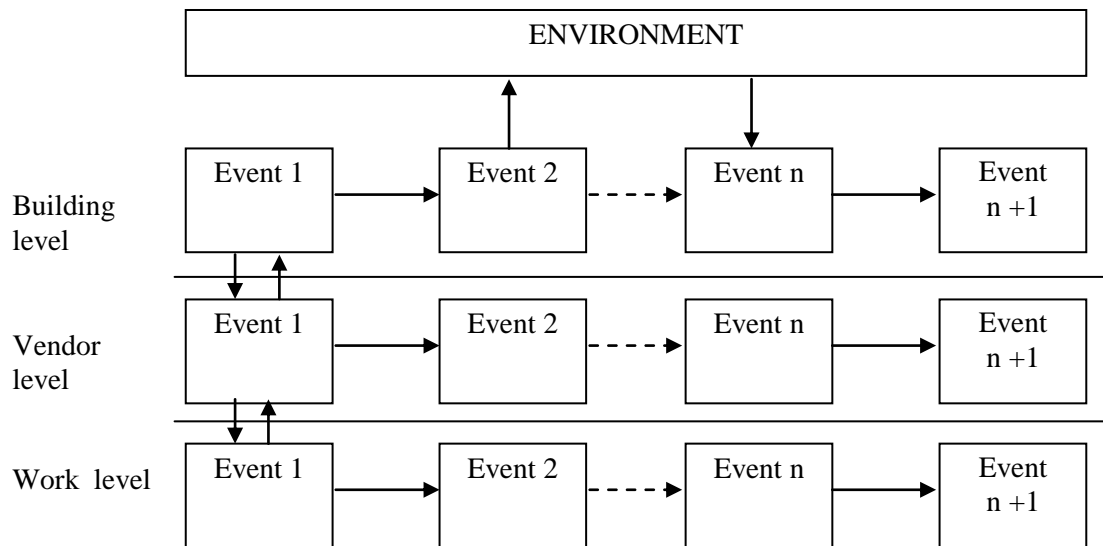
Figure 8: Multi-level IS change (extended from Lyytinen and Newman, 2008)

This model further elaborates the notion of punctuated equilibrium (Gersick, 1991) which was introduced in the social process model (Newman and Robey, 1992; Robey and Newman, 1996). The social process model only touches on the multi-level explanation of change, which is first-order level, that constitutes incremental adaptations, and second-order level, which involves short periods of revolutionary upheaval (Newman and Robey, 1992). In their elaboration, Lyytinen and Newman (2008) recognise the other three characteristics or components (Gersick, 1991) of a punctuated change and make reference to IS change phenomena. The first characteristic is the notion of deep structure. Within IS, change embeds a deep structure which according to Gersick (1991) is a network of fundamental, interdependent choices where units are organised and activities are maintained, which ensure the existence of the system (Gersick, 1991; Lyytinen and Newman, 2008). This is followed by the concept of equilibrium periods (Gersick, 1991) or periods of stability (Lyytinen and Newman, 2008). While deep structure refers to sets of choices, the equilibrium period is where these choices are chosen and maintained (Gersick, 1991). According to Tushman and Romanelli (1985), the equilibrium or stability is due to inertia derived from routinisation, cognition, motivation and obligation of organisational environment. Lyytinen and Newman (2008) however, argue that the system will not always be in equilibrium. It will drift and change throughout the period but still maintain its deep structure. In Gersick's (1991) opinion, systems make incremental adjustments without changing their deep structure. The final characteristic is the notion of system upheaval (Lyytinen and Newman, 2008) or revolutionary period (Gersick, 1991). According to

Gersick (1991) the revolutionary change dismantles the deep structure. In a revolutionary period, the change is not incremental but occurs through wholesale upheaval (Gersick, 1991). Lyytinen and Newman (2008) argue that nothing is revolutionary or radically new about the punctuation, but that it is a brief period of sudden change or upheaval. These changes will cause the system to erect a new deep structure which combines the old and new sets of choices (Gersick, 1991; Lyytinen and Newman, 2008). There are instances where the system upheaval fails and the system returns to its original deep structure or it becomes continuously disarrayed (Lyytinen and Newman, 2008). The new deep structure might not be working as well as previously and leaving the system worst off (Gersick, 1991). Figure 9 provides a sample depiction of gap creation and gap resolution which was resulted from critical events / punctuation and interventions / revolutionary change.
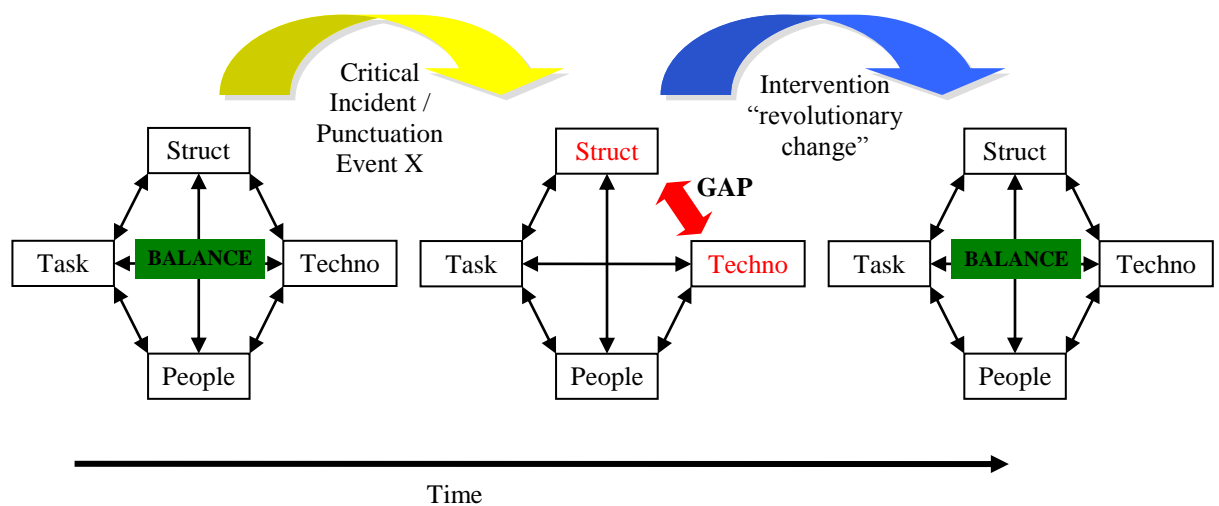
Figure 9: Event model of socio-technical change (adapted from Lyytinen and Newman, 2008)

The adaptation of process theory (Mohr, 1982; Pentland, 1999; Van de Ven et al., 1999) comes in two parts. The first part encapsulates the notion of process as a sequence of events (Mohr, 1982). It provides an understanding of how history affects the events and how events generate outcomes. This was earlier narrated through the concept of episodes and encounters. The other part of process theory is the notion of narrative explanation (Pentland, 1999) which is given less consideration in the development of the PSIC model (Lyytinen and Newman, 2008). Narrative explanation was used as a tool to contextualise the environment layer into the different layers of the PSIC model

(Lyytinen and Newman, 2008) by analysing the sequence of events throughout the change process.

Although process research was mentioned to be labour-intensive, involving collecting vast amount of data (Van de Ven and Poole, 2005), the beauty of the PSIC model lies in its capability to hang this vast data set, providing a clear graphical depiction of the project trajectory (Lyytinen and Newman, 2008). This is followed by the explanation of the processes through narratives or storytelling, which is considered as a difficult undertaking due to the depth and complexity of the process data (Van de Ven and Poole, 2005). Pentland (1999) has provided features to be included in the process narrative or stories which include identifying the chronology of events, focal actor or actors that established events, narrative voice, frame of reference and substance and context of the stories. Further to this critical explanation of the relationships and patterns of events can be made through different theoretical lenses. Bob-Jones et al. (2008) applied actor-network theory to explain the relationship between the different network of stakeholders in an IS development project. Following the PSIC model, Lyytinen et al. (2009) applied institutional theory to make sense of how ERP systems are adopted and institutionalised.

3.4 Position of the PSIC model within a diverse research stream

While identifying the position of the PSIC model within different position of relating data in theory in process accounts, we need to introduce the notion of closed-boxing. Here, the closed-box constitutes multiple elements (actors) and their complex associations which are viewed as a unitary whole (Callon, 1986). Adapted from actor-network theory (where it is called black-boxing), the ideas of closed-boxing plays an important role in simplifying the complexity in IS phenomena (Tatnall, 2003). Within the process research context, closed-boxing is referred to the encapsulation of change process.

Complete Closed-boxing
e.g. Statistical Models

Middle-Range Closed-boxing
e.g. Process Theories

"No" Closed-boxing
e.g. ethnographies

Simple

complex

Factor Models

SEM

Social Process Model (N&R)

Punctuated Social-technical ISD Change (PSIC) Model (L&N)

"Raw" Data

Story Telling

Closed-boxing
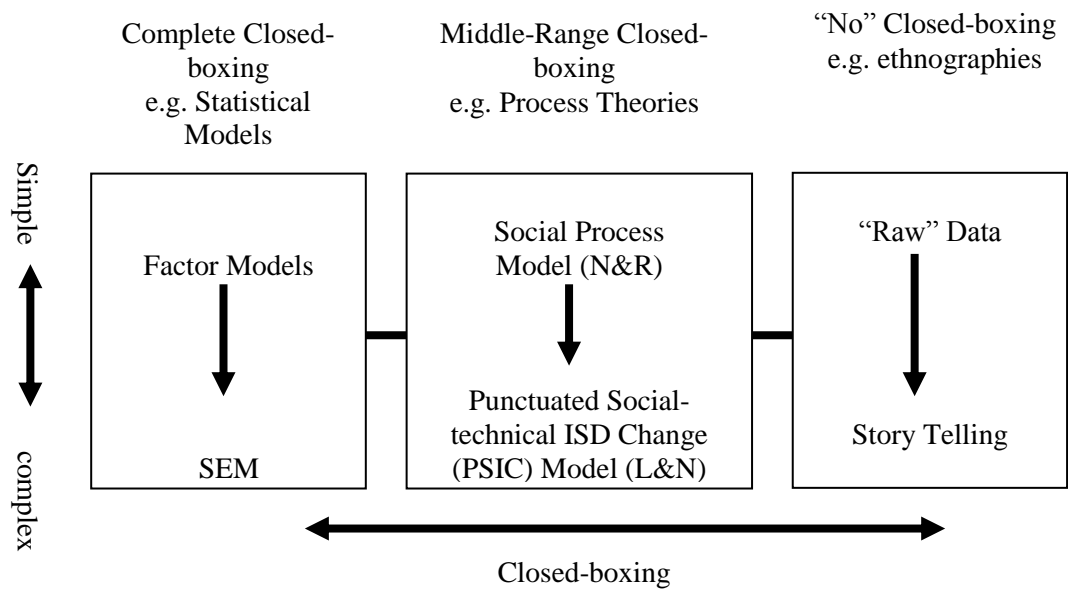
Figure 10: Position of the PSIC model within IS research streams (Lyytinen and Newman, 2008)

The above figure (Figure 10) depicts the magnitude of closing or opening of the "box" in IS process research. Variance-based studies deploying, e.g. Structural Equation Modelling (SEM), are an excellent example of a closed-box scenario. As discussed in prior sections, variance research takes into consideration only the degree of association between the precursors, i.e. independent variables with the outcomes, i.e. dependent variables. Therefore, it is observed that the processes within which the variables are tested are being ignored or closed-boxed. At the other end of the spectrum, ethnography offers a means to identify and understand peoples' way of life, viewing it from "native" eyes (Spradley, 1979). These understanding are manifested through the researcher's detailed narrative and storytelling. In this scenario, almost all processes or events are identified and explained. The stories produced are transparent enough for other people to understand the culture and the way of life.

The PSIC model or its simpler social process variants are neither completely closed nor completely opened as a box. Within such process studies, critical consideration is given towards how and why outcome is achieved by looking at the process as a series or sequence of events (Mohr, 1982; Markus and Robey, 1988). Therefore, it cannot be considered as closed-boxed like variance or factor models. However, it cannot be seen as an ethnographic research since not all events that occur are considered. Only critical

events are identified from the multiple source of evidence. Within this "middle range" closed-boxing, multiple events that occur are thus conflated to denote episodes (Newman and Robey, 1992) to account for the first-order (incremental) or the second-order (revolutionary upheaval or punctuated) change (Gersick, 1991; Lyytinen and Newman, 2008).

3.5 Summary

The two definitions of change epitomise the duality of research about organisational change generally, and IS specifically. While it is agreed that both variance and process theories are complementary their combination is thought not advisable (Mohr, 1982; Newman and Robey, 1992; Sabherwal and Robey, 1995). The evolution of the process model from its inception has gone through major developments. It has evolved from a simple social process account into a more complete account of socio-technical change. We argue that these developments are in-line with the ever changing complexity of IS research. The PSIC model rejects the closed-boxing of process, but limits its exploration to critical events only. The non-restrictive nature of the PSIC model ensures that details of the critical events are kept intact (Sabherwal and Robey, 1995). As a model is "a simplified picture of a part of a real world" (Lave and March, 1975), the articulation of the PSIC model attempts to collate vast process data sets into a structured trajectory of process events, thus improving our understanding of complex IS change. At the same time it depicts subjects' experience more effectively (Kling, 1987; Markus and Robey, 1988) and preserves details of shared events (Sabherwal and Robey, 1995). A further benefit of these process models is the capability to identify patterns in the project trajectory. As mentioned earlier, in relation to the multi-level IS change analysis, we have erected another layer of analysis called vendor-level to depict actual activities and critical events that occur during the development project. At the same time, a more systematic identification of critical events is needed to improve the methodological aspect of the PSIC model.

<div align="center">**CHAPTER FOUR**</div>

4   Research Method

4.1   Introduction

In general, the objective of this chapter is to provide an understanding to the reader regarding the method adopted in collecting and analysing the data. This chapter starts with the understanding and justification for the application of interpretive stance within qualitative methodology. This is followed by an in-depth discussion of the multiple-case study methods applied, with a brief introduction to respective case studies and the industry within which they are situated.

The data collection and mode of analysis section provides a detailed description of the steps taken in deriving the findings. In this research, we managed to source data from multiple venues, which include interviews, written documents and observation. The longitudinal nature of this research provides an in-depth understanding of the phenomena under study. In making sense of the data, a detailed coding process following grounded theory techniques was followed. To accommodate the vast data, a computer-assisted qualitative data analysis software (CAQDAS) was used to assist in the analysis. Outputs from the analytical process were sequenced, located in a process model and narrated. We employed these various methods of data collection and analysis to ensure their robustness and to improve the validity of the study.

4.2   Qualitative methodology and information system research

A qualitative research methodology is said to enable detailed observation of, and involvement of the researcher in the natural setting in which the study occurs (Kaplan and Duchon, 1988). Bearing in mind the research objective highlighted earlier, we consider the most suitable approach within the qualitative research setting to be the interpretive position. According to Walsham (1993), interpretive studies generally attempt to understand phenomena through the meaning that people assign to them. In this research, making sense of the interview data gathered is pertinent in understanding the emerging phenomena. Interpretive research in IS is aimed at producing an understanding of the context of the information system, and the process whereby the

information system influences and is influenced by the context (Walsham, 1993). As such, in understanding the relationship between IS and its context, all qualitative data gathered was codified and structured in such a manner that these relationships emerge without forcing the data into specified themes or categories. In this research, we attempt to adopt Strauss and Corbin (1990) grounded theory technique in analysing the data.

In line with the interpretive stance adopted in this research, we adopt a hermeneutic approach to understanding the textual data gathered. According to Myers (1997), hermeneutics suggests a way of understanding textual data. He further elaborates that hermeneutics is primarily concerned with the meaning of a text or text analogue (Myers, 1997). The basic question in hermeneutics is: what is the meaning of this text? (Radnitzky, 1970 cited in Myers, 1997).

Taylor says that:

"Interpretation, in the sense of relevance to hermeneutics, is an attempt to make clear, to make sense of an object of study. This object must, therefore, be a text, or a text-analogue, which in some way is confused, incomplete, cloudy, seemingly contradictory – in one way or another, unclear. The interpretation aims to bring to light an underlying coherence or sense" (Taylor, 1976 cited in Myers, 1997).

Relevant to our research, the aim of hermeneutical analysis becomes one of trying to make sense of the whole, and the relationship between people, the organisation, and information technology (Myers, 1997), employing the hermeneutic cycle (Boland et al. 2010)

4.3 Qualitative research methods and information systems research

There are various qualitative research methods that can be applied in order to capture the desired data. According to Myers (1997), a research method is a strategy of inquiry which moves from the underlying philosophical assumptions to research design and data collection. Among the available method includes action research, case study research, ethnography and grounded theory. Each of these methods provides different

ways of collecting the data and specific research methods also imply different skills, assumptions and research practices (Myers, 1997).

Qualitative research methods are designed to help researchers understand people and the social and cultural contexts within which they live. Kaplan and Maxwell (Kaplan and Maxwell, 1994) argue that the goal of understanding a phenomenon from the point of view of the participants and its particular social and institutional context is largely lost when textual data is quantified (Myers, 1997).

4.4   Case study research methods

This research employs interpretive multiple-case study research. Case study is an ideal methodology when a holistic, in-depth investigation is needed (Feagin et al., 1991 cited in Myers, 1997). Yin (2002) defines the scope of a case study as follows:

"A case study is an empirical inquiry that investigates a contemporary phenomenon within its real-life context, especially when the boundaries between phenomenon and context are not clearly evident" (Yin, 2002).

In natural settings, researchers are able to explain more clearly the causal links through real-life interventions, describe the real-life context in which an intervention occurred and explore those situations in which the intervention being evaluated has no clear, single set of outcomes (Yin, 1994). The purpose of a case study is to illuminate a decision or a set of decisions, which conform to the direction of the said research. According to Stake (1995), case studies constitute an in-depth exploration of a programme, an event, an activity, a process, or one or more individuals. The case(s) are bounded by time and activity, and researchers collect detailed information using a variety of data collection procedures over a sustained period of time (Stake, 1995). A case study can be used in both qualitative and quantitative research methodology: it is the method of collecting the data from the case that creates the differences. Stake (2000), in his previous research, argues that the case study is not a methodological choice but a choice of what is to be studied and further explains that, as a form of research, the case study is defined by individual cases, not by the method of inquiry used (Stake, 2000).

There is a strong case study tradition in the academic field of IS management. Case study research is the most common qualitative method used in information systems (Orlikowski and Baroudi, 1990). According to Myers (1997), the case study research method is particularly well-suited to IS research, since the object of our discipline is the study of information systems in organisations, and "interest has shifted to organisational rather than technical issues" (Benbasat et al., 1987). Marcus and Robey (1988) argue that outcomes for ERP system implementation are not only related to technical validity but more importantly to the behavioural and organisation validity. Robey and Newman (1996) further develop the social process model of user analyst relationship and its effects on project success.

The case study method is now accepted as a valid research strategy within the IS research community (Klein and Myers, 1999). The natural setting gives case researchers the opportunity to conduct situational and in-depth studies of complex phenomena that are not always possible because of the restrictions on studies conducted under laboratory conditions.

4.4.1 Enterprise systems projects in a university as a case unit

Universities were chosen for the case study for a number of reasons: universities are substantial and experienced users of IT and a significant number have emerged as purchasers of ERP systems (Oliver and Romm, 2002). Rands (1992) argued that the requirements for software acquisition vary considerably across different industries and universities are a specific vertical market targeted by ERP vendors who conveniently identify stability on the supply side as well as on the demand side.

Studies on the implications of ERP systems for universities have been carried out accordingly (Scott and Wagner, 2003; Pollock and Cornford, 2004). Heiskanen et al. (2000) conducted a detailed study of the use of software packages but conclude that such industry standard systems are inappropriate in such a setting as universities constitute a unique type of organisation. Pollock and Cornford (2004) suggest that the

significance of these systems would be better appreciated and understood if we were to resist viewing universities (or, for that matter, computer systems) as stable entities.

The research ideas developed and discussed have explicitly defined the use of an interpretive research construct. Interpretive studies assume that people create and associate their own subjective and inter-subjective meanings as they interact with the world around them. Interpretive researchers thus attempts to understand phenomena through accessing the meanings participants assign to these phenomena (Orlikowski and Baroudi, 1991). This research attempts to understand the interaction between actors within organisations in enterprise system implementation phenomena. Identification of critical events and the radical interventions during system implementation will be purely based on subjective interpretation of the responses from the interviews.

According to Walsham (1993), interpretive methods of research start from the position that our knowledge of reality, including the domain of human action, is a social construct of human actors. This applies equally to researchers. Thus there is no objective reality which can be discovered by researchers and replicated by others, in contrast to the assumptions of the positivist stance. It is known that the use of interpretive research methods lacks replicability and generalisability. The multiple-case study approach used in this research assists in the process of interpreting the social phenomena during the information systems development process. The determination of a specific critical event and the occurrences of punctuation to close the gap that is created by the change process can be generalised over the IS development and implementation process. It is due to the fact that similar events and change strategy occur over time within the same case or in different cases. Thus, it enhances the generalisability of the research. The use of a longitudinal case study method provides rich data sets for the elaboration of critical socio-technical phenomena. In addition, the conduct of a longitudinal study in information system research improves the exploration of the socio-technical process.

4.4.2 Universities as a context of research

Running a university today involves much more than simply having excellent teaching and learning resources. Universities are becoming more competitive in both academic

and administrative functions. Governments in some countries today are more relaxed in handling their educational responsibilities. Governments have empowered universities with more authority and independence on how they manage themselves, while at the same time reducing financial support. As a result, universities today are far more business-oriented than businesses themselves. They are using their available resources such as their academic resources and facilities to help to expand and diversify their revenue stream. Academics are required to invest a percentage of their time in consultancy, and university facilities such as lecture halls and sport centres are now marketed for rental to private organisations as well as the general public.

Therefore, as a result of scarce resources and stiff competition, universities are currently trying to make their way down this rocky road. One of the strategic plans established by universities involves the development of integrated enterprise systems. Results from surveys conducted indicate that in most cases the rationale behind ERP systems implementations are primarily business related. From improving service to customers to enhancing accountability, it has been demonstrated by universities that they are keen to improve their market share in the educational industry (King et al., 2002). A number of research studies have shown that ERP systems implementations in organisations have to some degree caused a shift in the manner in which business processes are carried out.

Due to its unique and prominent characteristics, the development and implementation of an enterprise system has also raised several management issues. According to Christopher Koch, what differentiates enterprise resource planning systems from other related information systems is the word "enterprise" (Koch, 2002). The word 'enterprise' entails that ERP systems provide an ultimate system that merges and integrates business functions and processes into a seamless information system architecture. Scapens and Jazayeri (2003) have, based on their longitudinal empirical research, identified four main characteristics of an ERP system, which include integration, standardisation, routinisation and centralisation. These characteristics have influenced management accounting in different ways.

The issue of integration within organisations has been developed throughout the development and implementation stages. The need to create an integrated business environment demands a lot of hard work and dedicated commitment. These factors must be communicated throughout organisational hierarchies. A break in communication within one of the organisational levels can create resistance and impede the overall development and implementation phases. Surveys conducted by previous research indicate that interdepartmental communication and co-operation during the implementation phases of an ERP system is crucial to ensure implementation success (Somers and Nelson, 2001).

Over time, the use of an integrated system not only mitigates the redundancy of work but also enhances the multitasking capabilities of employees. The institutionalisation of rules and routines will further enhance overall organisational efficiency and thus provide justification of the return on investment of enterprise system implementations.

4.4.3   Universities in a Malaysian context

Malaysia, being one of the developing countries in the world, is trying very hard to put itself on the map of the world economy and competing with other developing countries is not an easy task. In addition, creating a competitive edge over the other developing countries requires a strong base in all sectors of the economy.

The Malaysian government is currently focusing on its education sectors as the main hub of national development. Therefore, they established the National Higher Education Plan, which states the importance of governance in higher education institutions. Apart from the private educational institutions, governing public institutions is one of the most challenging tasks faced by the government. This challenging task not only covers the teaching and learning aspect of the institution but also the overall management of its resources. (Source: National Higher Education Action Plan 2007-2010). The higher education action plan was established envisioning the strategic plan laid out in the Vision 2020 and the Ninth Malaysian Plan. Both of these plans emphasise the importance of human capital development through education. As a result of this effort, Malaysia is gaining worldwide recognition as a preferred destination for tertiary education.

Currently ranked 11th worldwide by UNESCO for its appeal to students, the number of international students at various public and private institutions of higher learning has increased significantly from below 2,000 in 1995 to 75,000 in 2009. Of this, about a third is from China and Indonesia, while the rest mainly from MENA countries (Middle East and North Africa) and Western Asia.

(Extracted from Malaysia's Higher Education Department's official website)

Malaysia has twenty public universities, comprising of four research universities, four comprehensive universities and twelve focused universities. These universities were established under the Universities and University colleges Act, 1971 and are funded by the government of Malaysia. Malaysia also has twenty five private universities, which were established under the Private Higher Educational Institutions Act, 1996. (Ministry of Higher Education of Malaysia, 2011)

4.4.4   Research sites

4.4.4.1   Case 1

The university was previously a branch campus of another major university. Operating as a branch campus, the finance operation only covers the administrative tasks, and all other decision making and payments were made from the headquarters. It was in 2001 where the Malaysian government decided to establish a technical university in the state and it was announced as a university in February 2002. During their first intake in June 2002, 309 students were registered, which was supported by 77 academics in three faculties and 57 non-academics. Being a technical university, the pioneer faculties include Computer Science and Software Engineering, Electric and Electronic Engineering and Chemical and Natural Resources Engineering. This was to support the government decision to improve the level of technical universities in Malaysia. The university's vision is to be a world class competency-based technical university.

During the conversion/switch from the branch campus, the student and staff were given the opportunity either to return to their headquarters or join the new university as the pioneer staff. In joining the new university, the members of staff were in for a surprise,

with a different management style of the vice chancellor (VC). With the VC work motto as "more action, less talk", it was a total change from their previous management. The initiation of the system-based management created resistance from the staff, especially the old school who were more comfortable with the manual systems.
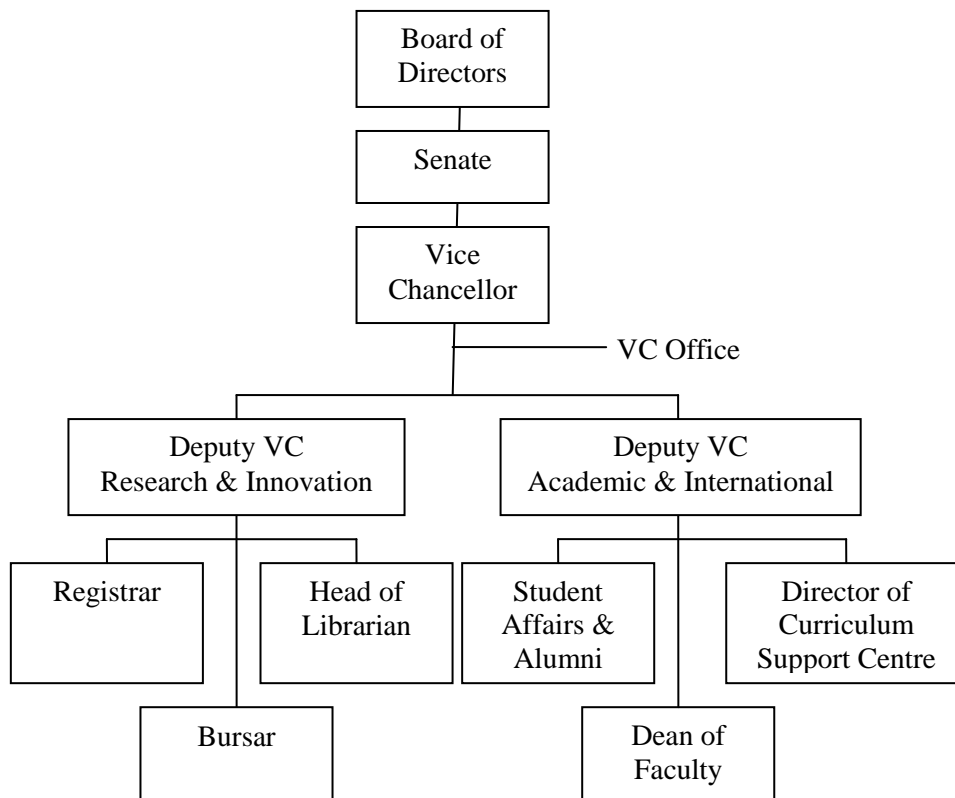
Figure 11: Organizational Chart – Case 1 (Source: Official Website Case 1)

Figure 11 depicts the organizational structure of Case 1 which is relatively simple with the Vice Chancellor reporting to the Senate and the Board of Directors. The operational structure is divided to two main tasks: research and innovation and academic and international. The research and innovation, headed by the deputy VC, is responsible for the human resource, finance and library services while the deputy VC for academic and international is accountable for the student affairs, the faculty and asset management.

Case 1 project started off with the VC's intention to establish a future organisation through the adoption of an integrated management system. To meet this vision, he

appointed a new head of ICT, who has vast experience in developing such systems. This new head of ICT brought with her a concept of e-management to improve the success of the project. Within this concept embeds the rapid application development (RAD) method where continuous development, deployment and modification would run in parallel during the project. To ensure this it requires knowledgeable users and vendors.

The vendor was appointed from a rigorous tendering process which went through evaluation and negotiation. The vendor came in with an integrated base system and a group of developers. The student system was completed and deployed after only six development months, although some issues emerged at the finance modules. The joint development approach adopted enabled the vendor to transfer their skills and knowledge to a group of internal developers who were expected to continue the development after the vendor's contract ended.

It was after only three years that the VC was replaced. The new VC had a different vision that advocated a stress-free work life. This vision in another word rejected the use of systems. The head of ICT was also replaced. The new head of ICT has exercised a department restructuring and re-allocated the developers, who were involved in the joint development, to other units and replaced them with new developers. During the three years of the new VC, the integrated system which was previously at ninety percent completion was either abandoned or low in use. For the finance system, modification that was conducted by the new developers has caused system instability. As a result, major issues were highlighted during the audit exercise. The auditor even suggested changing to a new finance system.

Again after three years in control, the VC was replaced with a new performance oriented person who envisaged the use of systems as a tool for performance improvement. There was at the same time a new head of finance appointed. He saw the existing finance system as a challenge that needed to be enhanced. He thus initiated a system-enhancement project which appointed the original developer as the vendor. The vendor was shocked to see the state of the existing system structure, which was intolerable. The review and testing of the existing system took more time than expected.

This resulted in a project delay, but an extension was granted for two months to ensure smooth completion. There was a disruption during the system deployment. The deployment was handled by the ICT department, who had a lack of knowledge on the system structure, but it was solved through an instruction list provided by the vendor. The system was successfully deployed and used when the VC decided to re-structure the finance department. New users who were not involved during the project will be using the enhanced system. This has resulted in a request for system modification to follow their ways of work but the head of finance has restricted the change to allow only for fundamental system changes. The new enhanced system was continuously used with a controlled system change environment. In summary, throughout the eight years in operation, the university has gone through three different eras of stewardship. Each of these eras was different; especially in terms of management styles that has had a direct impact on the system.

4.4.4.2   Case 2

The second case study is the oldest among the three case studies. It was the aspiration of the government to have only graduate teachers spearheading both the primary and secondary schools in Malaysia. Thus, in order to realise such a noble dream, the government granted the university status to Case 2 in 1997. Currently, with nine faculties, the university accommodates approximately 11,870 and 1,800 undergraduate and postgraduate students respectively, and is supported by 1,667 staff, with 719 and 948 academics and non-academics respectively.

Figure 12 below depicts the operationalisation of Case 2. Similar to Case 1, the Board of Directors is spearheading the organizational composition. The VC has direct control over the operations of the university as a whole through this single layer organizational structure.
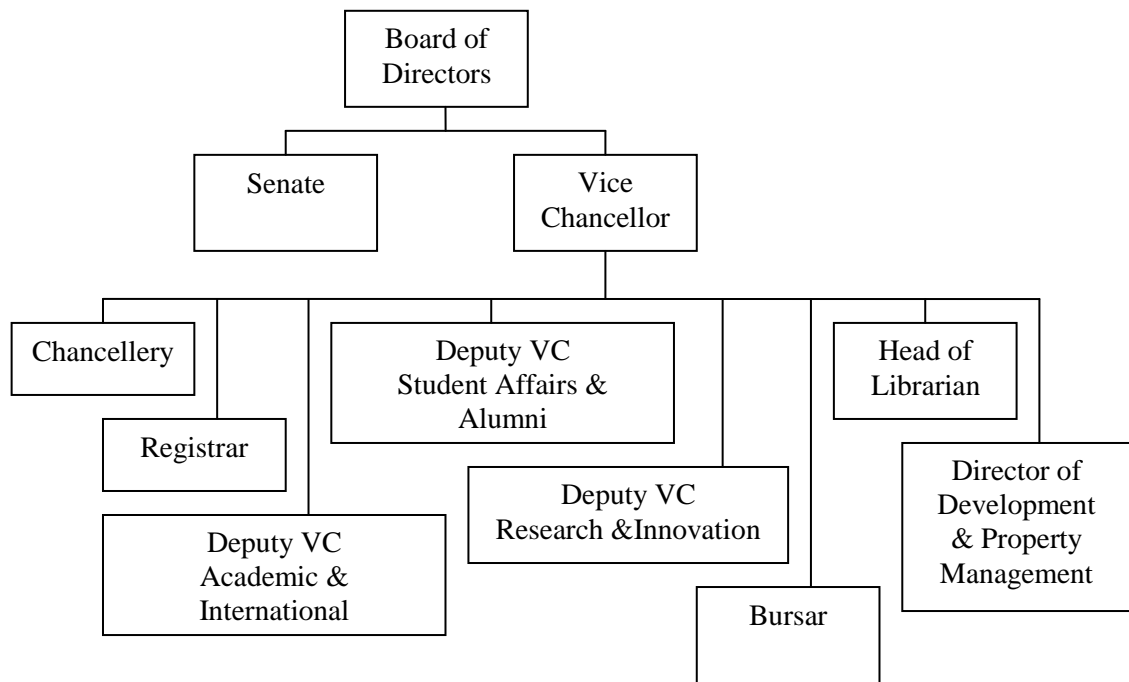
Figure 12: Organization chart – Case 2 (Source: Official Website Case 2)

In Case 2, the need for a new integrated system was caused by their island of systems which created work redundancy, information mismatch and data inconsistency. With the ever-increasing number of students and supporting staff, the need for a more integrated information system was crucial to ensure efficient utilisation of resources. The initiation of the new integrated system was made in 2003, due to the increase demand for a new, more stable system to replace the legacy system. The tender process itself took at least one year to settle from request for proposal (issue of tender documents) to evaluation, negotiation and selection of contractor. The development process was considered smooth-flowing, since only after a year the new integrated financial system was deployed for all the main modules. The vendor was using the base system as a prototype and mixed it together with the existing functionalities already embedded in the legacy system as the development strategy. The only development hiccup that occurred was during the data migration process, where the vendor faced problems with the data structure for the legacy data, which was different from the new data structure. Extensive amount of data cleansing was carried out that caused the project to miss its target by two months. This dampened the users' intention to carry out a parallel deployment strategy and conduct cut-over strategy. The new system flowed

seamlessly during the year end accounts closing. All financial reports were generated from the new system without any difficulty.

The vendor was in the process of completing the supporting modules of the finance system when a major crisis emerged between the vendor and the main contractor. The main contractor failed to make payments to the vendor for the work completed. After failing several attempts to recover the amount, the vendor terminated their contract with the main contractor. Following this, the client had to issue a new tender to complete the other 20 percent of the system which was mainly supporting modules. A new contractor was appointed but their lack of commitment and knowledge of the project and the system structure cost them the contract. They failed to complete any modules. During this time the IT developers gained their knowledge with the new system structure and managed to complete parts of the incomplete system, which are mostly the less-critical modules. With only the critical modules left to be developed, the client has issued an invitation for project completion to the previous vendor. Without much difficulty, the vendor managed to complete the system within four months and signed a one-year maintenance contract with the client.

4.4.4.3 Case 3

This university was established in 2002. It is a combination of ten institutes, which were previously managed individually under a government agency. In general, it was founded on seven of the agency's institutions; each came with a long history of experience in the hands-on technical education in various fields of engineering. These institutes were merged to form the university's strategic base and identified as branch campuses. Later, five more new branch campuses were established to fulfil the current and future demand of industries. Four of the seven initial institutes resulted from the government-to-government effort between Malaysia and its synergistic links with other countries. Therefore, in total, there were ten branch campuses which housed twelve institutes or faculties in the university. The most distinctive characteristic of the university is the concept of 'one institute, one specialisation'. Strategically located all over Malaysia, the university branch campuses offered various programmes within the following areas of specialisation: from electrical and electronics to medical science technology.

The diverse operational processes among these institutes initiated the call for an integrated management system (IMS) to support their daily operations. With 13,000 students and supported by 2,000 de-centralised staff members, having a single integrated database was supposed to ensure the efficient management of resources. To date, the university has produced 10,752 graduates who have successfully established their careers in both local and international job markets. And currently there are a total of 16,186 students throughout its establishment.

As mentioned earlier, the need for an integrated system was to streamline the diverse business processes of the institutes. The project initiation started with the users visiting other universities implementing an integrated system, and also receiving presentations from software developers promoting their software. It was followed by the tender process that entailed evaluation and negotiation processes with the shortlisted companies.

Figure 13 depicts Case 3's organizational structure which in general is similar to Case 1 and Case 2 in relation to the functions. However, the most obvious difference is the section on branch campuses and institutes. As mentioned earlier, Case 3 was established from the amalgamation of 12 institutes which were previously managed separately. Due to this arrangement there was a need to streamline their business processes through the implementation of an integrated system for efficient and effective organizational management. According to the vendor, this was the uniqueness of the project. The success of this project would ensure completeness of functionalities and with multiple campus capabilities. However, this uniqueness has taken its toll during the project. They have failed to streamline and integrate the business process of the 12 institutes before starting with the development. This resulted in unstable systems.
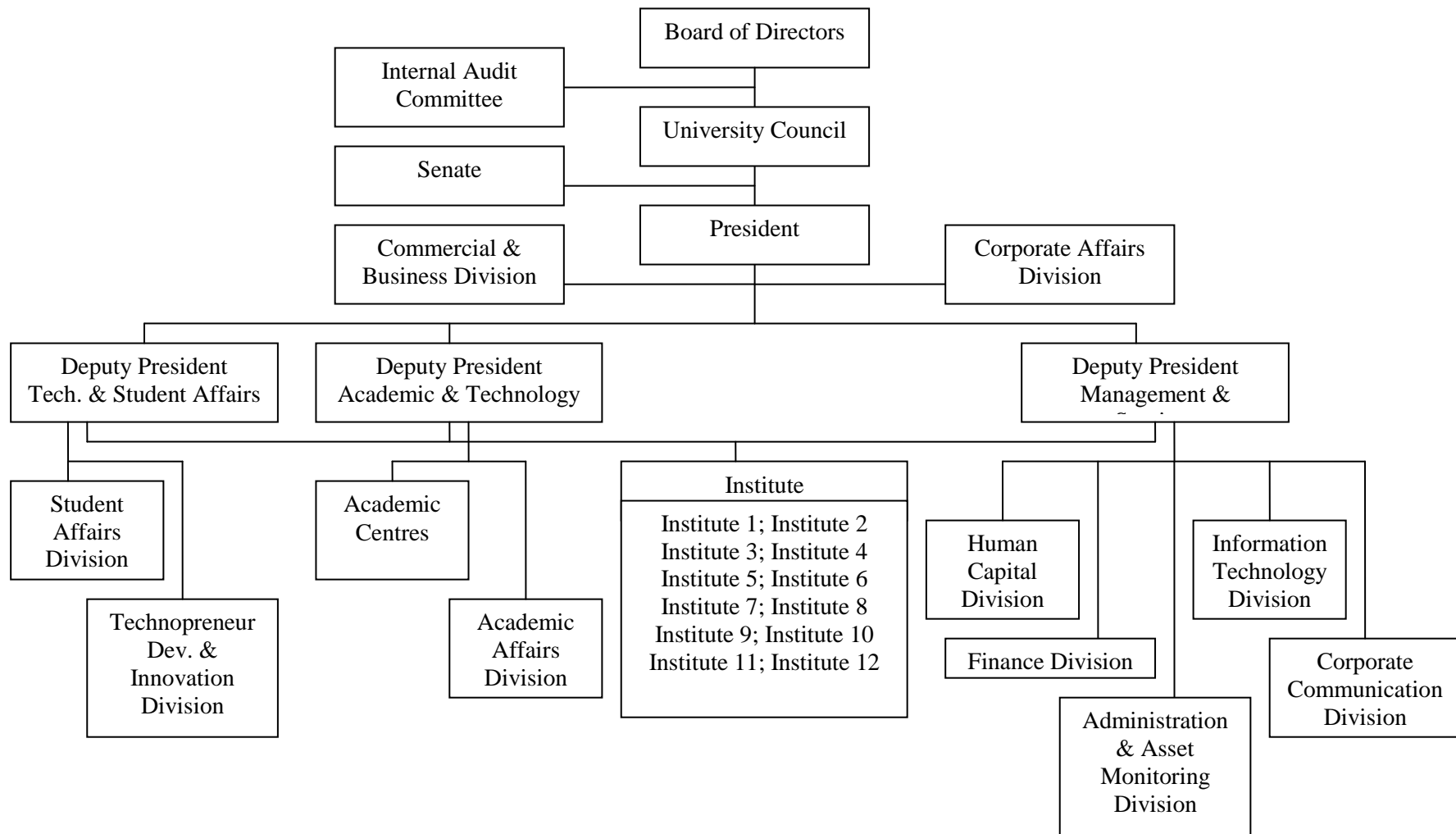
Figure 13: Organization Chart – Case 3 (Source: Official Website Case 3)

The project was managed by the project manager, who was keen on adopting a traditional system development approach. This approach was generally accepted by other project team members, including the vendor, who came into the project with a base system from their previous client (Case 2). Confident of their base system, they expected only to "plug and play" the base system into the organisation, and allowed only two years to complete the project. Following the traditional approach, the vendor started the system development with the heart of finance system, which was a general ledger module. The vendor was put in charge of multiple tasks which needed to be completed in parallel that is gathering requirement specifications and also business process re-engineering (BPR). This was due to the fact that the BPR team who were originally appointed for the project failed to commit themselves at the last minute. After several months the project manager was fired from the project due to his failure to commit to the project full-time.

A new project manager was appointed to the project. In taking office, she radically changed the planning for the overall project – from a traditional development approach to a rapid development approach. This rapid development approach (RAD) followed her e-management concept, which had proven a success (Case 1) in ensuring project on-time development. The most prominent change was the plan to deploy student-related modules within six months – in time for the new student intake. In relation to the finance system, the student-related modules covered the accounts receivable modules, which includes student invoicing and receipting. She also suggested that the six-month deployment would include only pilot sites which covered three campuses only. This abrupt change caused issues to the vendor development strategy as they were still in the midst of streamlining the account codes. As a result, the vendor had to re-align their activities to follow the project manager's plans. Following RAD, the gathering of requirement and development were conducted in parallel. Again, the vendor was faced with challenges when the users' failed to provide a sound business process related to the student financial modules. Each of the campuses had different work processes. At the same time, the users also rejected the prototype system introduced by the vendor. As a result, the vendor had to develop the system from scratch based on the users' patchy requirement. This system instability became apparent during the user acceptance test (UAT) when the system hung during the testing process. Thus the project manager

decided that it was just a system-walk-through test and not user-acceptance test. Another issue emerged during the project when the data migration team came in to migrate the legacy system data. With their lack of knowledge of the system data structure, their data migration attempts failed and they left the project. The vendor then successfully migrated all the data for the pilot sites deployment. In July 2007, the student system for the pilot sites was deployed successfully. Following the RAD method, the system deployment enabled the user to understand the system and put in requests for changes to improve the functionalities. From that point forward the vendors were burdened with the multiple tasks of developing new modules and modifying existing modules. It was after the pilot site deployment that the project manager left the project. She was frustrated by the project team members, who were the steering committee, the vendor and the IT department, who failed to follow her e-management concept.

A new project manager was then employed, but he was not able to control the project team, and was thus fired. It was later when the steering committee decided to appoint the IT department as the project manager and their first step was to deploy the student system to all other campuses. During this time, the student financial system had gone through changes and modifications were requested by the users. It has in a way stabilised the system functionalities. The UAT was carried out with all the campuses representatives where they found a major functionality was missing from the system, which was overlooked by the pilot sites. The users then requested the vendor to make modifications to the system to incorporate the missing functionality. At the same time the vendor had to migrate the data for the other campuses. Another problem emerged during the data migration process: the data from the campuses was not controlled. The first issue was that different campuses provided the same data, for example invoice number and the second issue was data in a different date format. The vendor who was not informed of this issue migrated the data as it was without cleansing it. The result was chaos. Data verification went haywire. The only way to solve this matter was through data reconciliation, which took more of the vendor's time. Even when the vendor appointed a business analyst to support the development for other modules, it failed due to the users concentrating on the deployed system. At this time, the vendor was bogged down with vast modifications and data reconciliations.

The project period reached two years when the vendor decided to leave the project. For the finance system, it is currently only at thirty two percent completion. The vendor was reluctant to continue with the project due to the fact that the client was inconsiderate towards them. According to the vendor, it was a "bleeding" or a "financially loss" project. The steering committee decided to continue using the existing system with the IT department being in charge of supporting and maintaining the system. The IT department faced a problem when only one of their developers had experience in system development. As a result they invited the vendor to provide the IT developers with training to enable them to support the system usage. The IT department was facing challenges from the users whose kept requesting system modifications and failed to provide sound requirements. The users were very satisfied with the integrated functionalities of the system, and that attracted them to continue using the system.

While the main reason for choosing the universities was easy access to the cases, at the same time they complement the need for studying a phenomenon in action rather than in situ. The researcher has taken full advantage of the access given to conduct the study.

4.5 Qualitative data source – Empirical evidence

Whether the study is experimental or quasi-experimental, the data collection and analysis methods are known to hide some details (Stake, 1995). Case studies, though, are designed to bring out the details from the viewpoint of the participants, using multiple sources of data (Tellis, 1997). Data sources available include interviews and questionnaires, observation, documents and texts and researcher's impressions and reactions (Myers, 1997). For the purpose of this research, interviews, observations and collection of written data sources were found to be the most appropriate ways of gathering the source of evidence and this also enabled cross validation of the evidence.

This section will explain in detail the method of collecting the data for the research. As mentioned earlier, this research employs three case studies, involving universities which at that particular time were in the process of developing an enterprise system for its

finance division. The name of the universities (including the names of staff members) has been disguised to preserve their confidentiality.

Interviews entail types of questioning that range from using open-ended questions to closed questions. In this research, a semi-structured interview approach was employed. A semi-structured method of interview was chosen mainly due to its flexibility in both the questioning and answering processes. This section will detail the interview process from identifying respondent to actual interview process.

4.5.1 The interview subject

The initial selection of interviewees was based on their relevant position during the development process and following Latour (1987), the "follow the actor" approach was applied, where we follow the focal actors to observe their interactions with other stakeholders. At the same time, the interviewee also provided names of those involved in the project or who had better ideas on the phenomena under study – in this case is the snowballing technique. As mentioned earlier, the research attempts to analyse the socio-technical relationship during the process of financial system development. As such, the interviews were conducted with as many stakeholders as possible in order to gain an in-depth understanding of the process. In general, the interviewees cover the following stakeholders. Including respondents at various levels within the universities' structure enhanced the validity of the research.

Stakeholder	Description
a) Bursar/Head of Finance/Director of Finance	These high level or elite interviews are required in order to get a first-hand opinion and an overview on the vision of the system implementation.
b) Finance users	These lower level interviewees are crucial in order to get a more in-depth understanding of the actual system implementation and deployment. The ability for them to identify critical events is crucial for this type of case study research.
c) Information and Communication Technology (ICT) Head / Chief Information Officer (CIO)	Similar to the above, these interviews are vital in describing the overall system implementation initiatives.
d) System developer/System Analyst	More robust empirical evidence is obtained from these respondents. These are added advantage in looking at issues in a different light.

e) Vendor team leader	Another perspective of the IS development raised by the vendor team. This provides a juxtaposition of issues.
f) Vendor developer	A more in-depth understanding of the development process gathered from the developer themselves. It cover the issues in dealing with the users and also the other vendor team
g) Project manager	This respondent provides a different view of the IS development. It provides a more in-depth understanding on the overall development strategy and approaches.

Table 8: Stakeholder identification

4.5.2 The interview process

4.5.2.1 Gaining Access

Arguably the most challenging aspect of any interview initiative was to secure access to a suitable respondent. For the purpose of this research, the researcher utilised his personal networks to obtain access to the case studies. For Case 1, the researcher was the ex-business consultant for the development project and later appointed as head of finance. The researcher acted as the head of finance for Case 1 and was involved during the system initiation and presentation in Case 2. In Case 3, the researcher was previously the ex-business consultant for the finance system development.

4.5.2.2 Interview Guides

The interview guide was prepared with consultation and feedback from the supervisor. In general, the content of the interview guide was acquiring general information regarding the interviewee and continued with the background and overview of the project. A copy of the interview guide (refer to Appendix 1) was e-mailed to each interviewee one week prior to the interview date and this interview guide was used only during the first meeting with the interviewees. At the subsequent meetings, no interview guides were prepared. Questions were largely based on the current state of the project.

4.5.2.3 Actual interview process/guidelines

The overall interview process was carried out cautiously. The interviews were conducted by replicating the process of a drama. This face-to-face interaction theory was developed by Erving Goffman who used it to interpret any social exchange (Myers and Newman, 2007). It is explained that social interactions were seen as a drama where there are actors (individuals and groups) who perform on a stage (a variety of settings and social situations) using a script (norms, rituals, expectations of how one should behave) (Myers and Newman, 2007). According to Manning (1996) cited in Myers and

Newman (2007), during the performance, the actor's appearance, manner and props are very important. This model was applied during the actual interviews. Focus was made on entry and exit, which also included impression management. Following this model, interview scripts only provide general questions. The challenges faced were to simultaneously listen to the responses, taking notes and providing feedback to the respondent. Further questions were asked based on their responses.

During the discussion with my supervisor on the interview guides, he mentioned that I had to properly understand the context of the interviewee's responses in order for me to probe further or drill down, if possible, to a critical event. In the critical incident technique, it is called controlling the interview through the use of generic probes (Chell, 2004). Therefore, in a semi structured interview, it is important not to over-prepare the interview script (Myers and Newman, 2007), in order for the interview to be more flexible and exploratory. Following the semi-structured interview method, an interview schedule was prepared, which usually consisted of a general question of what the interviewer wanted to gather from the respondent (Bryman and Bell, 2003). Following the response from the interviewee, the interviewer could ask further questions (Bryman and Bell, 2003) or further probe the interviewee to get more in-depth understanding of the issues being brought up. As a result of this drilling or probing technique, I only asked three of the eight questions that I had placed in the interview guide.

According to Horton et al. (Horton et al., 2004), applying a semi-structured interview method also provided the interviewee with more freedom to deliberate on their responses. In this study, the interviews conducted focused on the process of developing the financial systems in the three case studies. The aim of these interviews was to get in-depth information on emerging issues prior to, during and after the system development. During the interview process, the interviewees were required to describe retrospectively specific incidents which were deemed critical to ensure validity of the input.

4.5.3 Longitudinal case study method

In total, the timeline during which the research was conducted covered approximately two years, from July 2008 to April 2010, and was spread over four fieldwork visits. The

gap between each fieldwork visit was six months, with a maximum of a two-week visit each time. As mentioned in the interview subject and related to the table below (Table 9), the number of users in the table includes the head of finance and other finance users. In total, sixty interviews were conducted with each interview lasting between forty-five minutes to an hour. Please refer to Appendix 2 for detailed interview respondents by dates.

	Phase 1	Phase 2	Phase 3	Phase 4	Total
Date	07/2008	02/2009	09/2009	04/2010	
User Case 1	4	2	5	5	16
User Case 2	3	3	0	0	6
User Case 3	3	5	3	3	14
Vendor	1	11	2	3	17
Project Manager	0	2	0	1	3
ITD Case 1	1	2	0	0	3
ITD Case 2	1	0	0	0	1
ITD Case 3	0	0	0	0	0
Total	13	25	10	12	60

Table 9: Number of interview respondents, by case, by phase and by stakeholder

4.5.3.1 Phase 1 (the pilot study)

It is a requirement of the research training programme to complete a pilot study. The initial selection for the case studies was to include all universities that currently implement an enterprise system which refers to an integrated system for finance. Following some brief research on the matter, it was observed that four universities in the vicinity of the researcher's hometown were either currently implementing, or in the process of developing, such systems.

An e-mail was sent to the head of finance of four universities asking for permission to gain access to the university. Direct contact with the head of finance was established mainly due to the researcher's prior engagement with the university. Access was granted and interviews for the pilot study were conducted with the four universities. The mode of questioning during the interview was mostly exploratory and retrospective. Only general questions were asked, with the researcher probing interesting issues

further to gather a more in-depth understanding. The interviewees' responses usually required further elaboration with respect to particular historical events deemed pertinent for the research.

Initial analysis of the pilot data shows that three of the universities were currently developing or implementing the same integrated finance systems by the same vendor. In view of this interesting finding, it was decided that these three universities would be chosen for the study. The findings from the pilot study also changed the initial dimension or the domain of the research. While the initial research proposal intended to study the effect of enterprise systems implementation on management control, this was later changed to the current objectives, namely to understand the process of enterprise system development in universities in Malaysia.

In this research, the access obtained from a single respondent (the head of finance) grew into multiple respondents, following their recommendation and responses during the interviews. This follows the notion of following the actor as suggested by Latour (1987). The application of the snowballing technique was used in order to acquire further information on the issues discussed. This technique also enabled the researcher to identify any attempts at establishing a network.

4.5.3.2   Phase 2
During Phase 2, more respondents were interviewed. An additional of twelve respondents were identified and followed, with more users being introduced and more vendor developers available to be interviewed. While the users were all directly related to the specific case study, the vendor developers consisted of those who had been involved in one or more cases. The interview process conducted with developers involving multiple case studies were more challenging, since they tended to make comparisons between the two cases. On the other hand, it was a straightforward process of interviews for the users and the developers that involved one case study. Similar to Phase 1, respondents were required to identify their role in the project and to identify retrospectively any challenges encountered during the development.

In dealing with the vendor's developers, who had been involved in more than one case study, the respondent was asked to tell a story of what happened in each of the case studies. The tendency for the respondent to make comparisons between different case studies made the interview process more interesting. In this situation, the researcher probed with questions like "How?" or "Why?" in order to encourage the respondent to further elaborate their stories. Similar to the first phase, the respondents identified other actors that either accommodated or hindered the progress of the development for the researcher to follow-on.

4.5.3.3 Phase 3

During Phase 3, the number of new respondents was decreased, since most of them had already been interviewed during the second visit. At this stage, the researcher returned to the respondents who seemed to have a better or more interesting ideas on what was happening in the project. For Case 1 and Case 3, since the project was still on-going, the researcher asked each respondent about the progress of the development – e.g. whether there was any progress from the last visits. Challenges encountered during the development were further probed to get an in-depth understanding of the issues. During Phase 3, there were no interviews conducted from Case 2. This was due to the fact that the development of the financial system was already completed and the system was deployed. Thus, no outstanding issues were left to be investigated.

4.5.3.4 Phase 4

During this final stage, our objective was just to be updated on progress of the development. From the interview responses, it was noted that there were no new issues or challenges encountered during the development. Prior issues were either resolved or maintained. One of the most important signs that the researcher experienced was when the respondents, rather than blaming others (evidence from Phase 1 interviews) for the issues that occurred, blamed themselves for such occurrences (evidence from Phase 4 interviews).

4.5.4 Written data source

Among the written evidence gathered were implementation schedules, software requirement specifications (SRS), organisational structure and user acceptance test (UAT) and other related documents. The gathering of these written data sources was made in parallel during the analysis process as supporting evidence for the interviews.

4.5.4.1 <u>Observation and informal conversation</u>

During the phases, in order to gain more in-depth understanding of the project, the researcher also attended several project-based meetings as an observer, including business requirement sessions (BRS) and working committee progress meetings. Any spare time during the visits was filled with informal conversation with the users, discussing issues they faced during the development. The collection of these multiple data sources enhanced the understanding of the phenomena, thus improving the validity of the research.

4.6 Qualitative data analysis/Mode of analysis

The interpretive nature of the research affected the process of gathering and continued with the analysis of the data. As such, the questions posed to respective respondents largely determined the responses gathered. The analysis affected the data and the data affected the analysis in significant ways. Therefore, it is perhaps more accurate to speak of a "mode of analysis" rather than "data analysis" in qualitative research. These modes of analysis are the different approaches to gathering, analysing and interpreting qualitative data (Myers, 1997). There are many different modes of analysis in qualitative research. For the purpose of this research, making sense or understanding the data is the most critical part of the analysis, followed by chronology and narrative mode of analysis.

In general, the analysis went through multiple phases, from transcribing interviews to hanging the data onto the PSIC model. The table below (Table 10) provides the summary of activities carried out.

Step 1	Interview sessions
Step 2	Transcribing interviews (direct transcriptions)
Step 3	Translating transcripts (full English)
Step 4	Manual process - Paragraphing (according to main ideas, supporting ideas and examples)
Step 5	Manual process - Creating general coding /initial coding process and categories
Step 6	Manual process - Printing, cutting and pasting interview transcripts based on category/theme
Step 7	Manual process - Establishing general/overall mind map of the coding
Step 8	CAQDAS – Transfer all transcripts to NVivo8
Step 9	CAQDAS – Create "free node" from the transcripts – open coding
Step 10	CAQDAS – Create "tree node" from the "free node" – axial coding
Step 11	CAQDAS – Create further "tree node" from the existing "tree node" – selective coding – to accommodate the multi-level of the PSIC model

Step 12	Identify critical events from different development activities identified
Step 13	Erecting the PSIC model trajectory – identifying gaps and resolution to gaps – punctuations
Step 14	Establishing detail description for each critical events identified
Step 15	Story telling – to narrate each critical events with extract of interview transcript

Table 10: Summary of research activities

4.6.1 Coding, Grounded Theory Method (GTM) Technique and Computer Assisted Qualitative Data Analysis Software (CAQDAS)

Interpretive research is concerned with making sense of the data provided by the respondent (Walsham, 1993). In this research, understanding or making sense of the data was carried out through a coding process. According to King (King, 2004), a code is a label attached to a section of text to index it as relating to a theme or issue in the data which the researcher has identified as important to his or her interpretation. Ryan and Bernard (2000) further explain that coding forces the researcher to make judgments about the meaning of the text which correspond to the hermeneutics.

There are many approaches developed based on the use of coding in qualitative data analysis. Different approaches provide different ways of looking at the qualitative data. Among the approaches available are grounded theory, schema analysis, template analysis and analytic induction. The main similarity between these approaches, other than the use of text, is the development of coding before further establishment of social accounts. There are a number of bases or fundamental tasks associated with developing these codes (refer to Table 11). These include sampling, identifying theme, building codebooks, marking texts (Ryan and Bernard, 2000). The differences between these approaches lie mainly in the coding process, the overall concepts and the epistemological contexts.

Task	Description
Sampling	Transcript of text and then selecting the units of analysis within the texts
Finding themes	Themes are abstract construct that researchers identify before, during and after data collection. Themes can also be developed from review of literature and based on investigator's experience.
Building codebooks	Building an organised list of codes. This includes a detailed description of each code, inclusion and exclusion criteria and example of real text for each team
Marking text	Coding involves assigning codes to units of text. Codes act as tags to mark off text in the transcript for later retrieval or indexing values assigned to fixed unit

Table 11: Description of the fundamental task of coding (Ryan and Bernard, 2000)

Other than using coding as basis of construct generation, there are other methods or approaches in qualitative data analysis which use basic textual data. Discourse analysis, according to Dick (2004), is concerned with how individuals use language in specific social context. Schema analysis also uses the elements of linguistic and sociological traditions to make sense of information (Casson, 1983 cited in Ryan and Bernard, 2000). King (2004) also described that over descriptiveness of coding may cause the loss of individual participant voices in the analysis of aggregated themes. This is true, as the creation of themes largely depended on the researcher's background and experience as seen through his own interpretation.

4.6.2   Grounded Theory Method (GTM) techniques in coding

Grounded theory is a research method that attempts to generate theory from data (Elharidy et al., 2008; Lansisalmi et al., 2004; Esteves et al., 2007; Strauss and Corbin, 1994).   Some even apply grounded theory as a methodical aspect that is for the collection and the analysis of qualitative data (Hughes and Jones, 2003; Lansisalmi et al., 2004). Bryant (2002) elaborates that the value of GTM lies in its guidance to conduct research. The iterative nature of concept and data of the GTM and the notion of constant comparison ensures that the conceptual level and the scope of the emerging theory are stable (Orlikowski, 1993). Thus this robust method of analysing data was a perfect approach in dealing with vast stores of qualitative data. GTM went through turbulence due to the divergence of interest between its authors – Glaser and Strauss. In relation to the analytical procedures, though, there are no major differences between both authors (Locke, 1996).

The application of grounded theory as a technique or procedure to analyse and understand qualitative data is becoming more acceptable in IS research (see Vreede et al., 1998;1999; Urquhart, 1999). As mentioned above, the application of either the Strauss and Corbin (1990) or Glaser (1992) approach/technique is irrelevant. However, for simplicity and to accommodate our research, Strauss and Corbin's (1990) a grounded theory technique was adopted (refer Table 12 for details).

Grounded Theory (GT) Technique	Description
Open coding	Creation of codes based by paragraph – description/summary of paragraph
Axial coding	Re-reading of codes generated and re-arrangement according to theme/category – cutting and pasting
Selective coding	Re-reading of codes and categories and selection of category that most represents the cumulated categories.

Table 12: Summary of constant comparative method – based on Strauss and Corbin (1990)

4.6.3 Computer Assisted Qualitative Data Analysis Software (CAQDAS) – Nvivo8

The application of CAQDAS in IS research has improved over the years. The advantages of CAQDAS have successfully drawn in researchers to apply such software. The application of CAQDAS enhances the quality of the analysis (Fielding and Lee, 1991). The improvement of the quality of analysis mainly resulted from the capability of being able to manage efficiently vast amounts of data using CAQDAS (Moseley et al., 1997; Kelle and Laurie, 1995). Since less time is taken to deal with the data, more time is redirected to substantive analysis of the derived codes and emerging categories (Morison and Moir, 1998; Moseley et al., 1997). The application of CAQDAS has also improved the transparency of the coding process (Allan, 2003) and audit-trailing of the codes to the data. Thus, the capability of CAQDAS to retain the original documents enhances its visual aspect and maintains its context (Bazeley, 2007). Details of the discussion on CAQDAS can be found in Ahmad and Newman (2010). The researcher attended a two-day training to gain an in-depth knowledge and skills of the software. This hands-on training provided greater depth in understanding the data collected and the various techniques that could be used during the analysis. During this research, the manual coding process of applying a GT technique was conducted prior to the application of the CAQDAS. Thus, it enabled a comparison between both techniques and the benefits and drawbacks of each surfaced. The table below (Table 13) provides details for the comparison between manual GT technique and CAQDAS.

Grounded Theory (GT) technique	Manual	CAQDAS
Open coding	Creation of codes based by paragraph – description/summary of paragraph	Creation of codes as free nodes by sentence or paragraph – description/summary of sentences or paragraph – highlight and code
Axial coding	Re-reading of codes generated and re-arrangement according to theme/category – cutting and pasting	Re-reading of codes/free nodes and re-arrangement according to theme/categories/tree nodes – Creation of hierarchies by "drag" and "drop"
Selective coding	Re-reading of codes and categories and selection of category that most represent the cumulated categories.	Re-reading of codes and categories and selection of category that most represent the cumulated categories. Higher hierarchies of the tree nodes are established to show the selected codes.

Table 13: Comparison between a manual process and the application of CAQDAS for coding.

As discussed earlier, one of the most important benefit of CAQDAS is its capability to manage efficiently the vast data sets during the coding process. In applying CAQDAS during the open coding process, extracts of interviews were highlighted and coded into free nodes. This contrasts sharply with manual processes, which require cutting and pasting the interview transcript to different codes, thus potentially causing the researcher to lose context with the original transcript. By applying CAQDAS, the original copy of the transcript is still available in the database.

Compared with the manual coding process, life was much easier with the preceding process of GT – rearranging codes into themes. Themes (tree nodes) were created through reading and re-reading of the initial codes (free nodes). Themes emerged from the data based on researchers own interpretation and sensitivity. All codes (free nodes) that represent the theme (tree node) were transferred to their dedicated tree through a "drag" and "drop" process. With the manual process, this activity was a nightmare, since the small pieces of paper of the codes with the interview extracts needed to be repositioned to the dedicated themes. This iterative process continued until the selective coding was achieved.

1st level category	2nd level category	3rd level category	Concept	Data
Business requirement session	Project Level	Communication	Users' limited communication with developers	We communicated with them during sessions and after sessions. But the only thing was that they are located so far away; we even asked them to locate themselves in our office so that anything unclear can be discussed. But they rejected that. U5 phase 2
			Limited channel of communication	At the user level it is more difficult; we can only contact them during sessions, since they are busy with their daily operations. There's no time to have an informal gathering. Plus there's no other channel of communication. V1 phase 2
		Control and power	Process requirement according to superiors preference	In Case 3, they are not sure what they do. The direction from their bosses keeps changing day to day. They live by the moment, they don't have a target. And their staff are not enthusiastic about their work. It should not happen during requirement sessions, but it was being transmitted to us. We see that this thing happens and they acknowledge that it is happening. V7 phase 2
			Control over requirement session	…for me, sometimes it is difficult for them to accept my expression, so in the end… it is better for a less people in the sessions. Less people less problems, it will not be a problem since there are less people to convince. U1 phase 1
		Knowledge	Users' knowledge on accounting process	If they are comparing a report from the same subsystem of course they will get a same figure. But now they are trying to compare one from transaction details (subsystem) and with customer ledger (GL) (requires posting). Of course there will be a timing difference between these two reports. But they want it to be

				the same. Since their old system can give same figures. V1 phase 2
			Users' limited knowledge on IT	I do not blame them but I think their IT knowledge is still limited. Since this is a new thing for them. I do not see anyone who knows how the system is being integrated. They should have an idea on how the systems should look like in the first place. They just want to see everything that was being done manually in the screen. Since our system is a bit up to date, we have to customise to follow their requirement. V4 phase 2

Table 14: A sample of the coding process
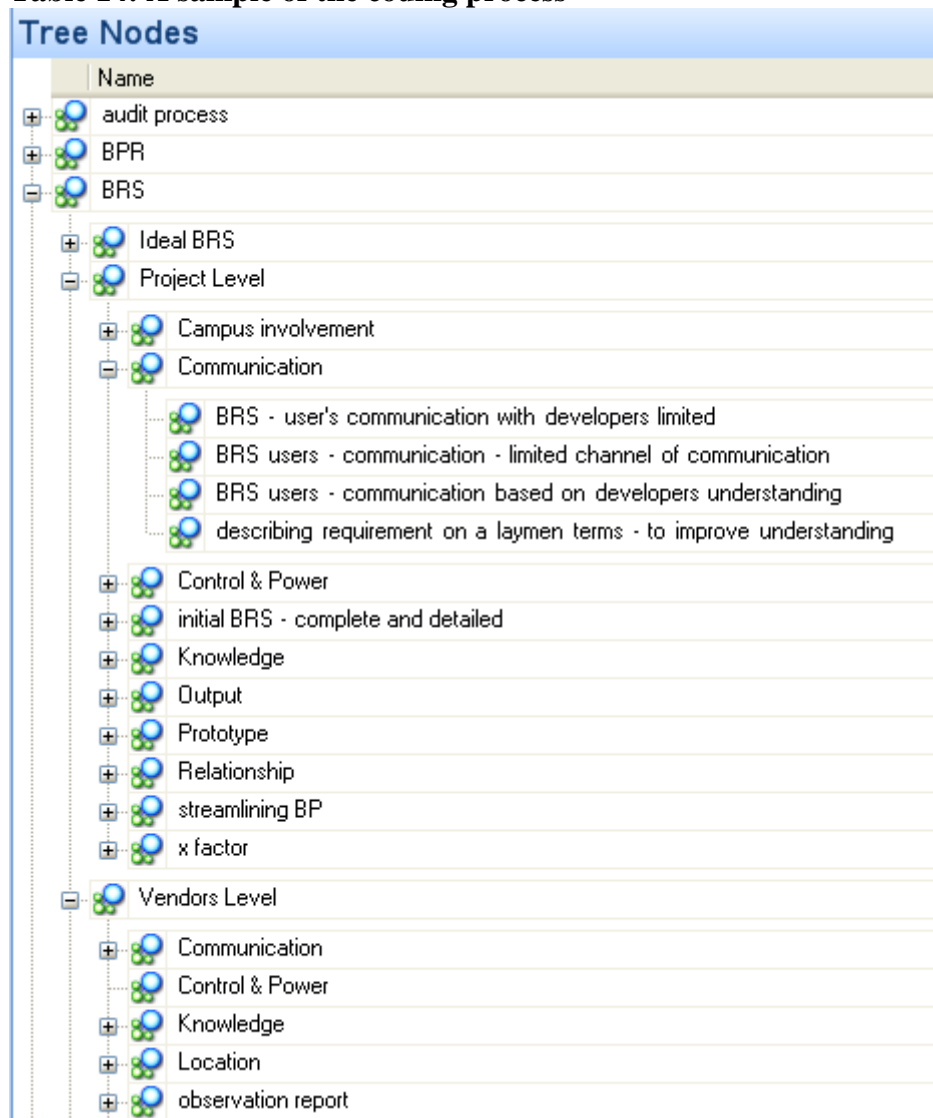
Figure 14: Sample screen capture for CAQDAS after coding process – events identification

In this research, the open coding process was carried out by creating free nodes in CAQDAS. Reading and re-reading of these codes and the attached extract from the interviews further generated concepts and categories (axial coding). In order to accommodate the PSIC model, these concepts and categories were structured according to the occurrence of the derived categories either at project, vendor or work level. At the selective coding process, these categories were further identified or structured into events (please refer to Table 14 and Figure 14).

During the study and for different purposes, the same data was coded twice. While the first coding exercise was for the events identification, the second coding exercise was conducted to assist in identifying stakeholders' interest and expectation towards the project and other stakeholders. The following (Figure 15) depicts the extract of the coding outcomes.
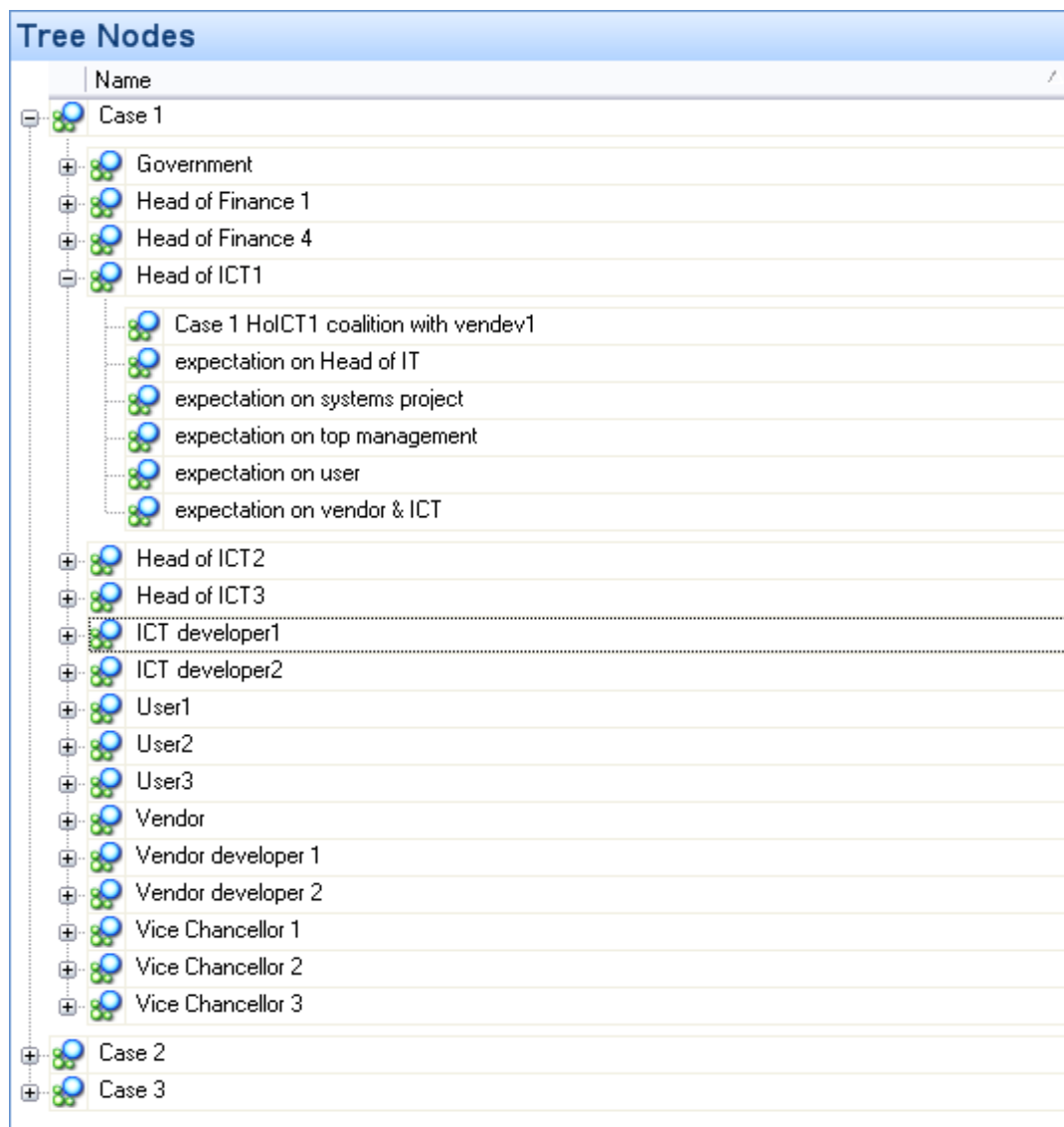
Figure 15: Sample screen capture for CAQDAS after coding process – stakeholders' interest and expectation

Table 15 illustrates the process of events identification carried out during the study. We use an event (P13) at Case 1 as an example. Interview transcripts were analysed and coded either line by line or by paragraph depending on the issues emerging from the data. Codes were attached to each line or paragraph based on the interpretations of the researcher of the case understudy. Through iterations between data and codes, categories emerged. In this illustration, the category is the appointment of a new VC (VC2) which was ultimately regarded as the event. Once a general identification of events was established, the researcher revisited the data, the codes and the categories in order to identify specific events elements (people, technology, task and structure), and which is applicable for the specific events and following the stakeholder analysis approach, the interest, expectation or action for each identified elements were also

identified. Further analysis of the data, codes and categories resulted in the identification of conflicts or coalitions. As a point to note, each process of coding and event identification was in parallel with the overall story line in order to make sense of the data and codes.

Events			
Appointment of new VC (VC2)			Technology People — P13 — Task Structure
Interviews extracts	Coding	Events analysis	Gaps (conflict)
"He (VC1) wanted the system that can improve the operations." Vendor developer, July 2008 "During the 2nd era, the VC2 is more on being comfortable and good well being in the workplace where everything should be on paper." IT developer 3, February 2009 "As you know our system is integrated. When the top management rejects the use of system which integrated with others, it gives a signal that they are not trying to build or maintain the IMS culture." User 5, February 2009	VC1 expectation on new system VC2 management styles VC2 expectation on new system	Expectation towards project: New system (Technology): to support operations New VC (VC2) (people): preference towards manual process. Use of system creates tension.	Conflict 1: New VC (VC2) (people) – New system (technology) results in no intention to support or use new system. Hence, gap between people and technology
"During the top management changes, there were also changes in my department, my boss was being transferred to the faculty and I was being	ICT restructuring	Steering committee (structure): Change in project team. Head of ICT transferred to faculty by VC2.	Conflict 2: New VC (VC2) (people) – steering committee (structure) results in change in project team – transfer of Head of ICT. Hence, gap between people and structure.

transferred from development team to a more customer support… the development of the system are being given to newer staff and the senior staff previously doing the development are transferred to the management post." IT developer 2, February 2009			
"As to date we have 3 directors of ICT… between the years there are also temporary substitutes." IT developer 3, February 2009	Frequent changes in Head of ICT post		
"During the 3 years period, there were several changes to the head of ICT post." IT developer 2, February 2009	Frequent changes in Head of ICT post		
"Based on my observation, during the tenure of the 2nd VC (VC2), there was a problem in the modification and enhancement of the system." Ex-head of IT, July 2008	Lack of system modification and enhancement	Development, modification & enhancement of new system (Task) – to improve existing system, did not occur	Conflict 3: New VC (VC2) (people) – system development & modification (task) results in no new development and modification of systems. Hence, gap between people and task.
"Due to the change in management, the development was halted." IT developer 2, February 2009	No new development of systems		

Table 15: An illustration of critical events identification (Case 1 - P13)

In conclusion, although applying manual processes and CAQDAS provided similar results of analysis, the benefits of applying CAQDAS provided the capability to

improve the overall analysis of the data through detailed analysis and transparency of the data.

4.6.4 Chronologies and narratives

According to Ghauri (2004), the use of chronologies is important when the researcher is attempting to develop longitudinal explanations that track a phenomenon over time. In this research, chronology was used to understand the overall trajectory of the project by identifying critical events. Narrative is a detailed analysis of the critical events: the Concise Oxford English Dictionary defines narrative as a "tale, story, recital of facts, especially story told in the first person." There are many forms of narrative, from the oral narrative to historical narrative. In IS research, the focus has mostly been on understanding the language, communication and meaning among system developers and organisational members (Myers, 1997). Therefore it is crucial for the ability of the researcher to develop a storyline based on the data compiled through the interview sessions conducted.

In this research, the chronology, the PSIC process model mentioned earlier and narratives for each of the case studies were established. In a page, the chronology for each project depicted the summary of events that occurred during the IS development project. The PSIC process model further elaborates the events into a detailed trajectory of critical events, according to its nature and contextualised to its environment. The project trajectory depicted emerging patterns within and between case studies and elaborated through narratives explanation.

4.7 Situating the researcher within the research

The development of this research idea originated from my personal experience with all the three case studies. In 2003, I was appointed as a consultant for an enterprise system implementation in one of the universities in Malaysia (Case 1). In charge of the financial system development, from the initial business requirement study right up to user acceptance testing, I went through several emotional phases while dealing with both the system user and the system developer. Communication skills were crucial in this situation. The process of automating and re-engineering accounting practices was not a simple task. The process of dealing with the project team members and also the

technicality of accounting processes have really challenged my perseverance and professionalism.

I was then appointed as the head of the university's finance department as well as a member of the university's IT council, which oversees the overall implementation process for the integrated information system (IS). Viewing the implementation process from different perspectives, both as an outsider (consultant) as well as an insider (head of finance and member of ICT council), gave me an opportunity to look at the implementation process from a wider perspective. The university's Integrated Management System (IMS) managed to go live after only a six months' development period. The challenges that I endured sparked my interest and motivation to conduct a research on enterprise system implementation, especially to investigate the interaction between actors, especially with regard to the impact of users and developers on the overall development process. With the success of the IMS implementation in Case 1, the vendor managed to secure a contract with Case 2 in which the vendor requested us to act as their reference site for Case 2 to visit. As the head of finance, I had been involved in the presentation during a Case 2 site visit. Thus this makes me indirectly involved in the Case 2 initial implementation stages. I was again appointed by the vendor to become their business consultant in Case 3. Although my appointment was short (approximately three months), I managed to obtain an idea of how things were done through my own observations and meetings with the users especially.

Within this study, I have taken the position of an "outside researcher" (Walsham, 1995). In this context, I am not part of any of the development team during the study. This distance would help me to provide more neutral views and interpretation towards the responses gathered. However, the prior experience in dealing with the cases provides priceless benefits to me as a researcher. Respondents were willing to express their feelings and concerns towards the overall development project that largely improved my understanding towards the projects. According to Walsham (1995), a limitation of an interpretive researcher is that the subjectivity of the researcher is always affected by the longitudinal nature of the case study which influences interpretations.

Confessional accounts (Van Maanen, 1988) highlight the researcher's experience of doing fieldwork through a self-reflexive and self-revealing account of the research process (Schultze, 2000). But it has the risk of becoming too autobiographical (Behar, 1996). According to Schultze (2000), there are different styles of confessional writing – Van Maanen's (1988) confessional tale or interlacing between ethnographic and confessional content (Behar, 1996). Although this study is not an ethnographic research, it does still requires a certain degree of confessional writing especially in developing the storyline or establishing a narrative for the events that had occurred in the projects. In this study, this section of situating the researcher within the research would be considered as part of a confessional account.

4.8 Summary

This chapter attempts to describe and explain the methods being used throughout the research. In general, this chapter is divided into three sections, being overview of qualitative research and case study research, qualitative data source and qualitative data analysis. The first section encapsulated the notion of qualitative research and information systems research. This section also introduced the case study methods, the university as context of research and the three cases under study. The second section covered the qualitative data source or the empirical evidence which largely involved semi-structured interviews, followed by written data source. The third section elaborated the mode of data analysis which introduces the coding process that applies grounded theory method (GTM) technique and NVivo8 as the assistive software for analysis. The notion of chronologies and narratives were also introduced in this section. This chapter was concluded with situating the researcher within the research with a detailed description on types of confessional accounts.

CHAPTER FIVE

5 Findings - Case 1

5.1 Introduction

The following chapters (Chapters five to seven) attempt to illustrate the analysis of the empirical data through the identification of critical events that emerged during the implementation process. The identification of critical events and gaps between project elements adopts Lyytinen and Newman's (2008) PSIC model. A PSIC-model-based trajectory was erected for each case to provide a clear depiction of the implementation process. This project trajectory simplifies the complexity of the project by identifying critical events. Further to the identification of the gaps within the critical events, based on the analysis of our extensive empirical data we further attempt to identify why these gaps were created. In order for us to answer this why question, we adopt a stakeholder analytical framework which identifies the stakeholders, their interests and expectations and the conflicts and coalition that emerged from their relationships. Following Lyytinen and Newman's (2006) data analysis step, based on the project trajectory erected, we discuss the overall project implementation sequence of events through a narrative explanation or storyline.

Chapter five presents the analysis of Case 1. It attempts to illustrate the project trajectory erected based on the PSIC model as presented in Figure 16 on pages 107 to 112. During the analysis, we attempt to identify the critical events that occurred during the implementation at the same time as identifying the stakeholders involved. The identification of the critical events suggests the gaps that were created among the socio-technical elements. Further analysis of the stakeholders identifies their interests in and expectations of each event and how the conflicts and coalitions that emerged between these stakeholders caused the gaps.

Organizational Context

Steering committee push

Rapid Application Development

Steering committee decision

Technology

People — Task

Structure

Project Level issues

Incomplete BPR / SOP

System rollout student related modules

Joint development interrupted

System rollout finance system AP related

Project Level

P4   P6   P7   P9

Vendor Level

V5   V8

Vendor Level issues

Requirement gathering & SRS

Appointment finance consultant

Work Level issues

Incomplete existing work process

Users' frustration with development

Users reluctant to use system

Users acceptance of system

System use 30%

Work Level

W4   W5   W7   W8   W9

July 2002

November 2002

108

Organizational Context | Knowledge transfer | ICT to handle modification | Vendor takes system to Case 2 | Appointment new VC | Changes in ICT head | Appointment new head ICT

Project Level issues | Parallel system modification enhancement | Appointment VC not renewed | Head of IT demoted to faculty | ICT restructuring

Project Level | P10 | P12 | P13 | P14

Vendor Level | V10 | V11 | Vendor leaves project 80% / 50%

Vendor Level issues | 1 year system warranty | Maintenance contract (1 year)

Work Level issues | User request for changes is good | System use 80%

Work Level | W10 | W11

October 2003

May 2005

Technology

People

Task

Structure

Organizational Context

Technology

People

Task

Structure

Project Level issues

Project extension

Unstable system deployment

Top management decision

Project Level

P24

P25

Vendor Level

V21

V22

V23

V24

V26

Vendor Level issues

Understand & modify – existing system

Smooth system enhancement modification

Double system testing

Enhancement completed

1 year system warranty

Work Level issues

System use 100%

Finance restructuring

Work Level

W25

W26

September 2009

January 2010

April 2010

111

Figure 16: Project trajectory – Case 1

5.2 Antecedent conditions

5.2.1 Antecedent conditions: Organizational structure and management structure

When the Vice Chancellor (VC) was appointed, he had one vision in mind. His vision was to create a world-class technical based university. He argued that to ensure this objective was achieved a total campus solution had to be in place. His intention was to adopt an integrated university system which had been developed by another university.

5.2.2 Antecedent conditions: Integrated management systems (IMS) for universities

In order to fulfil this intention, the VC requested a consultant to gather some information on the system and how the system could be implemented in the university. The consultant contacted the system architect and after discussion, seeing it as a business opportunity, the system architect agreed to join in with the development of the new system. With that they started to build a system that was fit for a world class university, by embedding the latest technology. The system architect together with another system developer started developing the system for the university. The new system was based largely on their previous university structure and other experiences.

5.2.3 Antecedent conditions: e-management concept

When the university's head of ICT left her previous tenure, she brought along with her an e-management concept which was already being implemented in her previous university. This e-management concept embeds principles including system integration, automation, intelligence, dynamism and paperlessness. Being successfully implemented there, she was hoping that she would be able to replicate it in her new office. The special feature of the system was its integrated nature (see Figure 17). This integration was not only embedded in the system application but also in the database. This concept was to avoid the creation of islands of systems currently found in other organizations. With this integrated nature, all systems were to be integrated into one single database for easy and fast access to data. Included within the e-management concept was her rapid application development (RAD) method. This RAD method is a combination of traditional system development life cycle (TSDLC) and rapid system development life cycle (RSDLC). Proven to be successful in her previous university, she had planned to implement a similar approach in the new university system development project.

5.2.4 Antecedent conditions: The existing finance business process

When the government decided to convert the branch campus into a fully-pledged university, receiving its own grants, all support from the previous university stopped. While previously managed as only a branch campus, the finance operations had been limited to document preparation for payment purposes. The finance unit was supported by only three staff which included a finance officer and two clerical staff. As a consequence, there was no full cycle of finance business process available. Hence, when the idea to develop the system emerged, they had to develop it from scratch.

```
┌─────────────────────────────────────────────────────────┐
│              E-Management Education System                │
│                    Single Gateway                         │
│                     (e-community)                         │
└─────────────────────────────────────────────────────────┘
        ↓                    ↓                    ↓
   ┌─────────┐          ┌─────────┐          ┌───────────┐
   │  STAFF  │          │ STUDENT │          │ RESOURCES │
   └─────────┘          └─────────┘          └───────────┘
        ↓                    ↓                    ↓
┌─────────────────────────────────────────────────────────┐
│                    FINANCIAL SYSTEM                       │
└─────────────────────────────────────────────────────────┘
                          ↓
┌─────────────────────────────────────────────────────────┐
│          DSS & EXECUTIVE INFORMATION SYSTEM              │
└─────────────────────────────────────────────────────────┘
                          ↓
┌─────────────────────────────────────────────────────────┐
│              KNOWLEDGE MANAGEMENT SYSTEM                  │
└─────────────────────────────────────────────────────────┘
```
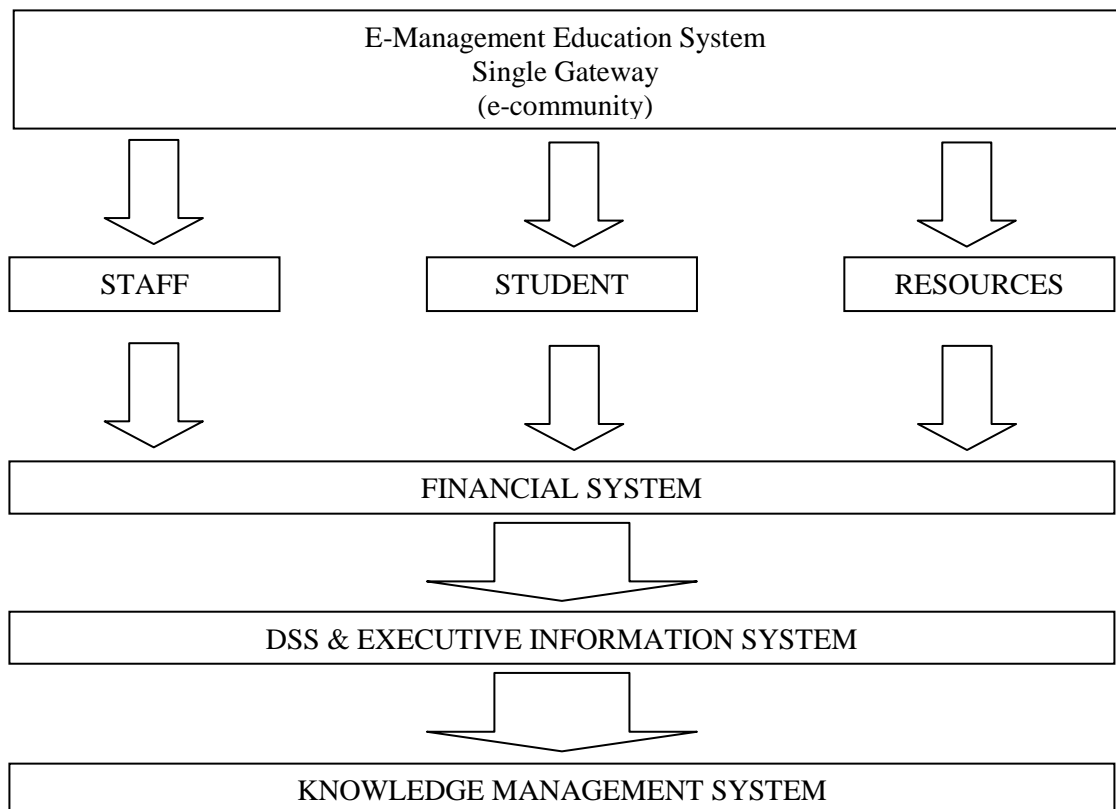
Figure 17: e-management system framework

5.3 Project implementation

The inception: An integrated management system for education – building a future organization.

"Future organizations stay close to their customers. They organize their businesses around the customers' logic. They act, not only plan and talk. They stress on quality and they deliver. The organizational structure is simple and the staff number is kept

minimal. They rigidly adhere to a few key values and yet allow their people to be innovative in the way they adhere to those values. They select people who are tough and are creative thinkers. They set high goals and support constant learning. They utilize technology to move faster to the global world. This type of future organization needs a very strategic management tool and electronic management is a proven strategy to achieve this."

<div align="right">Vice Chancellor, 2004</div>

The rector, with his vision to build the future organization, and the appointed head of ICT, with the e-management principle and the integrated systems, was like a match made in heaven. With the university still in its infancy, this proposal had developed into a full strategic plan for the university. Both of them were hoping that this system would become the backbone of the university as it moved into the future. Together they had created an e-management vision that stated:

"To strategically manage the organization through the implementation of a high performance and technology based system, focus on integration, automation, artificial intelligence, dynamism and paperlessness, and developed using rapid development methodology, towards the creation of knowledge environment to achieve the organization's vision."

<div align="right">Head of ICT, 2004</div>

5.3.1   The project team – steering committee

Within the project, the steering committee was chaired by the Vice Chancellor and comprised all Heads of Department and Deans of Faculties with the Head of ICT as the project owner. As a university-wide project, an IT Council was established above and beyond the steering committee. The objectives of the council were to: a) plan the overall total integrated IT implementation through the development of the IT Master Plan; b) analyse, advise on and endorse all IT document plans; c) analyse, advise on and endorse all IT policies and procedures; and d) to monitor and advise on the implementation of IT projects.

5.3.2   The project team – Finance working committee

After the university was inaugurated, additional finance staff were appointed to support the expanding university operations; and due to the limited number of people,

everybody was involved in the committee. The finance officer, who was there from the start, was appointed as the head of finance. It was hoped that her experience in handling the previous branch campus operations would help the system develop smoothly. But her strong personality later impacted on the overall development of the system.

5.3.3 The project team – the software developer (the vendor)

The selection of the contractor went through a rigorous open tender process for supply, delivery, installation, testing and commissioning of hardware and system software for integrated electronic management education system in March 2002. With an initial budget of around ten million Ringgit Malaysia, consent was obtained from the government and only upon approval of the proposal was the tender advertised. On the closing date, all tenders were opened and went through two levels of assessment or a tender evaluation process that included financial and technical evaluation. The technical evaluation was conducted through a double-blind review. Both of these reports were presented during the tender meeting, which was chaired by the VC and attended by a representative from the government. This was to ensure that the decision making process was valid and transparent. During this meeting, since the evaluation / reviews were done based solely on documentation received from the tenderer, the committee shortlisted three companies that fulfilled the requirement. Following this, the procurement unit called for an interview or system presentation. Only after this process was carried out, a tenderer was chosen and a price negotiation exercise carried out.

Ironically, the local software developer that was appointed was an ex-colleague of the head of ICT. They had been responsible for developing the system in their previous university, the integrated system mentioned by the head of ICT earlier. Nearly half of the developers had left their previous university and together set up a software house company which focused on developing a university system. An integrated university system was then a big gap in the local software market and this project was their first major breakthrough in the market. Each of the developers had their own strength in order to develop a complete integrated system – from student management systems to financial systems. Their experience in the previous university had helped them tremendously in delivering the system for this project. Using the based system that they had developed, they were ready to map it with the users' requirements.

5.4   Detailed chronological narratives of project trajectory

As mentioned earlier, it was the VC's vision to establish a future organization that had created a strong basis for the project to start. With the university newly established it was the critical time for such an inception (P1). At the vendor level, the project was the first for the vendor. The system that they had developed was based on their previous experience in system development. The relevance of their experience was a vital support to ensure project deliverables. At the same time, the appointment of the head of ICT had provided a second layer of support for the project. Her e-management concept, in which was embedded the rapid application development (RAD) method, and the joint development strategy had strengthened the mobilization of the project (P2). Following RAD, the most critical feature was continuous system modification and enhancement. With the joint development strategy in place, the vendor, together with the internal developers, would develop the system.

The head of ICT laid down her development plans, which needed to be followed by all members in the development team. Applying the RAD method, all development had to be at a minimum of sixty percent completion before deployment. Following the RAD it was expected that after the system deployment, the users would request modification or enhancement of the systems. The vendor and the ICT developers must accommodate these changes and these would continue until the users were satisfied with the systems. Her reason for adopting RAD was clear, as she highlighted:

"why we use the rapid development approach is because so far IT project fails because it takes too long to finish the development… so we need a very short time because of the urgent need and also to make sure that whatever we develop can be used immediately by the user and at the same time if there is any problem we can immediately support them…"
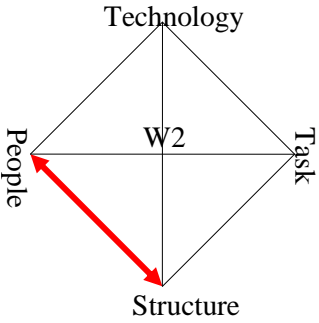
Head of ICT, July 2008

Upon her appointment in March 2002, she already planned that the student system would be deployed during the first student intake. Therefore, in order to achieve this, she had to work closely with the users and the potential vendor.

Therefore to ensure this objective was met, a joint development approach was established. Through this joint development approach, the system developed by the vendor was passed to the ICT developers, in order for them to deal with the users and conduct further modification and enhancement on the systems. This joint development agreement, which was signed in 2002, mentioned that all development would be jointly undertaken by the vendor and the ICT developers. During this period, the vendor would transfer their knowledge to the ICT developers who were mostly inexperienced. It was hoped that this arrangement would support the continuous modification nature of the development.

In general, the development started with laying down the concrete elements of the operational work process. For the finance system, they started with budgeting, procurement and accounts payable modules, followed by student financial and account receivable modules and continued with fixed asset, inventory and general ledger modules. There was a reason for developing the accounts payable related modules. For the vendor, it was their first project and its success very much relied on their first cheque payment, which would be generated by the accounts payable systems. It was a test for them; if they failed to develop the system, the cheque would not be issued (V2).
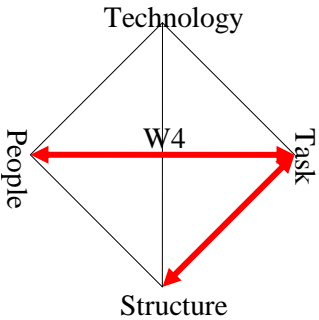
It was the vendor and the head of ICT's intention to develop and deploy as many systems as possible in the first phase; but the limited finance working committee created project limitations (W2). During that time, they only had two officers in charge where one of them was involved in the procurement process and the other was in charge of the rest of the processes. Therefore their intention was unfulfilled and they had to re-structure accordingly.

	Being a branch campus previously, the number of finance staff was limited especially since they were handling only a limited aspect of finance cycles. This lack of staff and their related experience thus caused an unstable and weak composition of the finance working committee thus created a gap between people and structure.
	Stakeholder Analysis
	The working committee (structure) was a stable structure to support system development through people and their experience. People included the users who were involved
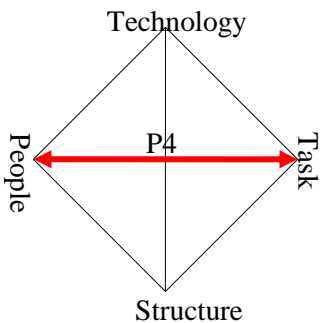
	in the daily operations which in this case was currently limited in number at the same time as they have lack of knowledge. In this case, a gap was created due to this conflict where there were not enough staff to establish a stable working committee.

At the vendor level (P3), following the e-management concept, the most critical aspect of rapid development was continuous modification and enhancement. Therefore to ensure this objective was met, the vendor would transfer their knowledge and skills on the development to the ICT developers. Through this coalition between the head of ICT, ICT developers, vendor and the e-management concept, the joint development approach was established. This system developed by the vendor would be passed to the ICT developers for further modification and enhancement.
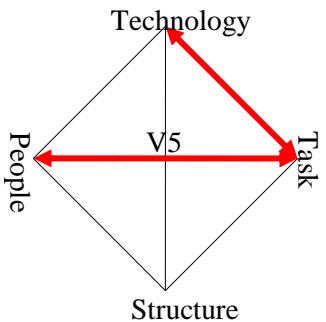
Due to their prior limited finance process available, drawing the process flow was frustrating for the users. After brainstorming everything that they knew from their limited knowledge bank, they started to complete their patchy flows through benchmarking and referring to other mature universities, especially their previous headquarters and their prior workplace. While others had experienced working in a private company, only the head of finance had a network with other universities. Thus she was using her own capacity to complete the process flows (W4).

	Again being a branch campus prior to this, the accounting cycle was incomplete. They were only involved during the preparation of the documents for further payment process at the headquarters. This incomplete existing process created limitations in the project thus creating a gap between task and people and task and structure.
Technology — W4 — People — Task — Structure	*Stakeholder Analysis* *The gap which was created was due to the conflict between the payment activity (task) and the users (people) where the users were not involved with the complete payment processes – from receiving bills to issuance of cheques where they were only involved in the preparation of bills for payments. This further created a conflict between the business process (structure) and the payment activity (task). The users' lack of knowledge and experience in dealing with full accounting cycles creates conflict at the work level since they were not able to provide the full requirements for the system development.*

Due to head of finance's frustrations, as well as her strong-headed and confrontational nature, she was always involved in a heated debate during the steering committee meetings. She argued that it was a waste of time to develop a system while an off-the-shelf system was available. There was even an occasion when she just slammed the door from the steering committee meeting due to the fact that the chairman did not agree with her ideas and maintained the initial development plans.

Technology People ←—P4—→ Task Structure	During BPR users were required to provide their existing business process to be radically improved to ensure a more efficient process was embedded into the new system. But their limitation on the business process restricted their capability to further develop their complete business process and worst in re-engineering the processes. Although they came out with a business process, it had never been tested before and it was just based on their limited understanding of what the process should be. It thus created a gap between people and task. *Stakeholder Analysis* *The conflict between the BPR process (task) and the users (people) was due to the users' lack of knowledge on complete business process and limited knowledge of the existing process, prohibiting the establishment of radical change towards existing business process to ensure efficient systems that resulted in incomplete BPR process.*
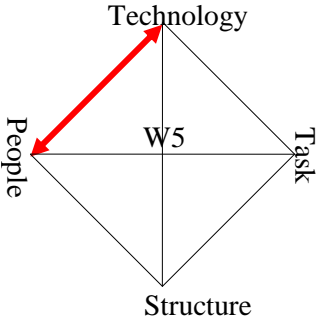
The head of ICT, observing her concerns, requested the vendor to develop a working prototype based on their initial requirement and the vendor base system, applying her rapid development method (V5).

Technology People ←—V5—→ Task Structure	Due to the incomplete nature of the business process, the proceeding requirement sessions were fruitless. Although a so called BPR process had been carried out, it did not improve the overall business processes. Thus it limited the vendor's capability to map the requirement to their base systems in order to develop the systems. It created a gap between people and task. The head of ICT, with her RAD, pressured the developers to proceed with the development with the limited process; it thus created a gap between technology and task and increased the gaps between task and people, this being additional work for the vendor. *Stakeholder Analysis* *The gap between the people and task was created due to the conflict between the vendor's (people) failures to apply the outcome of the BPR (task) as their basis of the BRS. It was the vendor's expectation to map these requirements to the base system. The pressure from head of ICT created*

	another conflict between the base system (technology) and system development (task) where the vendor was required to update the base system with the un-reengineered processes.

Accommodating whatever was available, hoping that upon seeing the actual system, she was willing to accept the idea of in-house development, scrapping her ideas over off-the-shelf systems. While other systems were running smoothly, concentration was on the finance systems and its users.

The vendor, while developing the system, faced difficulties not only due to the patchy and incomplete nature of the requirements but also due to the fact that the base system was from a private university with different operational requirements and procedures. Ignoring their limitations and accommodating the head of ICT's request, they managed to prepare an initial working prototype and presented it to the head of finance. She rejected the system totally arguing that the vendor did not fully understand her requirements (W5).
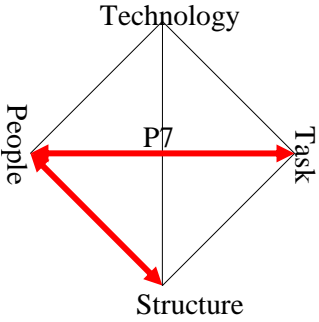
	Upon presentation of the working prototype, the user, with their lack of knowledge of RAD, condemned the prototype failing to accommodate their requirements. This created frustration towards the user over the vendor and the systems. It created a gap between people and technology.
	Stakeholder Analysis
	The prototype built by the vendor based on the users' limited requirement created conflict between the users (people) and the prototype (technology) due to its failure to meet users' requirements.

While the finance systems were unstable, the student systems were developed and tested adopting the rapid development method. The student systems, being more generally applicable, were easier and less complicated to develop. Within six months, the student registration system was deployed live during their inaugural student intake (P6). Student systems which generally automate student registration activities, are more straightforward compared to finance systems. From the available base system, the degree of customization was less complicated and a student registration process in one

university was easily applicable to another university. This created a stable interaction between project elements.
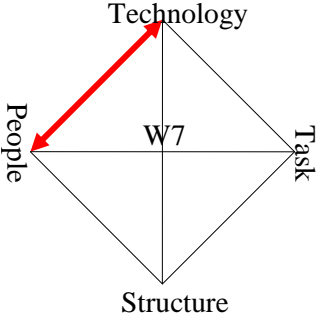
Within the stakeholder analysis, alignment of expectations and interests in the development of student modules was manifested through the smooth development of the modules. The coalition between the base system (technology) for its fully functional modules, student modules for their business process (structure) which was relatively standard throughout universities, the vendor (people) with extensive experience in developing student systems and the steering committee's (people) acknowledgement of its importance, ensured successful development (P6).

Since the systems were fully integrated, the pressure to deliver the student financial system increased. For the vendor, their burden increased exponentially when the joint development approach collapsed. The IT developers, who were largely new IT graduates, failed to cope with the pace of the development. The vendor, who was pressed for time, did not manage to accommodate the IT developers' need for knowledge (P7).

Technology People — P7 — Task Structure	The joint development approach, which was hoped to improve the overall development speed, proved to be negative. The ICT developer's understanding and knowledge on specific tools and business process was limited. Their interaction with the vendors caused the development to slow down. Vendors had to attend to them at the same time as to the development. Since the vendors were working against time, the ICT were left to study independently. This created a gap between people and structure and people and task, due to their failure to assist in the development. *Stakeholder Analysis* *The limited project timeline (structure) created conflict with the ICT developers and the vendors (people) in ensuring proper transfer of knowledge where the vendors were rushed to complete the development. At the same time the ICT developers had limited time to absorb and learn the business processes. Due to this, the ICT developers (people) failed to assist the vendor with the system development (task). These conflicts resulted in unstable joint development.*

They had to be independent and learn independently. In the end, the IT developers were merely an administrative help, organizing meetings and attending workshops for building work process. On a brighter side, it was only through attending these workshops that they were able to understand the users' business processes. Thus they were able to understand the vendor's system structure.

The conflict between the head of finance and the vendor continued. The head of finance was reluctant to use the system or even to test the system. She was sceptical over the vendor's knowledge of finance systems (W7).

Technology People — W7 — Task Structure	With the pressure from the head of ICT, the vendor continued to develop the finance system with their limited and incomplete process. Another complication was that the head of ICT was trying to push multiple modules simultaneously. With their limited knowledge, the users were overwhelmed with all the new processes, thus during the system testing the users just went along with the head of ICT and the vendors. But subsequent to testing, the users' reluctance to further familiarise themselves with the new system, led to complaints about the system's incompleteness. This created a gap between people and technology. *Stakeholder Analysis* *Conflict between the users (people) and the new system (technology) arose due to the users' lack of control during the development of the system itself. As mentioned previously, the lack of knowledge within the users made them indecisive as to what was required during the development. This led to frustration and rejection when the system was actually deployed for use.*

The head of finance's concern was that IT people could never understand accounting processes, thus would not be able to develop a finance system. It reached a point where the vendor saw that there was no way to make her use the system, other than employing a consultant, an accountant with finance system experience. Working with an accountant might improve her view over the systems.

Her initial response to the idea of a consultant was negative. She rejected meeting the consultant until she was forced to do so by the VC. Her first meeting with the consultant was only a brief encounter at her office door. It was only a week later that she invited

the consultant to her office to discuss development matters. Working at the finance office, the consultant tried to understand the workflow of the finance operations through talking to the finance staff. With his experience in finance process in a university, he drew up the process flow for all the finance processes and presented it to her. When she saw that his process flow was more detailed than her existing ones, she was amazed and based on these flows they started more detailed discussions. Having successfully broken down the barriers, the consultants combined the two process flows and came up with a more detailed and complete flow. After agreeing with the head of finance, he then mapped the flows with the vendor systems and requested the vendor to modify the system to accommodate the requirement (V8). Accommodating the users' concern over the vendor's level of accounting knowledge, a consultant was appointed. It was hoped that the consultant, with at least five years experience of dealing in finance systems would reduce the users' scepticism over the system capability. Understanding her concern, the consultant started to map their requirements and the systems and to identify gaps. During this exercise, the users' process flow was updated and the system was modified.

Within stakeholder analysis, the result of a robust development of a financial system was due to the coalition and strong alignment of stakeholders' interests and expectations of the project. The appointment of the financial consultant (people) with his vast experience ensured that the business processes (structure) were complete and agreed by the users. As a result, the vendor (people) would then apply these business processes and embed them within their base system.
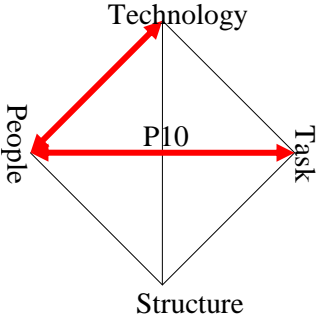
Once the vendor completed the modification, the head of finance tested the accounts payable systems with the vendor and the consultant present. The vendor and the consultant assisted her until she managed to issue a cheque. It was then she became more comfortable with the system and started to make modifications and changes to the other developed systems. November 2002 was a historical month for the vendor since it was then that the first cheque was issued not only for the project but for the vendor as well (W8). This rigorous exercise indirectly increased the users' confidence over the system since they could see their own processes were embedded in the systems. With

further assistance from the consultant and the vendor, the users started to use the new systems. Following stakeholder analysis, the modification and enhancement made by the vendors (people) on the system (technology) made it more user-friendly and improved its usability. The users (people) were now more confident with the new enhanced system with its updated functionalities, and supported by the consultant and the vendors they started to accept and use the system.
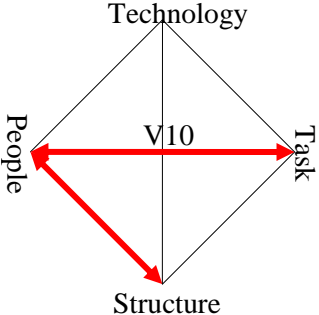
With the user starting to feel confidence in the new system, three finance modules were rolled out (P9). With the users' acceptance over the system, the accounts payable and its related modules were officially being used. Other users were trained in the systems and started using them. Within the stakeholder analysis, the new system achieved its mission to support the daily operations of the users and the vendor. The system use also meant that the system functionalities were being tested. The coalition of interest between the users, the vendors and the training process ensured the 1st module of finance system roll-out.

At the work level (W9), this was a new way of doing things. The use of new integrated payment systems was hoped to shed new light on their work processes. The integration between the modules made their work more efficient and smooth. It seemed that the new system provided complete payment functionalities. Following stakeholder analysis, the deployment of the new integrated finance payment system manifested the alignment of interests and expectations of the new system. The users were well satisfied with the integration functions between modules that ensured a complete payment process. This coalition resulted in the usage of a new payment system.

Moving forward, the user started improving the systems and system modification commenced. Later in 2003, the consultant was appointed as the head of finance. The ex-head of finance supported the appointment with an open heart, admitting her lack of experience in managing a division. At the same time, the users were now familiarising themselves with the new system. Any incompatibilities with their existing process resulted in users' requests for changes.

	During this time, the ICT developers had basic understanding of their users' business process through their participation during the workshops. With the vendors help the ICT developers started to attend to the users' request for system modification. But due to their lack of knowledge of the tools and system structure it created a gap between people and technology plus with the increasing number of users' change requests, the ICT developers was bogged down with a huge amount of work, thus created a gap between people and task.

Stakeholder Analysis
The new system (technology) was expected to be a complete system with full functionalities. According to the users (people), the system must be adaptable to different context – a more user friendly system. The ICT developers were also expected to improve their knowledge on new system structure to enable them to conduct system modification (task) in order to improve the existing system. However, conflict arose when the users labelled the new system as unfriendly due to its limited functionalities. This was a result of another conflict between the new system and the ICT developers who failed to understand the complex system structure. Following this, the ICT developers failed to carry out the required system modification. This resulted in an increased number of change requests and a domino effect of ICT developers' failure to modify the system.

The ongoing modification and enhancement continued until the users were satisfied with the system and the vendor completed the development (P10). According to the project schedule, the one-year system warranty started on 1st June 2003. Thus, the overall development took only one year to be in a usable state with modification continuing. It was the idea of the head of ICT that during the warranty period the vendor had to conduct system enhancement and system stabilisation until the system matured (V10).

	The vendor continued with the development during the system warranty period. With development, modification and system stabilization, the vendor was caught up with multiple tasks. This created a gap between the people and task and people and structure.

Stakeholder Analysis
The vendor set a 12-month warranty period for the project. For the vendor, these 12 months would be used to complete the development of the rest of the modules. However, conflict arose when the vendor (people) had several other tasks to settle within the limited warranty period (structure). They not only had to complete the
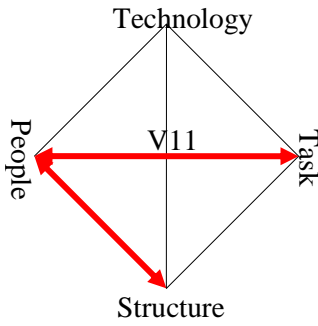
	system development but also assist the ICT developers to modify the existing system. It doubled the vendor's task when the ICT developers require more help than expected. This created another conflict between the vendor (people) and system development (task). As a result, the vendor failed to complete development within 12 months of the warranty period.

This was continued with another year of maintenance contract, which ended approximately in May 2005. According to the head of ICT, a system needed at least three years to be developed and another two years to mature. Thus the arrangement with the vendor was only until the system was fully completed. It was during the warranty and maintenance period that the IT developers started to get involved in the system modification and enhancement. They had been involved directly with the establishment of business processes for almost a year when the head of ICT decided to put them to the test through converting or translating their business knowledge into a technical diagram. While the vendor was currently at a lower pace of development, it was time for them to actually transfer the system knowledge to the IT developers. The vendor had also arranged technical training for the IT developers in order for them to update their skills with the development tools. After all this rigorous hands-on training was conducted, the IT developers managed to assist the vendor in handling the users' continuous request for changes and enhancement.

According to the head of ICT, with rapid development methodology, the more changes and enhancements that were required and suggested by the users, the faster the system matured and this also ensured that the system was continuously used. At the same time, the users felt the sense of belongingness in the system and tried to make it the best (W10). As such, the use and the request for changes of the system would ensure system maturity. The users' willingness to use the system showed that the systems were usable and had potential to be improved. Following stakeholder analysis, it was expected of the users to use and request changes. It was the part of the RAD approach where continuous system modification was the most critical aspect. During the last two years, the use of the system had increased from thirty percent to eighty percent for core finance modules and with the help of the ICT developers, the development was still on-going. At eighty percent, all major functional modules were operational. The coalition between the new

system functionalities, the users' willingness to use it and request modification ensured system maturity.

The one-year maintenance contract only employed one of the vendor's developers on site. Her function was to maintain all systems that had been deployed and at the same time to assist the IT developers to make system modifications. During this one-year period, the vendor was not only faced with finance systems maintenance but also burdened with other, multiple tasks. With the users now more dedicated towards using the system, more requests for upgrading and enhancement emerged. With the IT developers only coping with the modification, all enhancement and development of systems were passed to the vendor (V11).

Technology People — V11 — Task Structure	The one-year maintenance contract only employed one vendor's developers on site. Her function was to maintain all systems that had been deployed and at the same time assist the ICT developers to make system modifications. During this one-year period, the vendor was faced with not only finance systems maintenance but was bogged down with multiple other tasks. With the users now more dedicated towards using the system, more requests for upgrading and enhancement emerged. With the ICT developers only coping with the modification, all enhancement and modification of the system was passed to the vendor. This created a gap between the people and structure and people and task. *Stakeholder Analysis* *Following the warranty period, the vendor signed a one-year maintenance contract with the university. During this period, it was expected that the vendor was to maintain and support the working system to ensure its usability. As such, the vendor team had to maintain and support the existing working system. However, conflict arose between the vendor developers (people) and vendor team (structure) when there were insufficient team members to support all systems. The vendor only stationed one developer to support all of the system modules. With the ICT developers continuously requiring assistance in carrying out the modification, it limited the time for the vendor developers to carry out other tasks. As a result, another conflict arose between the vendor developers (people) and system support (task) when the vendor developers were bogged down with system maintenance and also supporting the ICT developers.*

When the maintenance period lapsed, the vendor left the project with an 80 percent completion of the core modules and 50 percent completion for the supporting modules. With the joint development agreement, the balance of the system was to be completed by the IT developers. And it was at this stage where other universities started to make visits to view the integrated finance system (refer to Figure 18) craved by all university administrators. And one of the universities was Case 2.
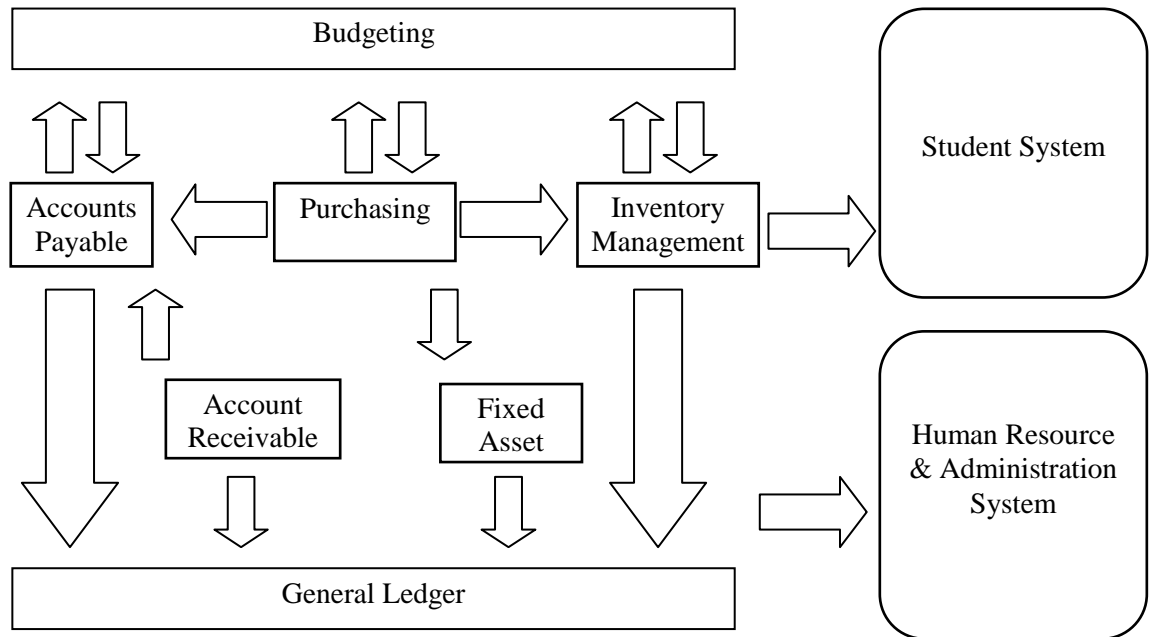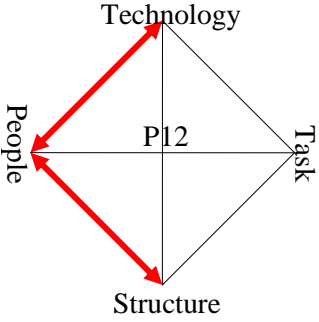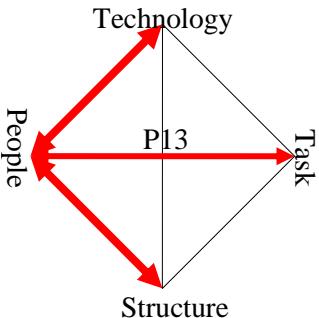
Figure 18: Integrated Management System framework (Source: Vendor)

In February 2005, the VC appointment had lapsed after three years. While other new universities' VCs with the same three-year tenure were renewed for another session, the VC appointment was not renewed and a new VC was appointed. Some speculated that the reason why the VC's appointment was not renewed was due to some internal staff from prior branch campuses not being keen on the VC's management style which was directive and private-sector oriented compared to a more laissez-faire or relaxed approach they were much more familiar with. Their scepticism towards the VC reached the point where they commented negatively about the VC to the government. In early 2005, a new VC took office. Being transferred from another agency, his approach was more relaxed and accommodating. Even his management motto was to be comfortable and harmonious in the workplace.
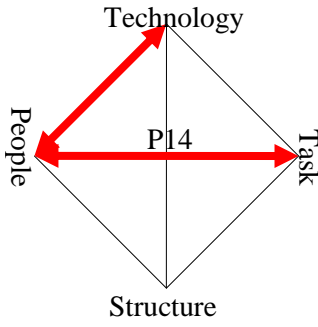
Technology People P12 Task Structure	The discontinuation of the VC's tenure created a big gap between people and structure and people and technology. The dismissal of the VC weakened the steering committee. This was due to the fact that it was the VC's vision to develop an integrated system for the benefit of the university itself. In addition, it was through this high level project co-ordination that the project was on-going. Without him spearheading the project, disintegration was likely. Organizational context: VC tenure not renewed. *Stakeholder Analysis* *It was the interest and the expectation of the vice chancellor to build a future organization through an integrated system i.e the project. As a result, a steering committee was established to support the development of the system in order to achieve the organizational mission. However, the decision not to renew the VC's tenure created conflicts within the project, especially between the steering committee (people) and the project team (structure). To date, it had been the VC who had driven the project and motivated the team members, resulting in reduced support towards the development of the system. This caused project drift – work only involved continuous development and modification of existing system, thus no new project had been initiated.*

The change of VC also caused a radical change to the top management structure (P12), including the transfer of the previous head of ICT to the faculty and a new head taking charge. The registrar left the university due to health problems and later the head of finance also left the university to further his studies. At this point in time, all the main supporters of the system started to disappear and the huge integrated system began to fall apart (P13). The ex-head of ICT hoped that the system awareness that was instilled within the system owners would ensure system continuity.

Technology People P13 Task Structure	The appointment of the new VC not only failed to maintain the existing project organization but weakened the overall project structure. The head of ICT (project owner) was transferred to the faculty and a new head of ICT was appointed. These events created a wider gap between the people and structure and also people and task. Organizational context: Appointment of new VC *Stakeholder Analysis* *The appointment of the new VC was the turning point of the project. His preference was towards manual process and any use of system would create tension with the workers. This created conflict between the new VC*

	(people) and the new system (technology). Another conflict arose between the new VC, the steering committee (people) and project team (structure) when the steering committee was dissolved. The existing head of ICT (project owner) had no control over the project. Eventually, she was transferred to faculty and a new head of ICT was appointed. With the dissolution of the steering committee, the life of the new system relied much on the new VC and the new head of ICT. Conflict arose when the new VC (people) failed to support any system maintenance (task) approach. It was up to the ICT developers to maintain and support the system. By this time the users had been fully using the system. This conflict resulted in the project halting since there was no development of a new system.

There were many reasons for the collapse of the system but the key reason was due to the new VC's management style. He believed that for an organization to be successful, it must be comfortable and harmonious at all times. His intention was pure where a work place was a happy place but others who despised the system saw it as a reason not to use the system for their everyday job. Therefore, IT or the system was not a priority in his management of work since it was seen as a burden. While previously there had been no substitution for the system, now whenever they were stuck, they adopted a manual process. This trend continued until some of the systems previously developed were not in use or even abandoned.

| | The new head of ICT's restructuring exercise created a bigger gap in the project. Although the re-allocation of the ICT staff was seen as a career development prospect, it created disruption to the development project. ICT developers who were involved in the project from the start, who have been painfully struggling to understand the users' business processes and vendor's development tools were transferred to another unit which did not involve system development. And newly appointed developers took charge. This restructuring and new appointments created gaps between people and technology (being the new developer's understanding of the system and the development tools) and widened the gap between people and task (being the new developer's incapability in undertaking development work).

Stakeholder Analysis
It was acknowledged that the new system would support daily operations and it was just mere system maintenance which was required to ensure its functionalities. At the same time, the ICT developers were expected to support the maintenance of the system. Sadly, the new head of ICT only intended to maintain the existing system and no new |
|---|---|

	development of the system occurred. This created conflict between the new head of ICT (people) and the new system (technology). Another devastating conflict occurred when the new head of ICT exercised department restructuring on the ICT department. During this exercise, he allocated the existing ICT developers to another department and appointed a new developer to support the maintenance of the system. In other words, he stationed a less experienced developers in charge of system maintenance. As a result, the new ICT developers were having problems in understanding the system structure and development tools thus creating another conflict between the new ICT developers (people) and system maintenance (task) due to their failure to understand the system structure and conduct system maintenance.

The new head of ICT added to the wound by conducting a restructuring for the IT department (P14). The IT developers who were now experts in system development were relocated and stationed at other divisions which were not related to any system development matters. As mentioned by the Finance IT developer:

"I was being transferred from the development team to a more customer support unit…"

IT developer 1, February 2009
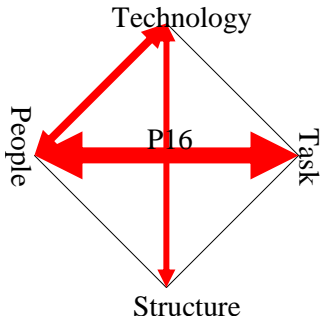
The rationale of the restructuring exercise was that too much focus was on system development, causing the overall IT management to be disrupted. Thus now they were concentrating on the management of IT and reduced their focus on system development. Even the e-meeting system, which had frequently been used previously, was not used. The discontinuation of the e-meeting system was a setback to the e-management concept of a paperless environment. Currently, there were no laptops used during meetings, only piles of papers. As one of the IT developers shared:

"Now, we are using papers during meetings, where previously we only used laptops. It is not being exercised anymore…"

IT developer 2, February 2009

According to the IT developer, this happened because there was no control over the overall e-management principle since the head of ICT kept changing over the years. And over time, the new management were considering e-meeting as a non-critical
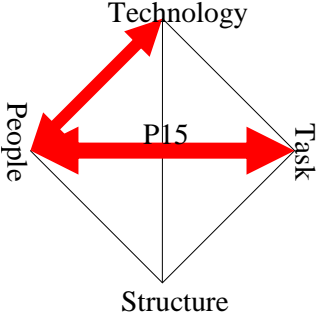
aspect of management. During the two years of the new VC era, his new management styles and also the restructuring of departments had caused at least fifty percent of the developed systems to be abandoned or not used (P16).

	Shift in top management priority, changes in ICT leadership and its restructuring and users turnover and re-allocation caused system abandonment. It was at a stage where due to improper handover of tasks, some modules/systems were not able to assist the task in hand. The new VC, the new ICT head and the new ICT developers were not able to continue to view the need of a system, thus created a gap between people and technology and people and structure. The low system use and system abandonment created a bigger gap between people and task.
Technology — People — P16 — Task — Structure	*Stakeholder Analysis* *The main reason for the system development project was to provide support to enhance operations. This was made possible through strong organizational and project structure through the establishment of project owner (head of ICT) and system owner (users). However, the change within the organizational structure (structure) created conflict with the new system itself (technology). The appointment of the new VC, new head of ICT and the restructuring of the ICT departments together with rapid staff turnover, in a way, immobilized the new system. This thus created another conflict between these groups of people (VC, head of ICT and ICT developers) with the system (technology) itself due to their lack of support towards the system. At the same time, the new ICT developers (people), due to their lack of knowledge and skills, were struggling to continuously maintain and enhance the system thus creating conflicts with the task (system development and modification). All these conflicts resulted in system abandonment where modification of the system was limited. At the same time, users started to return to manual process whenever they were stuck using the system.*

This restructuring exercise, coupled with staff turnover and no proper handover of tasks, had reduced the use of the systems. There were even processes that were not being computerised, instead following manual process. The restructuring had re-allocated project champions to other non strategic departments thus limiting their expertise. Whatever happened depended much on the IT strategic planning of the organization. When the IT heads kept changing, the strategy diminished or became diluted. In all, during the two years, the systems maturity was flat or even declining (P15). As highlighted by the IT developer:

"There are even systems that we developed that are not being used… sadly, the systems that we've developed just sit there without anyone to modify or enhance… due to that, we received feedback for unused systems."

IT developer 2, February 2009

Technology People — P15 — Task Structure	The users or the system owners, upon daily use of the system, saw the potential of the system to improve their own processes and continuously requested changes and even enhancement to the systems. With their limited knowledge of the system's structure and the users' business processes, changes and modifications that were carried out by the ICT developers failed to incorporate the integrated nature of the systems, thus created a gap between people and technology. With an overwhelming number of changes to solve, the ICT developers just pushed through the changes without considering the impact on the users. This further widened the gap between the people and task. *Stakeholder Analysis* *The development of the new integrated system was to enhance the operational efficiency of the users' daily task and the system was expected to provide complete system functionalities. Upon deployment of the system, the users were getting a grip of the new system and continuously using the system to support their activities. At the same time, the new ICT developers was expected to understand the system structure and development tools in order to continuously modify and enhance the system. However, conflict arose between the users (people) and the new system (technology) when the continuous use of the system by the users exposed many inconsistencies with the system functionalities and instigated the need to change and improve the system. Further conflict arose when the new ICT developers (people), who were expected to carry out these changes and modifications failed to understand the system structure and the development tools (technology). As a result, the system modifications and enhancement (task) carried out by the ICT developers (people) were incomplete and patchy, which had a domino effect on other project events.*

For the users in finance, the system had become their backbone for their daily operations. Although the system still required modification and enhancement, it was excellent in supporting the day-to-day operations of the finance department. With the new head of finance appointed, following other users, he continued to use the system.

The new IT developers handling the finance system failed to maintain the system. Changes or modifications done to the system failed to take into consideration the integrated nature of the system. Changes were carried out in isolation (W15). As mentioned by one of the users:
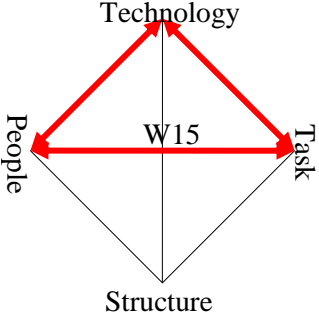
"These problems or issues are being directed to our IT developer for improvement. But we could see that the existing IT developer has not been able to comprehend these issues. Or it would take a lot of time to solve certain issues."

User 7, October 2009

Added by another user:

"It's not about the system… it is how to control manipulation of the system itself… sometimes changes are being made without taking into consideration the concept of integrated system…"

User 2, July 2008

	The users' eagerness to use the system collapsed when they saw that the modified systems failed to meet their requirements. This created a gap between technology and task and technology and people. Failing to identify the modified system weaknesses, they continued to use it. Further requests for changes were made and to make it worse, these requests for changes were made without consultation with other modules in the system. They were isolated requests although the system was an integrated system. This created disintegration within their system itself, which created a gap between people and task when jobs were not able to be settled.

Stakeholder Analysis
For the users, the new modified system should incorporate the improved functionalities that follow their requirement to enable them to carry out their daily tasks. However, conflict arose between the users (people) and the new modified system (technology) when they found out the modifications carried out by the ICT developers were incomplete and patchy and did not meet their requirements. This further created another conflict between the new modified system (technology) and daily operations (task) when the modified system was not able to support the users' operations smoothly. As such, the users (people) were not able to carry out the operations as needed, causing frustration over the modified system. As a result, the users' continuously requested changes and modification to make the system more users friendly.

At the work level, there was no control over the request for changes or modifications; each of the users requested changes as and when they felt like it without taking into consideration the impact on other systems. Similarly, it was not being mentioned by the new IT developers. Over the years, although the users were still using the systems, the system integration collapsed. On the surface, each sub-system within the finance system now stood alone. It was during their 2006 audit exercise that the auditor had remarked negatively towards the system. Due to the system's failure to provide valid financial reports, the auditors had suggested a replacement to the system (W16). A standard accounting for government agencies (SAGA) based system was recommended. The current head of finance, without hesitation, wanted to replace the system with a SAGA compliant system. The users even conducted a visit to other universities that had implemented such a system. The purpose was to view the system functionality and usability compared with their existing systems. Upon deliberation, the users were concerned over the SAGA system functionality. According to the users, the application of a SAGA compliance system would be a step back for the university. From the presentation, their existing systems were much more up-to-date compared to a SAGA system.

Technology **People** W16 **Task** **Structure**	The disintegration of the system caused a direct impact on the users' operational and reporting capabilities. It was during the 2007 audit exercise that the auditors identified a weak financial statement prepared by the users. Although they were using a financial system, financial reports were still prepared manually. This created a gap between people and task and people and technology. Reconciliation needed to be prepared manually since the systems were not able to support the task. This created a gap between task and technology. *Stakeholder Analysis* *As previously stated, the modified system was expected to provide improved functionalities to support users' operations. Until then, the user continuously used and requested modification of them system. Statutorily, all financial reports were subject to an audit exercise. This audit exercise was to ensure that all organizations were able to provide stable and consistent financial reporting. However, conflict occurred when the modified system (technology) was not able to assist the users (people) to ensure a smooth audit process due to its unstable financial reporting capabilities. Another conflict arose between audit process (task) and modified system (technology) when the system failed to provide sound reporting; as such the users had to prepare the reports manually based on the*
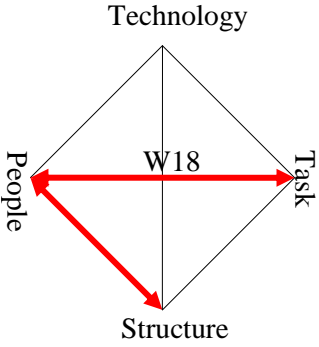
	data from the modified systems. This created conflicts between the users (people) and the audit exercise (task) when the users had to do additional tasks to complete the reports and satisfy the audit requirement. The incapabilities of the new system to provide sound reports caused extensive reconciliation to be carried out in order to explain differences. As a result, more conflict arose when the auditor was not confident with the financial reports provided.

It was the middle of 2007 when the new VC came into office. The new VC was a chartered management accountant with a PhD in accounting. His focus was more towards performance measurement and organizational governance. According to him, only proper governance could ensure organizational integrity and credibility. His motto was value based, strategy focused and performance driven. To him, a system could be a manual process or an automated process. He was open to any system as long as it improved organizational performance while maintaining values.

It was at the same time that the IT unit received a new director. With a more stable position, he was able to establish a more robust strategic plan for the university's IT initiatives. His strategy was mainly to continue the first IT strategy of e-management. His objective was to ensure the continuation of the system applications. In order to achieve this, the university had allocated a budget for enhancement of existing systems (P17). The appointment of a new VC, new head of ICT and new head of finance stabilized the project structure. The new VC, whose priority was to ensure transparency in management, identified systems as the vehicle to achieve this objective. The new head of ICT supported the existing integrated system by planning to enhance the existing systems. This was further strengthened by the new head of finance, whose experience in finance system development was considerable. The congruity of ideas brought light to the failing project. Within the stakeholder analysis, support and confidence shown by the different stakeholders towards the existing system created alignment and coalition. They agreed that use of any system should be able to improve the performance and transparency of the operations. Thus agreement was reached that the existing system would require enhancement in order to support operations.

A few months after the appointment of the new VC, a new head of finance was appointed. His initial task was to respond to the audit queries and to avoid re-occurrences (P18). The new head of finance saw the existing system as an opportunity to improve the overall finance operations with concentration on the reporting functions. With the 2007 audit management report as a starting point, the initiation of the enhancement project commenced. According to the head of Finance, to ensure the continuity of the system, the original vendor would be appointed for the project. Their knowledge and experience in developing the system originally would ensure proper system enhancement. In so doing he had established an ad-hoc working committee to review in detail the audit queries and to propose a solution. Chaired by him, the committee found that all the queries were instigated from the finance system instability. Positive responses received from the users on the system's capability to support daily operations provided confidence for him to continue using the system rather than abandoning it and replacing it with another system. Reviewing the system, he was confident that through minor enhancement and modification to the existing system, it would be able to solve all the problems especially the reporting aspect of the system. With his vast experience in developing finance systems he was able to assist the users in upgrading the system to another level.

According to the new head of finance, the existing system required enhancement to support operations and reporting. This was supported by the audit reports, which stressed the importance of the system enhancement to accommodate reporting requirements. This created coalition between the stakeholders that the existing system required modification and enhancement to improve its reporting functionalities. This alignment of interest instigated the initiation of the financial system enhancement project starting with the appointment of the vendor.

| Technology

People — W18 → Task

Structure | In initiating the project, the head of finance felt a certain degree of resistance towards his ideas. Although initially he planned to involve everyone in the project, the sense of resistance that he felt made him change his mind. Only those interested and keen to be involved in the project were invited. Since those who resisted were experts in the system and had been involved from the start, this created a gap between people and structure, as key people were not involved in the project. His negative reaction towards their resistance reached the extent where they were transferred to another unit which did not involve system usage. This created a gap between people and task.

Stakeholder Analysis
The need for the system enhancement was according to the new head of finance, to improve the existing system to support operations and reporting. This was supported by users, who agreed that the existing system needed to be improved to support operations and reporting. On the other hand, another group of users suggested that the existing system was enough to support operations. It only required modification but not total system revamp. Following this, the head of finance developed a strategy that was to isolate the staffs who was reluctant to get involved in the project thus creating a more stable confrontation-free working committee. The head of finance made sure that those involved were keen to improve the systems. The isolation and transfer of staff to other departments created conflicts between the different users' groups (people) and the finance working committee (structure). The isolation weakened the working committee. The transfer of staff to another department also created conflict between the users (people) and operations (task) where new staff was replacing old. |

His idea to enhance and modify the system was faced with a challenge from users who had been using the systems for at least five years (W18). As he mentioned:

"90 percent of the staff agree on my plan to change the system… only 10 percent are reluctant to change… they do not want to change because they are complacent with the old system… some of the officers are reluctant to change because they think it is their system… they have been involved during the initial development…"

Head of Finance, July 2008

Although initially he tried to involve everyone in the enhancement project the users were dragging it back, creating unwarranted issues in the project. Hence, he decided to
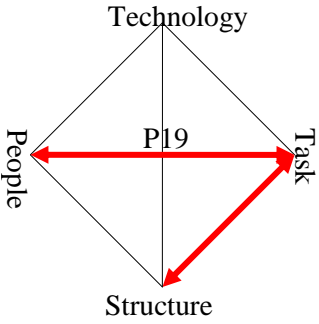
leave them behind and continue with the other users who were willing to improve the systems (W19). The head of finance's strategy to isolate the staffs who was reluctant to be involved in the project created a more stable confrontation-free working committee. The head of finance made sure that those involved were keen to improve the systems.

A proposal for finance system enhancement was presented to the top management and it was accepted with the required budget. In choosing the contractor for the project the head of finance assured himself that the only way to make the enhancement project successful was to invite the previous vendor into the project. In order for that, a special proposal was submitted to the government to apply for approval for the direct appointment of a contractor. With sound justification and rationale, the proposal was accepted and the original vendor was appointed (V19). The vendor came in with a new improved version of the integrated system from Case 2. This created a coalition between the vendor and their base system with the alignment of expectation to improve the functionalities of the existing system. With newly improved and additional functionalities, the vendor was confident that the project would be a success.

At the vendor level, the enhancement project would be based on the tender specification. This was further supported by a new base system (from Case 2). This new base system incorporated new functionalities and new modules which were applicable to them. This boosted the vendor's confidence in the overall enhancement project. During this time, the ad-hoc working committee was dissolved and a finance system working committee was formed with the same members. The function of the committee was to review the systems and establish a requirement specification for the project. By involving all units, any problems over existing systems and any new requirements were dictated and collated into one tender specification.
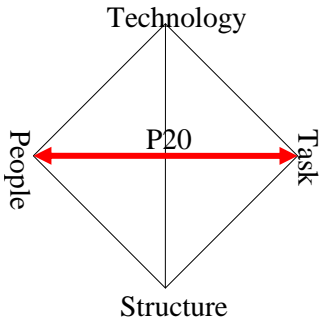
The enhancement project started in February 2009. Within approximately six months, the vendor started to review the tender specification with the users. During the review of the tender specification, the vendor found that most of the specification was vague and not sufficiently detailed. Consequently, this had also affected the total allocation of time for the project (P19). There was an instance where a one line requirement by the

users actually involved multiple sub-systems or forms development. Following that, a gap analysis which tried to map their requirement with their existing systems was conducted. In general, this project covered two main activities. First was the enhancement of the existing financial systems and second was the development of new modules.

Technology People P19 Task Structure	The working committee, based on the audit management letter as their reference point, created a tender specification. Apart from the audit reports, concern over existing systems and need for a new system were captured and added to the tender specification. The appointed vendor, upon deliberation of the tender specification with the user, was shocked by the level of brevity. A one line item upon deliberation incorporated multiple screens and forms. Whilst the project timeline was based on the tender specification, it created a gap between structure and task. The additional task identified created a gap between people and task. *Stakeholder Analysis* *The tender specification or the requirement for the enhancement project was based on the audit reports which captured the system defects. And according to the working committee, it was vital that the issues brought up in this audit report were solved. As for the vendor, this system enhancement project was based on the users' tender specification. However, conflict arose between the vendor (people) and tender specification (structure) when upon detailing the specification, the vendor found out that the specification lacked detail. It was vague project documentation. The vendor did not understand the tender specification. Additional requirements were deliberated thus created another conflict between the vendor (people) and system enhancement (task). The vendor (people) was frustrated with the working committee (people) due to their failure to state their requirements in the tender specification. With this additional task, it was expected that the vendor would not be able to follow the project timeline.*

With support from four full-time developers, the vendor was ready to kick off the project. The project was divided into four units for easy management and mobilization. It included the student financial and accounts receivable, accounts payable, procurement and fixed asset and accounts and general ledger. Strategically, each developer was in charge of a unit. The 'one developer – one unit' concept was intended to expedite the overall enhancement of the systems. The vendor ventured into the project with a more robust system, which was developed and completed in Case 2. The more stable and

complete processes that were embedded in the system provided high confidence to the vendors. This was because the vendor's system had gone through a maturity stage in the Case 2 project. In this project, the application of the vendor base system was only applicable for development of new modules. The enhancement of the existing system was to reflect their improved processes.

Technology People — P20 — Task Structure	Compared to their previous initial development, on this occasion their business processes were more complete and robust since they had gone through years of modification and adaptation, either from government regulations or other universities' processes. The knowledge accumulated over the years created a coalition between the users and their business processes during the enhancement project. The only concern was that it had never been documented and had only become tacit knowledge of the users. Even though they knew what they wanted, they failed to make it a firm request. This created a gap between people and task. *Stakeholder Analysis* *On this occasion, the business requirement session (BRS) resulted in a more stable users' requirement. Through their daily experience, the users were able to update their business processes and at the same time embedded standard, regulations and other guidelines. However, the users (people) failed to provide a stable requirement specification during the sessions (task). Their requirement kept changing during the discussion sessions. This instability created a conflict between the users (people) and the BRS (task).*
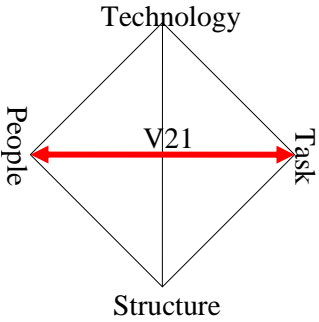
For both of the activities – the enhancement of the existing system and the development of new modules – stable business process flows needed to be established and confirmed (P20). Only through this could the enhancement be seen to be beneficial; if not it would be similar to their existing systems, which according to the users were patchy and unstable. In developing the improved version of the process flow, they had embedded all required details from government rules and regulations to internal policies and procedures. Everything needed to be incorporated into the new systems.

The vendor was confronted with a shock when they started to review the programming code for the systems. It was a nightmare for the vendor looking at the patchiness of the systems. It was difficult for them to identify the original structure of the system due to the enormous changes and modifications to the systems. In order for them to overcome this situation, prior to the system enhancement, they had to test each and every system

structure's programming. They had to do this clean up before enhancing the system. According to the vendor, that was why the users were experiencing system instability. It was due to the fact that the IT developers had patched it with another script. This system review process itself had taken most of the vendor's time in the project. It was only after the tidying up process that the vendor could start to enhance and to update the systems (V21). As stressed by one of the vendor's developers:

"Now our work is very much on modifying existing systems modules rather than developing a new system and to understand other people's work is quite difficult. It is easier to develop a new system rather than to understand other people's work. Since it has been a while that they have used the systems and have gone through various changes…to understand the existing system is one thing… to change the coding is another thing. Then we have to test it… now we have to do everything."
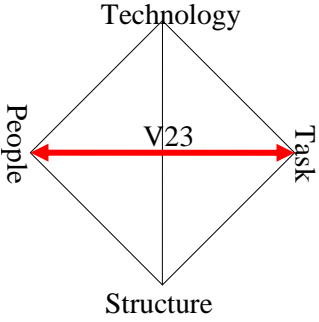
Vendor Developer, October 2009

	The vendor was again caught by surprise for the second time when they started to review the existing system. Over the years, the system had gone through major modifications and to make it worse, these changes were not properly documented. This review process was critical before any updates or modification could be carried out and it took most of the vendor development time. This created a gap between people and task.
Technology / People — V21 → Task / **Structure**	The vendor was only able to start their actual system modification once they had cleaned up all the mess created by the ICT developers previously. Once completed, it had to go through system testing to ensure its completeness. In updating the systems, the vendor worked closely with the users to ensure all requirements were captured in the modifications. The users who had extensively used the system previously were terrified of the system instability. Therefore their level of scepticism over the system was very high. As a consequence, for each issue identified, they wanted to know the roots of the cause and the solution to the cause in detail. Although this ensured system completeness and stability, it also increased the burden of the vendors, thus created a bigger gap between people and task.
	Stakeholder Analysis
	The vendor expectation towards the enhancement process was simple. They would just update the existing system with the new base system since the system structure was similar. However, conflict arose between the vendor (people) and system enhancement (task) when upon review of the system, the vendor found out that the system had gone through major modification and sadly, it did not

| | *follow the actual system design structure.* |
| | *Further to their review on the existing system, the vendor then required to update the existing system to its normal state. This increased the conflict between the vendor (people) and the enhancement exercise (task). The additional time taken to review and update the existing system had limited their time to conduct actual enhancement to the system.* |

During the actual system enhancement, the vendor was working closely with the users, looking at the system problems one by one in detail. The roots of the problem were identified and recorded. The vendor would then try to solve the identified problems and communicate this to the users. Through this process the modifications became more transparent and the users would appreciate the vendor's work. These detailed reviews had taken more time than expected but according to one of the users, they were not concerned with the timelines; most important was that the modifications were completed and perfect. The users were hoping that it would be the first and the last enhancement required to the systems. Thus it was worth spending time on it.

The development of a new system was more straightforward. The vendor gathered the requirements and developed a system requirement specification. Once this had been agreed, the vendor mapped it with their base system and came up with a system prototype. This working prototype was later presented to the users for confirmation and acceptance. One example of this process was the loan management module, the development of which only took fifteen days in total to complete (V22). Following stakeholder analysis, the system enhancement project attempted to improve the functionality of the existing system. This improvement would be based on the audit reports and the users' cumulative experiences. For the vendor, the base system from Case 2 provided a strong basis for the project. The vendor had planned to update the existing system with this improved users' requirement and other university's best practices. The combination of these elements created a coalition, thus improved the stability of the project itself and so resulted in a smooth system enhancement project.

  Technology People V23 Task Structure	The level of users' scepticism towards the system was critical, when every system that was modified and enhanced would go through two levels of testing. The first level of testing would involve its user, concentrating on operational sense of completeness. This level of testing would never be free from changes or modifications. The vendor would make the necessary changes and would go through the second level testing with the head of finance and the system co-ordinator. At this level, they would inspect the system integration and also high level reporting functionalities. Once this was satisfactory the system could proceed to deployment stage. This two-level testing created an extra burden to the vendor thus created a gap between people and task. *Stakeholder Analysis* *Following the robust system enhancement exercise, the vendor was faced with another challenge or conflict with the users. This time it was system testing. The users' scepticism over the system stability instigated the need for double system testing. According the users, this attempted to ensure system stability through robust testing. This conflict between the vendor (people) and double system testing (task) created additional work and consumed more of their limited development time.*

Another turn of events emerged when the users decided to carry out two levels of system testing (V23). The first level was the normal user acceptance test (UAT) which was conducted by the vendor with the users. During this time the users had to test the system and request modification if required. Following this the vendor made the necessary modification. Once this was satisfactory, a final acceptance test (FAT) was conducted with the head of finance to test the completeness and the rigour of the system. He then requested another round of modification. Once both levels of test were satisfactory and the required modification was completed, the system was sent for deployment. This dual level testing process had taken the vendor's precious development time. As highlighted by the vendor's developer:
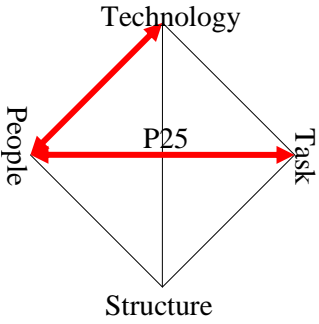
"…another thing is that in this project we have two levels of user testing. First is the UAT and then FAT. During FAT, their boss would conduct the test and he would also identify certain things that need to be changed. This increased our work load and created delay in the project."

<div align="right">Vendor developer, October 2009</div>
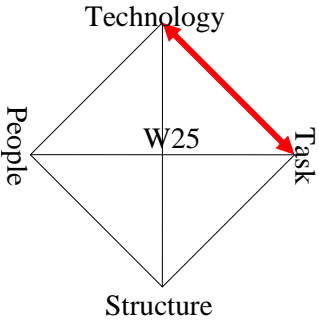
In August 2009, six months after they started the project, the percentage of completion was only around fifty percent in total (P24). Only certain systems were completed and tested. Others were still in the development stages. The reasons for this delay were due to both users and vendors. The users had played a part in the delay right from the start, during requirement gathering itself. They failed to identify their processes and put it in writing: everything was in their heads. Only during system testing did they manage to underpin their processes, which lengthened the overall development process. Another reason for the delays was the lengthy fine tuning of the systems, which was sometimes unnecessary. As for the vendor, the process of reviewing and cleaning up the existing system was extensive and time-consuming but it was required since without proper cleaning the enhancements to the system were impossible. Another cause for the delay was the time management for the projects. The specifications provided by the users were vague and incomplete. Only upon detailed discussion with the users did they manage to identify the actual requirements for the project and this exceeded the planned total time allowed. However, a coalition was established between the vendor and the client, where both parties acknowledged their mistakes and decided that more time was required in completing the system. Hence another three months was given to the vendor to complete the system.

At the project level, the coalition between different stakeholders ensured project continuity. This was evident when both client and vendor acknowledged the reason for the project being delayed. The client needed time to stabilize their requirements which required details. Similarly, the vendor required more time to review the existing system, which was being salvaged by the ICT developers, who failed to understand the system structure in carrying out modifications. The result of the coalition saw a three-month project extension being granted. During this time, it was just a matter of continuing the project (V24). This three-month extension period ensured that the enhancement project ran smoothly. Through the vendor's understanding of the users' concerns and scepticism, modifications were carried out with the full knowledge of the users. The combination between the SRS and the base system provided useful guidance for the vendor to complete the enhancement. Teamwork between users and vendor really showed when the project was completed within the three month extension period.
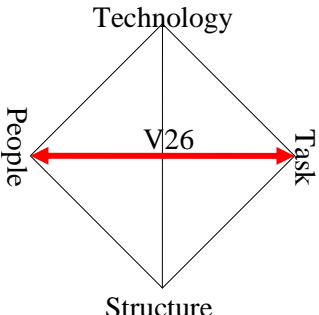
Again, at the vendor level, the coalition between fully functional base system, stable users' requirements and accommodating the project timeline resulted in a successful enhancement project. The vendor managed to complete the enhancement on time after being given the three-month extension. The extension granted enabled the vendor to ascertain a complete and robust system enhancement.

Technology People — P25 — Task Structure	It was agreed between the client and the vendor that the deployment of the system would be carried out by the ICT developers, who at this stage was not involved directly in the enhancement project. Upon completion of the development, the vendor passed the completed system together with the instructions for the deployment. The ICT developers failed to understand the instructions and continued to deploy the system to the application server. The ICT developer's lack of knowledge and interest in the overall project created a gap between people and technology and also people and task. *Stakeholder Analysis* *For the system deployment, the vendor was expected to pass the complete enhanced system to the ICT developers for deployment. System deployment was a process of transferring the enhanced modules of the system from the development server into the application server. However, throughout the enhancement project, these ICT developers were not involved directly during the project, thus they had little knowledge of the actual system enhancement. This created conflict between the ICT developers (people) and the enhanced system (technology). Their lack of knowledge and exposure to the project resulted in a ripple effect that created further conflict with the deployment activity (task). This was shown by their inability to understand the vendor's deployment instruction which was provided to assist them. This resulted in an unstable system deployment.*

In November 2009, the vendor completed the system enhancement and passed it to the IT developers to deploy the system to the production server. Another blunder occurred when the IT developers failed to deploy the systems, although complete instructions had been provided by the vendor (P25). At the working level, the enhanced system prompted error messages upon users' inputs (W25).

Technology People W25 Task Structure	Upon using the newly modified system after the deployment, the users were prompted with error messages on their screens. It seems that the ICT developers conducted an incomplete system deployment. The users did not manage to use the new systems until the problem was solved, thus created a gap between task and technology. *Stakeholder Analysis* *The ICT developers' failure to conduct proper deployment created further conflicts at the work level. The deployed enhanced system was expected to provide complete system functionalities as required by the users in order to support operations and solve audit issues. However, conflict arose between the enhanced system (technology) and daily operations (task) when the new enhanced system was not functioning as required. This was shown through error messages, which were prompted for all data entered. This resulted in increased frustration to the users when they failed to use the new enhanced system, which increased their workloads.*

The vendor who was currently in their warranty period continued to assist the IT developers to solve the deployment issues. Following the deployment, the warranty period started. It was agreed between the vendor and the IT developers that only items under warranty would be reported for the vendor to solve. Other system issues or bugs that were not related to the warranty had to be dealt by the IT developers themselves. However, this was never the case: the users had more confidence in the vendor and reported everything to the vendor. Looking at it as a small matter, the vendor accommodated their requests; consequently, this indirectly burdened the vendor, who at the same time had other outstanding matters from the project that needed to be completed (V26). The users' lacked of confidence towards their IT developers and the IT developer's lack of motivation to get involved in the project had created more work for the vendor.

Technology People V26 Task Structure	The vendor team was left with only a representative to handle the warranty issues. According to the warranty agreement, during this period, only items included in the warranty would be handled by the vendor. Any other items would be solved by the ICT developers. This was never the case: the user gained more confidence towards the vendor and reported everything to the vendor. Accommodating their request, since according to the vendor it was just a small matter, indirectly burdened the vendor, who at the same time had other outstanding matters from the project that needed to be solved. The

	users' lack of confidence towards their ICT developers and the ICT developer's lack of motivation to get involved in the project created more work to the vendor. A gap between people and task was created.
	Stakeholder Analysis
	It was expected that any system mis-functionalities would need to be solved during the warranty period. During this system warranty, the vendor was required to support and maintain the enhanced system.
	It was agreed that the vendor would only be in charge or make modifications or enhancements for items included in the warranty and the ICT developers were in charge of other modifications. However, the users were very sceptical about the ICT developers' capabilities to modify their system i.e to avoid recurrence of system disintegration. This resulted in the users requesting the vendor to make modifications for even the simplest change. As such, this created conflict between the vendor (people) and the system warranty (task) when the vendor was burdened with all system problems and modification.

At the same time, the head of finance was highly sceptical of the IT developer's skills over the systems and had decided not to allow the IT developers to touch the system once it was fully deployed. Following this, they were only allowed to make changes to the surface of the system. Any modification to the system engine had to be dealt with by the vendors. This was to ensure non-recurrence of the patchy and unstable modifications issues.

As described earlier, the enhancement project only involved users who were interested in making improvement to the systems, as such problem makers or those who resisted the plan were left out or even transferred to other units that did not involve the use of systems. It seems that they – the minority – had communicated their grievances to the VC. As a result, the VC had started an investigation into the situation. He first reviewed the finance organizational structure. The review showed that the allocation of work and line of reporting were inconsistent. There were instances where one officer had to report to another officer at the same level. The VC had also conducted interviews with all the officers to review their functions and responsibilities. Satisfied with the reviews and investigation, the VC restructured the finance division without the head of finance's consent (W26).

Technology
People — W26 — Task
Structure

It was immediately after New Year when the VC directed the restructuring of the finance department. This decision was made after rigorous investigation over complaints made by one of the finance staff. This restructuring created many gaps within the work level. New people were in charge of new units, thus created a gap between people and task. These new people were also using the new enhanced system which they had not been involved in. This created a gap between people and technology. This restructuring impacted the overall finance organizational structure with a different person in charge, thus created a gap between people and structure.

Organizational context: top management decision – finance restructuring

Stakeholder Analysis
A major restructuring occurred in the finance department when the VC found out that there were inconsistencies in the organizational structure. This created conflict between the users (people) and the finance organizational structure (structure). As a result of this restructuring, rather than the original users involved during the project using the system, different users were in charge of the new enhanced system. As such, conflict arose between the new users (people) and the enhanced system (technology) when the new enhanced system functionalities were not specified to their requirements. This was due to the fact that different users have different ways of doing things in order to get the same results. This resulted in continuing use of system with requests for modification.

Technology
People — W27 — Task
Structure

The use of the newly enhanced system after the restructuring further created gaps in the work level. Due to the restructuring, the new technology seemed to be incompatible with the new structure. Different people had different ways of doing things, which created a gap between task and technology, people and technology and technology and structure.

Stakeholder Analysis
According to the head of finance, there would only be continuing use of the enhanced system. For the new users training would be provided. He stressed that the requirement embedded in the new enhanced system was complete and stable enough to assist in the operations. Conflict arose between the head of finance (people) and the new users (people) when the head of finance decided that no modification of system was allowed and they were required to continue use and adapt to the new enhanced system. New users were not allowed to request system changes for user-friendliness purposes. The new users (people) were working in a new controlled environment of the new enhanced system (technology). They were not allowed to apply their expertise to further enhance the system. As such, the new users felt the constraint of using

	the new enhanced system (technology) to carry out the operations (task). Their creativity was restricted. This decision was made due to a strong coalition between the enhanced system and the head of finance who was directly involved during the enhancement project. The new finance organizational structure (structure) also created conflict with the new enhanced system (technology) when additional training was required to update the knowledge and skills of the new users.

This restructuring happened on the verge of the new enhanced system deployment (W27). With the restructuring exercise taking immediate effect, this had impacted the overall system usage. The requirements and development of the system enhancement had involved people from the previous structure, while the system use would involve people from the new structure. The head of finance in protecting the new enhanced system had allowed the new officer in charge to use the system with no changes or modifications allowed. Any process inconsistencies had to be referred to the original officer to solve. Only through this would the system be freed from further inconsistent changes.

The head of finance had also ensured that the dedicated IT developers were only allowed to access the surface functionality of the system. Any necessary changes to the system structure/programming had to be re-directed to the vendor for modification. This eliminated the system patchiness that had previously resulted in instability.

5.5 Horizontal and vertical analysis

5.5.1 Horizontal analysis

Based from the project trajectory erected, we found that there was a different pattern of conflicts emerging within the project that were due to the punctuated events associated with a change in the vice chancellor (VC). Throughout our period of research, there were three changes in the post of vice chancellor. In relation to the integrated systems development project, each of these VCs had a different perspective concerning the project. As a result, the tenure for each VCs was seen as a different episode (eras) especially for their decision and action taken during the project.

It was the first VC's intention to develop a system that was designed to not only automate the business processes that could improve their daily operations, but in the long term could prepare them to be competitive in the industry. Through this top down approach, the steering committee was given full support from the top management to carry out the project. Any conflict that occurred during the project was largely due to lack of knowledge within the project team members and due to the infancy of the organization itself. As for the vendor, with their base system and the support from the top management, they were able to develop and implement the system with the support from the internal IT department. After approximately 18 months the vendor left the project with the assurance from the Head of IT that the IT developers would continuously enhance and modify the system. A punctuated event occurred when the VC's tenure was not renewed and he had to leave office (P12). Conflicts emerged between the developed systems (technology), the steering committee (structure) and the VC (VC1) (people) who was the back bone of the project. As mentioned by the first Head of Finance:

"The VC during that time told me that there is no alternative when I suggest an off-the-shelf system for payroll process."

Head of finance, February 2009

The VC's strong support for the new system was evident as highlighted by one of the users:

"So what the VC did was he made it compulsory for everyone to follow it (system culture). With that we are able to create the culture of IMS. Of course there are those who rejected this idea. The orthodox. What we respect about the VC was that what ever people said about it he's never given up. That is important. Therefore in order to develop such system, the top management, leadership must be firm on what they wanted… the VC says that by hook or by crook we have to make this happen…"

User 5, February 2009

The appointment of the new VC (VC2) in May 2005 into the university not only failed to resolve the conflicts but created further conflicts (shown in the trajectory by thickening of the gap lines) (P13). The conflicts arose due to the fact that the new VC had no inclination towards continuing the development of the system or enhancing or improving or even using the existing system. As mentioned by one of the users:

"As you know our system is integrated. When the top management rejects the use of system which integrated with others, it gives a signal that they are not trying to build or to maintain the IMS culture. It is a waste of time and money. Millions of it. We can develop everything, but if they are still comfortable with using paper, it won't help."

<div align="right">User 5, February 2009</div>

The appointment of the new VC (VC2) had resulted in a new head of IT being appointed with the transfer of the existing head of IT to the faculty. At the same time, the IT department went through a restructuring exercise. This action created further conflicts between technology, people and structure. This further created new conflicts between the people and task due to the fact that the new appointed IT developers failed to understand the integrated system structure and making incorrect modification. The users were in the verge of replacing the system when a new VC (VC3) was appointed in May 2008.

Concerned about the performance of the university, VC3 supported any measures available including using systems to support operations. This support was shown through the approval of additional budget for IT initiatives (P17, P18). This positive inclination toward the system initiated the need to enhance the system rather than to replace it. The appointment of the new VC (VC3), the initiation of system enhancement and the appointment of the original vendor resolved the existing conflicts. This clearly showed how change in the VC affected the overall project life.

5.5.2 Vertical analysis

In Case 1, the vertical interactions were mainly due to the deployment of the system between the project, vendor and the work level. It provides understanding of how activities in one layer interact with other layers. In Case 1, the first vertical interaction

was between the project and work layer where the vendor deployed 30 percent of the finance system, the accounts payable system (P9). The finance department which was currently using a manual payment process converted to using this integrated accounts payable system to support their operations (W9).

Approximately one year after the project started, the vendor signed a maintenance agreement with the client. At this stage the vendor had already deployed 80 percent of the finance system's core modules and the balance of 20 percent had to be completed by the ICT developers (V11). The users were getting used to the new system and requested for changes and modification of the system to improve its user-friendliness. The third vertical interaction was between the project and work level which represented the deployment of the completed system after the system enhancement exercise.

The analysis of Case 1 shows how change in top management (vice chancellors) had both a negative and positive effect on project life. Through the vertical analysis, we found that how deployments of new system had a positive effect on work level activities − an improvement from manual processes.

5.6   Summary

This chapter depicted and narrated the implementation process of integrated financial systems in Case 1. The project started off with a coalition between the top management (VC) and the users. However, conflict arose due to knowledge and communication barriers between project stakeholders within the project, vendor and work level. Throughout the project, at times, gaps were resolved through coalition between stakeholders and at other times, bigger gaps were created due to increasing conflicts. This is shown in the trajectory that provides a depiction of the widening and narrowing of gaps over the project's life. The trajectory of Case 1 clearly shows how change in top management (VC, head of ICT and head of finance) impacted the overall process of the system implementation.

CHAPTER SIX

6 Findings - Case 2

6.1 Introduction

This chapter presents the analysis of Case 2. Similar to Chapter five, it attempts to illustrate the project trajectory erected based on the PSIC model as presented in Figure 19 on pages 156 to 159. During the analysis, we attempt to identify the critical events that occurred during the implementation and at the same time identify the stakeholders involved. The identification of the critical events suggests the gaps that were created among the socio-technical elements. Further analysis on the stakeholders identifies their interests and expectations of each event and how conflicts and coalition emerged between these stakeholders that caused the gaps.

6.2 Antecedent conditions

6.2.1 Antecedent conditions: The ideas

The development of the integrated management system (IMS) was initiated by the vice chancellor (VC) during his term of office in 2003. Supporting this idea, the ICT director was interested in a new system from Case 1 whose IT director, busily marketing her ideas on the e-management concept at IT director meetings, presented the idea to top management. With support from the ICT director and the Bursar, the plan to change from the old system was timely. Based on the responses from some of the interviewees, this shows that their legacy system was not suitable to manage dynamic organizations. The lack of integration between systems was causing frustrations among its users, especially the Bursar's office in compiling reports for the government.

From its early initiation, work was carried out in order to prepare a request for proposal (RFP). Business processes were being reengineered to ensure completeness in the RFP. It took nearly one year until the finalization of the tender at the end of 2003 and a contractor was appointed as the contractor for delivery and supply of IMS which comprised the hardware and software.

Organizational Context		SC push to continue project				SAGA			
Project Level issues	ICT developer overwhelmed change request	Inter department discussion	Appointment new contractor	New contractor – termination		Appointment of vendor		ICT developer supports system	

Project Level: P11, P12, P13, P14, P15, P16

Vendor Level: V15

Vendor Level issues: Project continuation & completion

Work Level issues: User frustration with incomplete changes, Users' satisfaction with new system

Work Level: W11, W15

April 2008 — July 2008 — August 2008

Technology — People — Task — Structure

Figure 19: Project trajectory - Case 2

It was in early 2004 when a new VC came into office and was briefed about the IMS which was now in its early stages. Based on his previous experience, he was sceptical about the overall IMS project. Reviewing the tender process of the IMS, he saw that there was a gap between the amounts offered by the appointed contractor and the other tenders. He was rather uncertain as to whether the project could be completed within the contract value. His scepticism over this project also increased because of his distant relationship with the ICT director. Based on the interview responses, discussions were carried out to assure the VC that the contract was genuine. Upon assurance on the matter, the VC agreed to continue the IMS project subject to agreement. The VC wanted an external system consultant to be appointed to carry out thorough checking of the overall IMS project. Although the top management was sceptical over the idea, the users were eager to view the system capabilities. A visit to Case 1 was made and the users found the new system's promises very acceptable. It was after the visits to Case 1 that the project for developing a new integrated system resumed.

6.2.2   Antecedent conditions: Legacy systems and its problems

The existing legacy system that supported their existing operations involved multiple systems. This island of systems covered three main activities. It included academic systems, payroll systems and finance systems which were all stand alone systems, where integration between these systems was impossible. In relation to their finance systems, internally, the systems were integrated. The finance system, which was first used in 1997, had gone through major modifications. To date, the system was stable enough to support their daily operations. Although operationally, the system covered eighty percent of their operations, technically, the legacy system was weakened each day. At that time, the system was only compatible with Windows 98; plus it was only able to support twenty five concurrent users, which limited its use with the expansion of the university. In addition, the legacy system was running a one-man show that relied on one expert. Therefore, in terms of technical support, it was sometimes difficult to get a fast response to system problems and if that person suddenly felt like leaving the job, all university operations would be at risk. This limitation had created the need for a new integrated campus solution for the university.

6.2.3 Antecedent conditions: Business Process Re-engineering (BPR)

Being a university that had been established more than 10 years, the work flow or the standard operating procedures were all in place. While the tender was being finalized, the finance department had started a re-engineering process. With reference to their existing processes, radical changes were being made to improve the process efficiency. As mentioned by the head of finance:

"From that we'll try to cut short any process that takes too long. Even for vouchers, initially, we had three levels, entry, verify and approve. It takes time. Now even the entry level is done by an assistant accountant. Previously, following the government process, the entry level is only typist / clerk. Therefore they need two more levels for verification and approval. Since now the entry level is done by assistant accountant, so we cut to two levels."

Head of Finance, February 2009

This process not only reduced redundancy of work but also ensured timely processing of voucher preparation. The earlier need for multiple level processes was due to the fact that previously, the data entry had been done by a clerk or typist, and thus it needed proper verification or checking from higher level staff. But now data entry was done by an assistant accountant who had better knowledge of the process so there was no verification level required thus reducing it to only two levels – entry and approval level. This was possible with the involvement of all levels of staff during the re-engineering process. Although this re-engineering exercise did not involve any third party or a consultant, as usual, it did not restrict or limit the overall process since the users themselves were well versed in the process that was involved in university finance systems.

6.2.4 Antecedent Condition: The new integrated management systems (IMS) for education

This integrated system (see Figure 20) was jointly developed by Company A, a public limited company and a public university (Case 1) in 2002 through a joint development agreement. Through this synergy, the integrated system had managed to support the ever challenging nature of universities operation.

```
                        ┌─────────────────────────────────┐        ┌────────────────────┐
                        │            Budgeting            │        │                    │
                        └─────────────────────────────────┘        │   Student System   │
                          ⇑⇓            ⇑⇓           ⇑⇓             │                    │
         ┌──────────┐         ┌──────────┐         ┌──────────┐     └────────────────────┘
         │ Accounts │ ⇐══════ │ Purchasing│ ══════⇒ │ Inventory│ ══⇒
         │ Payable  │         │          │         │   Mgt    │        ┌────────────────────┐
         └──────────┘         └──────────┘         └──────────┘        │                    │
              ⇑                     ⇓                                  │  Human Resource    │
              │         ┌──────────┐    ┌──────────┐                   │  & Administration  │
              ⇓         │ Account  │    │  Fixed   │                ══⇒│     System         │
         ┌──────────┐   │Receivable│    │  Asset   │                   │                    │
         │          │   └──────────┘    └──────────┘                   └────────────────────┘
         └──────────┘        ⇓              ⇓
         ┌─────────────────────────────────┐
         │          General Ledger          │
         └─────────────────────────────────┘
```
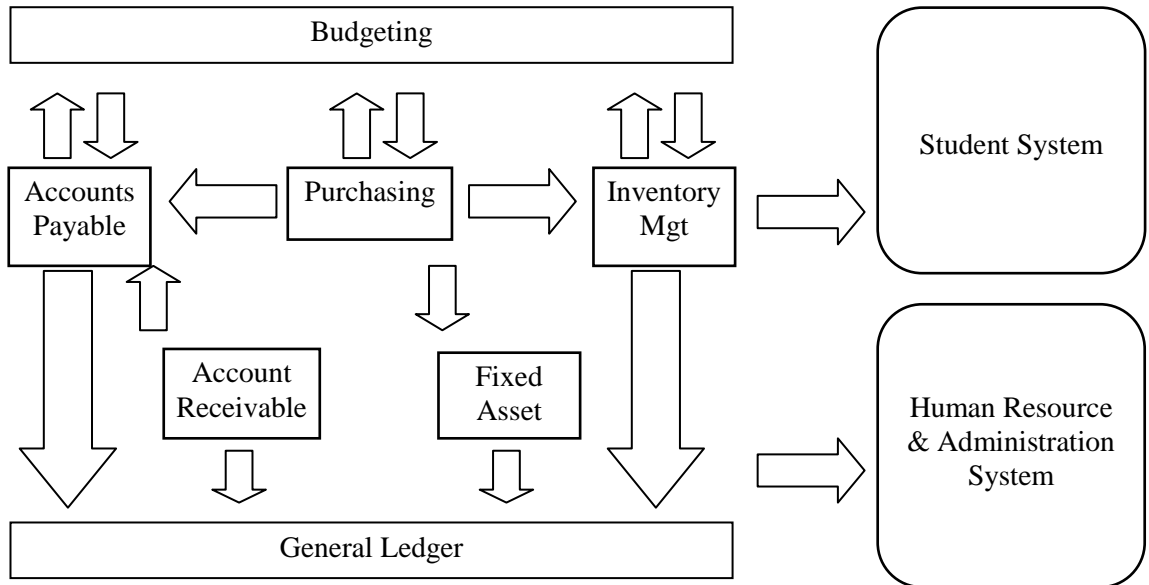
Figure 20: Integrated Management System framework (Source: Vendor)

Characteristic	Description
Scalability	IMS Education's modular architecture allows for scalability and performance, enabling thousands of users and courses to be supported and implemented from a single site. Institutions can easily expand and leverage their campus investment based on their needs and requirements.
Integration	The open architecture of IMS Education enables the integration of third-party applications, interfaces, and system services to seamlessly interact with its platform. Extensions to the system can be integrated into Smart Card Systems, Building Management Systems, Video Conferencing Systems, and other external devices, which are made possible via its open and scalable architecture.
Security and Reliability	IMS Education is set up with its own login manager, authorizing a system administrator to provide authorization rights to users based on approved access areas.
Collaboration	IMS Education connects the various educational communities via a single web browser based interface to facilitate the sharing and dissemination of information within a controlled environment.

Table 16: The characteristic of the IMS (Source: Vendor website)

Key benefits	Description
Enhanced Performance	IMS Education enables the delivery of up-to-the-minute information and quick interactive response time for heavy user loads.
High Efficiency	Less load and memory usage per server connection is required, resulting in higher performance and better efficiency of the server, which, in turn, translates into more users per server.
Easy Administration	Installation and administration of the application is simple and easy, saving the administrator time and effort, while giving end-users easy and secure

	access to the information they need.
Fully Customizable	IMS Education is fully customizable so as to cater to the different needs and requirements of various educational institutions.
Multiple Platform Support	By adopting a standard web browser technology, IMS Education can be deployed on the most common computing platforms such as LINUX, UNIX, Windows and Macintosh.
Open Architecture	IMS Education's open architecture allows for increased flexibility and protects future technological investments.
Version Upgrades	By providing regular version upgrades to introduce new technical and functional information, as well as latest statutory requirements that may arise from time to time, organizations can be assured that the application would never become obsolete, both technically and functionally.

Table 17: The key benefits of IMS education (Source: Vendor website)

6.3   Project implementation

The inception – Their legacy system was an island of systems. It was disintegrated. This lack of integration had created frustration among its users especially the finance department, which was required to collate all information from these systems in order for them to prepare monthly reporting to be presented to the Government. Data duplication and redundancy of work was inevitable due to this island of systems. As mentioned by the head of finance:

"Previously we had an isolated system, and when we wanted to get the number of staff we had to do it manually, looking at the payroll systems. In my mind, why don't we link everything, now even for number of students, if you asked every department, they will give you different figures which is similar when we require the number of staff. Most of the time, I have to answer questions regarding the numbers and not the owner. Once the systems are linked we can easily tell how many undergraduate, postgraduate students we have and the number of staff we have now… that is the first part of the integration. Everybody will be responsible for their own systems…"

She envisioned:

"By the push of a button all the reports can be generated. Even the bank reconciliation, we do not have to manually tick the items, now it is all linked with the banks and it

makes work much easier. With the linking and integration, all executive reports are prepared by the push of a button. It is the beauty of it that I can see at the end."

Head of Finance, February 2009

6.3.1 The project team – Steering Committee

The steering committee was established mainly to act as a project reference point with the Vice Chancellor (VC) spearheading the committee. With such a high level command for this project, it had given the project the highest priority in the university. The university had given the project a mandate where an e-university committee was formed. The establishment of the e-university committee had given the project another lift where the project had become the backbone for the university administrative and operational activities. With this, any outcomes from the project would be embedded in the organizational policies and procedures. The alignment of this project to the university strategic planning had shown the importance of the project to the university.

6.3.2 The project team – Finance Working Committee

In general, the finance working committee had involved everyone in the finance department. For easy organization, they were being grouped according to their unit. There were four main groups, which were the student accounts and receivables unit, accounts payables unit, procurement and budgeting unit and general ledger and fixed assets unit. Each of these units was responsible for specifying their own requirements for their modules. Each head of unit had to represent their unit during the working committee meeting, presenting and defending their requirements.

6.3.3 The project team –Software Developer (vendor)

The vendor development team consisted of a project team leader supported by four developers who were in charge of the four units grouped by the users. With this 'one unit – one developer', it was hoped that the development would run smoothly throughout. They were in turn assisted by three IT department developers.
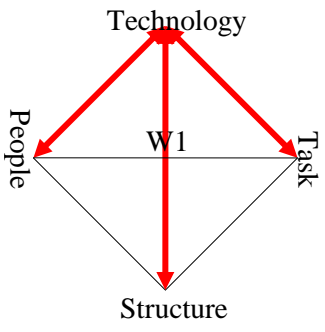
6.3.4 The project team – IT department developers

Three IT developers were allocated by the IT department to assist the finance department and the vendor during the system development. Since this project adopted

the joint development strategy, they were expected to learn and understand the system structure to enable them to support and maintain the system when the vendor completed their task. The vendor at the same time had to transfer their knowledge and skills to these developers during the course of development.

6.4 Detailed chronological narratives of project trajectory

In general, the implementation of the new system tried to achieve system integration within the university, from academic systems right up to human resource systems, a complete campus solution. The islands of systems that were currently in operation had been creating confusion and frustration in relation to data instability and inconsistency. This had especially affected users in finance, where data from other departments were everything to them and they were the receivers of any system inconsistencies. Relying on these data had also created work redundancy, where data from other systems needed to be re-entered into the finance systems (W1). It was hoped that in the future by a push of a button, reports would be generated with correct figures and with supporting documents in place.
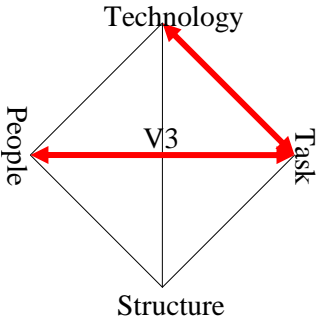
Technology People — W1 — Task Structure	The island of systems that was erected from different departments, although initially only to cover their daily operation, over time had been outgrown by the expansion of the university. With 16,000 students, data provided by these different systems also differed, hence reducing the reliability of the reporting. The non-integration between these multiple systems also created redundancy of work for staff, especially in updating information in the respective systems. This created a gap between technology and structure and task and technology. The existing stand alone finance system with its limited parallel users also created a gap between technology and people. *Stakeholder Analysis* *The reason for developing the legacy system was mainly to support their daily operations especially in the reporting of financial figures. From 1997 the system was used with continuous enhancement made to it to cope with the ever changing reporting requirement set by the government. But as the university expanded and competition increased, the legacy system was not able to cope with the expansion. This also reduced the efficiency of daily work practice and the problem of redundancy of work emerged. Thus it was not able to meet its raison d'etre. The expectation that the users put on it collapsed. This created multiple conflicts between the stakeholders. Conflict between legacy systems (technology) and the reporting task (task) arose due to the failure of the legacy system to provide sound and valid financial reporting.*

	At the same time, the legacy system (technology) also failed to accommodate the governmental reporting structure (structure), which caused further conflicts with the users (people) who had to restructure the reports manually to satisfy the reporting requirement. These conflicts failed to support the operations and the reporting function of the department thus establishing the need for a new integrated financial system.

At the project level (P1), the need for a new integrated system was well acknowledged by all stakeholders involved. Although different stakeholders had different expectations of the new project, this was all in congruence with the overall objective, which was to develop a new integrated system to support the university's operations. The steering committee, the finance users, the ICT developers and other internal parties (people) saw the need for the new integrated systems. At the same time, the external groups (being the vendor and the project manager) came into the project with systems that worked and fulfilled the client requirements. As such, the objective of the new system was aligned with the project group intentions and expectations.

The vendor came in with a base system which had been developed in Case 1 (V2). The vendor, acknowledging their system incompetence in relation to their process robustness, had tried to play the system integration card. The base system incompleteness was mainly due to the fact that Case 1 was still in its infancy during development. The system integration was hoped to crucially support what their clients existing system was missing. The need for the integration was hoped to supersede their ego of their so-called complete system. With an open mind, the vendor saw the project as an opportunity to improve their existing system and to make it a system best practice. In other words, the vendor came into this project with a system that integrated all functional areas of the university and this base system acted as a prototype during the development. The use of this prototype was to enable users to view the system as the development moved along. The vendor prepared themselves with enough manpower (developers) to comprehend the possible complexity of the project. This inevitably improved the overall project structure for the vendor. This created an equilibrium at the vendor level.

At the vendor level, each element and its expectations of the project were fully aligned, thus establishing a coalition among themselves. The base system (technology) acted as the prototype of the new integrated system, which was supported by a structured development activity (task). At the same time, the vendor (people) applied the knowledge and skills to support the project, thus ensuring the project would be a success.

Technology People — V3 — Task Structure	As the development started with the business requirement session, the vendor was confronted with the users' unusual request. Rather than the legacy system being mapped to the base system, they (the users) suggested that the vendor should identify the additional functionalities of the legacy systems, update them onto the base system and then the actual requirement session could proceed. This activity created a gap between task and technology, where the base system was considered as having a lack of functionality and also between task and people, meaning the developers had to do additional work. *Stakeholder Analysis* *The vendor was confident that the base system that they had was capable of improving the situation in the university through its integrated features. But at the same time, the end-users were also confident about their modified system and insisted that the vendor, before starting their development, should match the base system functionalities with the legacy system. Any discrepancies on the base system should be updated to follow the legacy system before actual development could start. Conflict arose between the vendor (people) and users (people) when the users insisted on using their base system as the base of the development, which was different from the vendor's expectation: the vendor expected to use the base system as the basis of the development and the base system as a prototype. Further conflict arose between the vendor (people) and system development (task) when the vendor changed the development approach to accommodate the users' request, thus creating an additional task for the developers. Another conflict arose between the base system (technology) and system development (task) where the base system was not stable enough to act as a prototype to assist the vendor to simplify their development. However, a coalition was established when the vendor agreed to match functionalities of legacy system with the base system. This agreement was mainly because of the process already embedded within the legacy system and with the vendor's expectation to improve the functionalities of their base system; this matching process would ensure their expectation was met. However, other conflicts still persisted.*

The vendor was in a dilemma when the users requested them to use their legacy system as the basis of the system requirement (V3). The users were claiming that in terms of functionalities, their legacy systems offered more than the vendor's base system. During the initial part of the business requirement sessions, the vendor had taken some time to sit down with the users and run through the vendor base system. This was because the users were completely familiar with their legacy systems and able to point out which part of the vendor's base systems needed to be updated. At the same time, the users had also provided the vendor with their work process to support their processes in the legacy systems. The most important point was that the users wanted the vendor to match their systems with the users' existing system. The reason was that their legacy system had gone through major changes from its inception many years ago. The flexibility of the legacy system had ensured valid changes were made. And what the system had now was complete enough to cater for their operational processes.
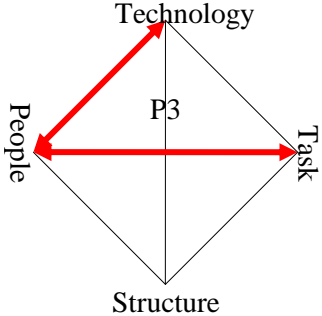
Moving forward with their requirements or in addition to their legacy systems, due to their years in operations, they were able to spell out other requirements that further enabled the vendor to improve their systems. Most of these requirements related to system reporting capabilities which referred to new guidelines and procedures. These guidelines and procedures covered internal and external parties. Government policies were the first to be adhered to, followed by other applicable policies by other universities. According to the users, it was important to know what they wanted and, as a control measure, what they want must fit with standard policies and guidelines. With any changes to the process workflow or any new introduction of processes, they would make sure that the internal audit department was involved in the process. This was to ensure the validity and the completeness of the newly developed process. It was hoped that upon conforming to standards and guidelines, this newly developed system could be applied to other universities or educational institutions. Another major aspect during the business requirement sessions was the level of user involvement. The arrangement of the users according to smaller groups had enabled them to go into the details of each process. In addition, the involvement of the clerical staff had enabled process detailing and catering system usability. But their involvement was only through their assistant accountants, who represented them and acted as a mediator to table their requirements during the working committee meetings.

Whilst detailed requirements were discussed at group level, a higher level discussion tabled their entire requirements together with the process flow. It was at this level that all integration issues were to be solved. Typically, when initial discussions only involved group members, their requirements were isolated to their own processes. When being tabled, sometimes these requirements contradicted other units' processes. This sometimes created a heated debate in determining the applicable processes – reaching deadlock where no-one was willing to compromise. This was where the finance project co-ordinator had to play his part in bringing everyone back into perspective. If this also failed, the matter had to be brought to the chairman of the finance working committee. Considering all arguments, she had to make her decisions. And her decision represented what was best for the organization rather than the individual units. It was during these multiple level meetings that the requirements of the lower level staff or the clerical staff faded away. Since their mediator had to defend their own processes in the meeting, failing to understand the importance of their requirements, the mediator gave way to others. It was during the system roll-out that the users identified that something was missing.

The process of requirement gathering flowed smoothly without major hiccups. Based on the users' work process and their system-based requirements, the vendor managed to develop their system requirement specification (SRS) in a timely manner. With the system process all in place, the vendor started developing the working prototype. The steering committee had decided that the project would be a joint development effort where the internal ICT department would join forces with the vendor team to develop the system (P2).

Within the stakeholder analysis, the expectation of a joint development approach was to ensure smooth development through joint development. The steering committee decided that the ICT developers would assist in the development. The reason was mainly to reduce the heavy reliance on the vendor once the project had been completed and it was expected that the ICT developers would be in charge of the enhancement and modification. The ICT developers agreed to this idea, with the expectation that it would

further improve their skills on system development. At the same time, the vendor was expected to transfer their knowledge and skills on development to the ICT developers.

Technology P3 People ←→ Task Structure	But as development progressed with the vendor only allowed 12 months for development of all finance systems, the development pace was rapid. The vendor did not have spare time to dictate things that needed to be done by the IT developers. With the ICT developers' lack of knowledge on the tools used, they were left out of the development, thus no transfer of knowledge occurred. This consequently created a gap between people and structure, where the IT developers failed to grasp the technology, and between people and task, where the ICT developers were not able to assist in the project development. *Stakeholder Analysis* *It was decided and agreed that the project would take only 12 months to complete. During these 12 months, the vendor was expected to transfer knowledge and skills to ICT developers. At the same time, the ICT developers were to absorb knowledge and skills from vendors. The joint development would ensure smooth development of the system. However, this limited project timeline created conflict between the vendor (people) and the project timeline (structure) in relation to the joint development scheme. Due to their packed schedule, the vendor was not able to teach or to transfer any knowledge to the ICT developers to enable them to jointly develop the system. As a result, another conflict arose between the ICT developers (people) and joint development (task) where the ICT developers were left behind and failed to assist in development.*

Although it read perfectly on paper, there were constraints on the implementation side. The vendor team was working to a tight schedule of deadlines, thus there was no time to waste. Everybody had dedicated work to do and they were experts in their own areas. The ICT department developers, although there were three of them, were novices, especially with the vendor's development tools. Their experience did not help much during the development process. Failing to catch up with the vendor's team, the ICT team just assisted in co-ordinating the project meetings and other administrative tasks (P3). As the vendor did not have time to train them, it was up to them to learn by themselves.
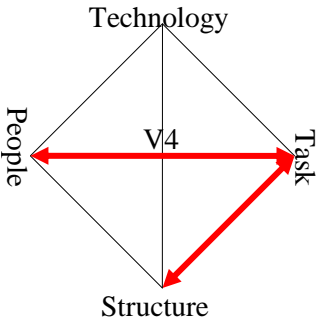
For the data migration process, the users prepared a full ten years' worth of data from their legacy system. Upon checking in detail, it seems that there were differences in
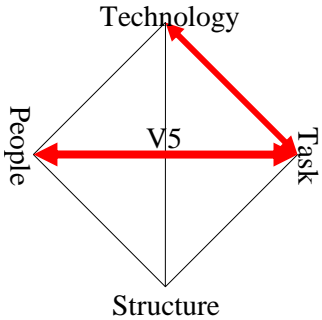
terms of the data structure between the legacy systems and the new systems, as highlighted by the vendor's developer:

"The old system had its own structure. And we have our own system structure. Sometimes, their data structure is not able to be matched with our data structure. For example, the new system has company and branch field which is not available in the old systems. So it is not matched. There are instances where the old system has more data field than the new systems and vice versa… So we have to do data cleansing before it can be migrated to the new systems. We have to identify each field which takes a lot of time. It takes months for us to complete the data cleansing."
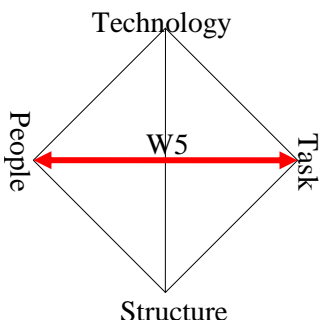
<div align="right">Vendor developer, February 2009</div>

As a result, the vendor had to do a data conversion to ensure that all data from the legacy systems were exactly mapped to the new systems and this took more time than expected (V4).

	The process of data migration was not as smooth as the other earlier processes. The data provided by the user from the legacy system were raw data that needed to go through a cleansing process. This was due to the fact that there were differences between the legacy system data structure and the new system data structure. As a result, the vendor had to ensure all data structures were matched before the data could be migrated and this exercise took more time than it should have taken. Hence it created a gap between people and task being additional work to the vendor, and between task and structure, where due to the different data structure, additional tasks were required, which also affected the project timelines. This data cleansing exercise was a pre-requisite for the data migration process. *Stakeholder Analysis* *Data migration was the most critical process to ensure project success. The user and the vendor had different expectations over the data migration process. To accommodate the data migration process, the users provided the vendor with the raw data taken from the legacy system and expected the vendor to migrate it. At the same time, the vendor would be required to match the data structure during migration. However, upon checking the raw data, the vendor found that there were discrepancies in the data structures between the legacy and the new system. This created a conflict between the legacy data structure (structure) and the new data structure (structure). This means that the raw data needed to be cleaned before it could be migrated to the new system. This additional*

	process created a conflict between the vendor (people) and the data migration (task), where additional work needed to be completed before data could be migrated. This additional task (data cleansing) created further conflicts between the project timeline (structure) and data migration (task) due to the project's limited timeline.
Technology People — V5 — Task Structure	The migration process that follows created a bigger gap between people and task and task and technology when the migrated data did not match the previous reports. Thus upon completion of the checking and reconciliation by the users, the vendor had to update the systems. *Stakeholder Analysis* *The purpose of the data migration was to ensure smooth data transition from legacy to new database and in this case, the vendor was expected to ensure proper migration of data to ensure smooth completion of project deliverables. However, at the vendor level, the problems with the data migration process created more work than expected. A conflict arose between the data migration process (task) and the new system database (technology) when the data were not fully migrated into the new system database. Thus, in addition to the data cleansing process, which took time, the vendor had to update the new system database for all the reconciling items found by the users. This created another conflict between the vendor (people) and system development (task) due to more work and taking more development time, which was limited. As a result, this system update took more development time thus caused delay in system development.*

Although some of the data were migrated by balances, some of the data required detailed transaction migration for reporting purposes (V5). Upon checking the migrated data, the users found out that the figures did not tally, not only when compared with the migrated data but also with the new system. The head of the working committee stressed that this issue had to be solved before the system roll-out. Therefore, in order to expedite the reconciliation process, the users were again grouped by units and they manually compared the report from the previous years with the report from the new system (W5).

Technology People — W5 — Task Structure	Upon checking the migrated data for verification purposes, the users were shocked to find that the financial reports generated by the new system did not match the controlling reports. Therefore, the users were required to reconcile both reports for all 10 years, by unit by account codes. These pressurising activities thus created a gap between people and task, where the data migration process was creating more work for them. *Stakeholder Analysis* *As a normal process, the user would verify all the data that*

	had been migrated into the new system to ensure its correctness. This verification was done based on reports produced by the new system and matched with the legacy systems reports. Conflicts arose when the figures did not tally and the users had to conduct a major reconciliation between the two reports. This created a conflict between user (people) and data reconciliation (task) in work level process.

As shared by one of the users:

"…we are on the brink of giving up due to the fact that the migration is creating problems. The data do not tally. It is a headache."

<div align="right">User, February 2009</div>

Although it was a problem to check these data, this exercise was pertinent in ensuring smooth running of the system roll-out. The prototype was then presented, and being able to experience the prototype based on their requirement increased their confidence in the systems (P6). The prototype was tested and iterations on changes and modifications followed. The vendor managed to make the required changes and modifications on-time, until the system was stable for users' acceptance testing (UAT). Since the users had made modifications during the prototype testing, the UAT sessions ran smoothly with only minor modifications.

Within the stakeholder analysis, the expectation towards system testing was to ensure that all requirements were met. Data were completely and correctly migrated and updated when the new system was ready for testing. A coalition between stakeholders was established when the new system met the requirements of the users. Thus the UAT process ran smoothly. This improved the users' confidence in the new system.

Although most of the tests were done at the development server, there were tests done at the application server itself. This was due to the fact that the vendor was not able to complete the system on time. Although it was risky, it was the only way to ensure on-time system roll-out. The finance system had to be deployed on 2nd January 2005. The initial timeline for the system roll-out for the first phase was in November 2004 where the new system was intended to be run in parallel with the legacy system in November

and December 2004. But due to the vendor's massive data conversion workload, they were not able to complete the development on time (P7).
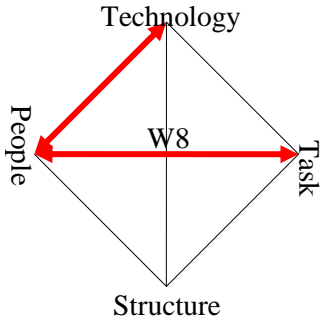
Technology People — P7 — Task Structure	The extended time taken during the data cleansing exercise caused delay from their overall development schedules. The new system, which was supposed to be delivered in November, was postponed for 2 months. The users' initial plan for parallel runs was abolished. This created a gap between the project level structure and task, structure and people and people and task. *Stakeholder Analysis* *The users expected the new system to be deployed in November to enable them to run it in parallel with the legacy system. This parallel approach would reduce the risk of the new system not functioning as required. Conflict arose earlier between the vendor (people) and the system development (task), which created further conflicts at the project level when the vendor failed to complete it on time. This delay was due to the extra time taken during the data cleansing and data migration process. The parallel deployment strategy (structure) was scrapped or aborted, due to the vendor's failure to complete the system development (task) on time. The users (people) were frustrated with the cancellation of the parallel strategy (structure). As a result, the vendor continued with the development and targeted completion by the end of the year.*

The finance system was made live on 2nd January 2005 and the legacy system was cut-over to the new system. Compared to the other modules being developed concurrently, finance systems were the first module to be used within the project. The other departments were amazed at the ability of finance department to develop and use their system within twelve months considering the complexity of the finance system itself.

On deployment most of the requirements were met and the users were very excited in using the new systems, however, there was resistance to the new systems (P8). The users were used to the legacy system since they had been using it for years. Some might have been using it from the first day they started working, hence they complained that the systems were not user friendly. They started to appreciate the new system once they had actually completed the whole process, whereby they were able to experience the additional functionalities through the system integration. At the same time, to avoid this resistance spreading to others, awareness of the system was raised through intensive system training. This enabled users to have the feel of the new systems. Within the

stakeholder approach, the stakeholders' expectations of the system roll-out were largely met when it ran smoothly. The vendors managed to complete the development in December 2005 and the system was rolled out in January 2006. The users were satisfied with the functionalities available with the new system, which were better than what they had before. The alignment of interest and expectation among stakeholders further created these coalitions that ensured successful completion and deployment of the system.

At the work level, the system use always creates need for changes and modification. It was after the system roll-out that the clerical users were complaining that the systems were not user friendly (W8).

Technology People W8 Task Structure	The operational level users found it was hard to leave the legacy system and move to the new system. They were complaining that the new systems were not user friendly. Another reason for their resistance was that they could not see their requirement in the system, and thus lacked a sense of ownership. They complained to the vendor that the top level users did not know their actual work, and thus ignored their requests. They planned to create a work-around if the systems were not modified to their requirement. This created a gap between people and task and people and technology. *Stakeholder Analysis* *At the work level, the new system faced resistance from the users. The user had several expectations of the new system. First it was to be similar to their legacy system in that the functionalities should support their daily operations. They also expected their requirements to be embedded in the new system which they thought would help in improving their work, but their requirement was ignored by their supervisors. This created conflict between the users (people) and their daily operation (task), where they labelled the new system as unfriendly. This created conflict between the users (people) and the new system (technology), where the user threatened not to use the system and create a work-around.*

Although requests were made during the requirement sessions and system training, they were either rejected or modified. Thus, the functionalities accommodated top level users only, ignoring the needs of those actually using the system. They were on the verge of abandoning the system if the systems were not modified to their needs. Considering their intentions, the vendor accommodated their request and made changes to the

system without jeopardizing its overall structure (W9). As mentioned by the vendor developer:

"…to follow the operation level. It is not all requirement not agreed by the operations level, only on certain processes. They [the clerical staff] even told me that the higher level staffs do not know the trouble that they faced. There are quite a number of things that I have to modify to cater for the operations requirement to ensure implementation."

Vendor developer, February 2009

The closing of the financial year, using the new system, ran smoothly. Accounts were closed in a timely and complete manner. Financial reports were verified, tallied and confirmed. Further to this, the audit process also ran smoothly without major issues. Auditors were satisfied with the reports and the trails that the system provided.

	The internal conflict that occurred between the vendor and the main contractor affected the vendor's work in the project. Whilst the vendor was depending on the payment from projects for their operations, a non-payment from the main contractor created a major setback for them. Since the main contractor was avoiding any communication with them, the only way to solve this problem was to terminate their contract in the project. This created a gap between people and task and people and structure, and their agreement with the main contractor collapsed.
	Stakeholder Analysis *It was the expectation of the vendor to receive payment for the work they completed. But due to the contract arrangement, all payments were made through their main contractor. As such, the main contractor was to receive payment from clients and pay the vendor for the amount of work completed. Conflict arose between the vendor (people) and the main contractor (people) when the main contractor failed to make payments to the vendor up to the point where the vendor limited working capital for the project. The vendor terminated their contract with the main contractor and left the project. The nature of the system development was that it was expected to ensure timely deliverable of project output. However, due to this unforeseen circumstance, conflict arose between the vendor (people) and the system development (task) when their agreement with the main contractor was terminated and all development activities were stopped. This contract termination further created conflict between the vendor (people) and the project team structure (structure).*

The vendor was in their second phase development when disaster struck (V9). The main contractor failed to make payments to the vendor. The vendor was appointed to the project through a fronting arrangement, with another company being the main contractor. The vendor was the sub-contractor for the project. The reason why the vendor did not individually contract themselves, was that their company capital was limited and insufficient to support the overall project cost. Thus by hanging on a larger company, they were able to bid on a bigger project. Being a sub-contractor, all payment in relation to the development was made by the client directly to the main contractor, who was then supposed to transfer the payment to the vendor. What happened was that although the payment was made to the main contractor by the clients, there was no payment received by the vendor. The vendor came to know this because they were currently working closely with the finance team, thus information on all payments made was known to them. It was after three consecutive payments to the main contractor and no payment received that the vendor decided to stop all development activities and terminate the contract. But this was with the knowledge of the clients and the clients understood their dilemma.
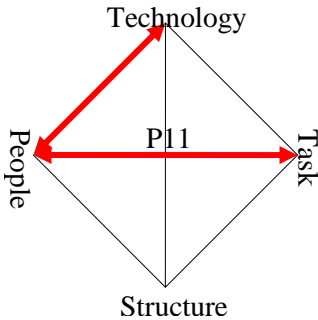
Technology People — P9 — Task Structure	Upon discussion with the vendor, the client decided to terminate the contract with the main contractor. This created a gap between people and task, where no party took over the development of the systems and between people and structure where the termination of the contractor / vendor caused the project team structure to suffer. *Stakeholder Analysis* *The high quality of work shown by the vendor improved their relationship with the client, thus created a coalition. The client felt sorry for the vendor for their unpaid work done. Conflict arose when the client (people) then decided to terminate their contract with the main contractor (people). Due to this termination the vendor automatically stopped all system development activities thus created another conflict between the vendor (people) and system development (task). The termination of the main contractor and the vendor created further conflict between the people and the project team (structure). This weakened the project team structure and jeopardised the project continuity.*

Although the vendor terminated themselves from the project, their relationships with the clients were still strong and continued to bloom to where the client had signed a one-year maintenance contract with the vendor (V10). At this point, following stakeholder analysis, two conflicts arose and a coalition emerged. The termination of the contract
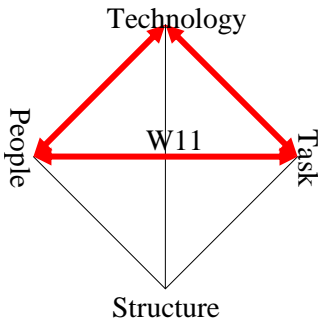
between the vendor and the main contractor and the client with the main contractor was due to conflicts. This also created a coalition between the vendor and the clients, due to the fact that the clients were very satisfied with the quality of work done by the vendors. As a result, the client offered the vendor a maintenance contract for the new systems. During this time, the vendor took the opportunity not only to maintain the system but also to develop other supporting systems.

The contract termination was considered as a blessing in disguise (P10). The vendor leaving the site had created the need for the ICT developers to step up. Rather than just co-ordinating the project, it was time for them to actually do the development. But they needed time to study the design and the structure of the system before they could actually make any changes or modification. Thus they had taken the opportunity to learn from the vendor during their maintenance contract and started to maintain and support the users. There were several expectations of system maintenance. For the vendor, the signed contract served the purpose to support and maintain the existing systems. For the ICT developers, expectation to learn new skills during this project never faded. It was their interest to learn and to assist the vendor to maintain the system. It was during this maintenance period that the vendor had more time to sit down and transfer all their skills and knowledge to the ICT developers. Based on the actual users' change requests, they started to make modifications and changes to the systems with the vendors. This helped to meet the expectation of the steering committee for the ICT developers to assist in system enhancement and maintenance. The users, taking advantage of this opportunity, requested changes and the ICT developers felt overwhelmed and not able to cope with the request (W11 and P12).

| | As the users started to feel comfortable with the new systems, they also started to request changes to make the systems full proof. This created a gap between technology and task, technology and people, and people and task where it seems the new systems offered were not fully supporting their operations. *Stakeholder Analysis* *For the users, the new system was to support their daily operations and reporting. But upon deployment and system use, the users alleged that the new system was not fully proof and that it required modification and enhancement. This conflict between the users (people) and the new system (technology) caused continuous requests for system* |

	modification. Similarly, the new system was also found to be lacking functionalities to support their daily operations. This further created conflict between new system (technology) and daily operations (task). Combining these two conflicts, further conflict arose between the users (people) and the daily operation (task) due to the fact that the users were not able to conduct their work due to incomplete functionalities of the system.
Technology People P11 Task Structure	The changes requested by the users were increasing by the day. The more they used the system, the more changes they requested. With their limited knowledge, the IT developers felt overwhelmed with the task. Therefore, this created gaps between task and people and people and technology, being a failure of the IT developers to understand the systems. *Stakeholder Analysis* *It was the users' expectation that all requests for changes and modification should be perfectly completed and it was expected of the ICT developers to make it all work. The new system itself was open for modification and enhancement due to their right for the system source code. However, in meeting this expectation the ICT developers were facing difficulties in modifying the system due to their limited knowledge of the system. This created a conflict between the ICT developers (people) and the new system (technology) where the ICT developers failed to understand the requirements and complex system structure. As a result they modified the system based on what they knew rather than what they should know. Another conflict between the ICT developers (people) and system modification (task) arose when the ICT developers failed to make correct or sound modification. The result of this incomplete modification was experienced by the users.*

Sadly, their willingness to study and make changes to the system did not compensate for the mistakes that they had made to the systems. Some of the changes that they carried out were incomplete, thus creating more problems for the users. Their lack of finance system knowledge had made the users frustrated (W11).

Technology People W11 Task Structure	At the work level, the modification done by the novice IT developers created frustrations for the users upon using the systems. Due to their lack of knowledge, the modification to the systems was incomplete and patchy. They failed to understand the overall structure of the finance system before starting with the modifications. Mistakes happened even when the users had specifically identified the changes that they wanted. This caused gaps between people and task and technology and people. As a result this also created a gap between technology and task, due to the system's failure to support their operations. *Stakeholder Analysis* *The users' expectation towards the new system increased as*

	they became more familiar with the functionalities. This change in expectation created conflict between the new system functionality and the users. To meet this expectation, they started to request changes to the systems to further improve their work process. At the work level, the users' expectation for a modified system was not met. It was getting worse. This was because the ICT developers did not understand the request and they did not have enough knowledge and skills to make the modification. It created more conflict between the new system (technology) and the users (people) since the system did not allow them to carry out their task. Another conflict was between the users (people) and daily operation (task), where the new system's unfriendliness affected the users' daily operations task. The result of these conflicts created further conflict between the new system (technology) and daily operations (task) since the modification carried out by the ICT developers created more frustration for the users. The modified system failed to support the operations.

The users almost gave up with the incompetence of the IT developers. As mentioned by the head of finance:

"Sometimes it is frustration to them that they do not understand our requirement but I told my staff that we are the user, we think that what we have to explain is easy but they do not have the background. Try to be patient with them. We can't force them to do it. Some of my staff has already given up. But then we will not get what we wanted. The problem is that when you request changes, they will touch one table and it will affect other tables that cause problems in other systems."

Head of Finance, February 2009

The users had to understand the technicality of the system in order to make the developers understand their request. Only then would the modification be successful. It was up to a point where the users felt like learning how to do the programming themselves rather than relying on the developers. In order to solve this issue, meetings between IT and finance were held to discuss the numerous requests for system changes (P12). As a solution, all requests had to go through the IT developers who were stationed in the finance department. She would screen all requests to ensure validity. Any requests that related to similar screens were consolidated, so that only a valid request was passed to the other IT developers to make the changes. Apart from
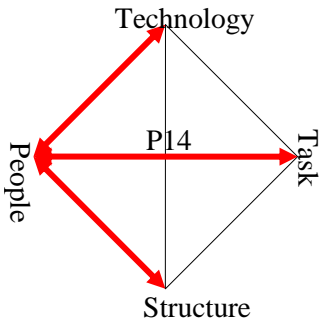
screening the users' requests, the IT developers were also in charge of modifying smaller requests to ensure system continuity.

Following stakeholder analysis, the conflict between the new system and the users continued until a meeting between the head of ICT and the finance project co-ordinator took place. The function of the users' co-ordinator was to co-ordinate activities relating to the users' working committee. The head of ICT was similarly to support ICT developers in dealing with development issues. The head of ICT complained that the users were requesting too many modifications to the systems which the ICT developers could not comprehend. During the discussion it was found that not all change requests required major modification. Some of the change requests only related to minor screen or button display. But some change requests required change to the source code and databases. It was decided a new change procedure should be put in place. One ICT developers would be stationed in finance to screen all change requests. Only major changes would be forwarded to the other ICT developers for modification. Other minor changes would either be compiled and modified or passed back to their supervisor for further training. The new change request procedure agreed depicted the coalition and the alignment of interests and expectations between the co-ordinator and the ICT developers, which resulted in the smooth running of the project.

Determining the status of the development, the amount required to complete the system was still large for it to be offered through quotation method i.e below RM200,000. Thus the users tendered out the supply and delivery of twenty percent of the integrated finance system. As for the vendor, due to their capital constraints and trying to avoid the risk of being defrauded again, they did not respond to the invitation. Upon the tender closing date, another contractor was appointed to continue the development (P13). While the project was currently at eighty percent completion, a new contractor was appointed to complete the development. The aligned expectations among the users, steering committee and the new contractor created a coalition in completing the project.

At eighty percent completion, the work-in-progress (WIP) system needed to be completed. It was also the expectation of the steering committee to complete the new

system. At the same time, the users were expecting a full blown system to support operations. The new contractor was thus expected to complete the system. The appointment of a contractor would complete the development of the remaining twenty percent of the finance system, which was mostly supporting modules.

Technology P14 People ⟷ Task Structure	The new contractor came in with two developers trying to understand the existing system structure. With one developer having knowledge on the tools used by the previous vendor, the other developers were a protégé trying to study the system from scratch. As a preliminary test, the users gave them the budget modules. After several days, they failed to produce any deliverables. In addition, the contractor's limited working hours made it worse. With no progress on the task given, the clients decided to terminate the new contractor. Their failure to understand the existing design structure affected their capability to undertake and complete the task. This created a gap between people and task and task and technology. The termination of the contractor further created a gap between people and structure. *Stakeholder Analysis* *The new contractor was expected to complete 20 percent of the new system. The main module to be completed was the budgeting module. Although the new contractor had prior experience in developing systems using similar tools they failed to understand the programming structure of the previous vendor. Conflict arose between the new contractor (people) and WIP system (technology) where the new contractor failed to understand system structure and programming. At the same time, their limited working hours also contributed to their failure. This failure to complete the development created a conflict between the new contractor (people) and system development (task) where the contractor failed to accommodate the users' request. The contractor's failure to continue developing the system resulted in their termination. The termination of the new contractor's contract created conflict in the project team structure that was the users, steering committee and the IT department. With the ICT developers lack of knowledge, there was no way that they could complete the development. As a result, system development was generally halted with only minute modification and enhancement by the ICT developers.*

On the first day, two representatives of the contractor came to the site and reviewed the system. According to the new contractor, they needed more time to study the system structure and design architecture of the system before they could proceed with the development of the system. The low commitment of the new contractor was shown when they came in at 10am and left around 5pm every day. With the amount of work

that needed to be completed, the users sensed that it would not be completed. The new contractor failed to understand the system structure of the existing system – the design and structure of the system that had been completed by the vendor (P14). The users had decided to only test their capability with one of the modules which was already partly developed by the previous vendor. Without much progress on the development, the contractor was terminated by the users (P14).

During this time the ICT developers had managed to understand the system and accommodate any modifications required by the users. Confident with their capabilities, the finance team discussed outstanding modules that needed to be developed with the ICT team. Any modules that were more complicated had to be outsourced through quotations. The ICT developers managed to develop modules up to a point where the total project cost was less than RM200,000, where a call for quotation could be made. At this level, the vendor was financially capable of replying to any invitation made. When the finance department finally opened an offer for project continuation, without hesitation, the vendor submitted a proposal and their offer was accepted (P15). Within the stakeholder analysis it was expected that the WIP system needed to be completed in order to support the users' operations. During this time, the need for a developer heightened the ICT developers' willingness to assist in the development. Coalition between the WIP system (technology) and the ICT developers (people) emerged when the ICT developers increased their initiatives and willingness to learn and understand the new system, which improved the quality of their modification. This resulted in the users' high satisfaction and full acceptance of the changes being made. This created coalition between the modified system (technology) and the users (people). The users' decision to appoint the vendor to continue the development of the system created further coalition within the project level. With this arrangement, the ICT developers would concentrate on the modification of the system and the vendor would concentrate on the 20 percent development.

In general, this project was a continuation of the existing system. They called it phase two of the project. This phase involved either new supplementary modules or additional functionalities for modules completed earlier (refer to Figure 21). The project timeline

was four months and at the same time the vendor was also serving the maintenance contract for the existing system (V15). This four-month project ran smoothly without any hiccups. The vendor's capability to understand the users' needs and at the same time, the users' capability to present their ideas clearly helped.
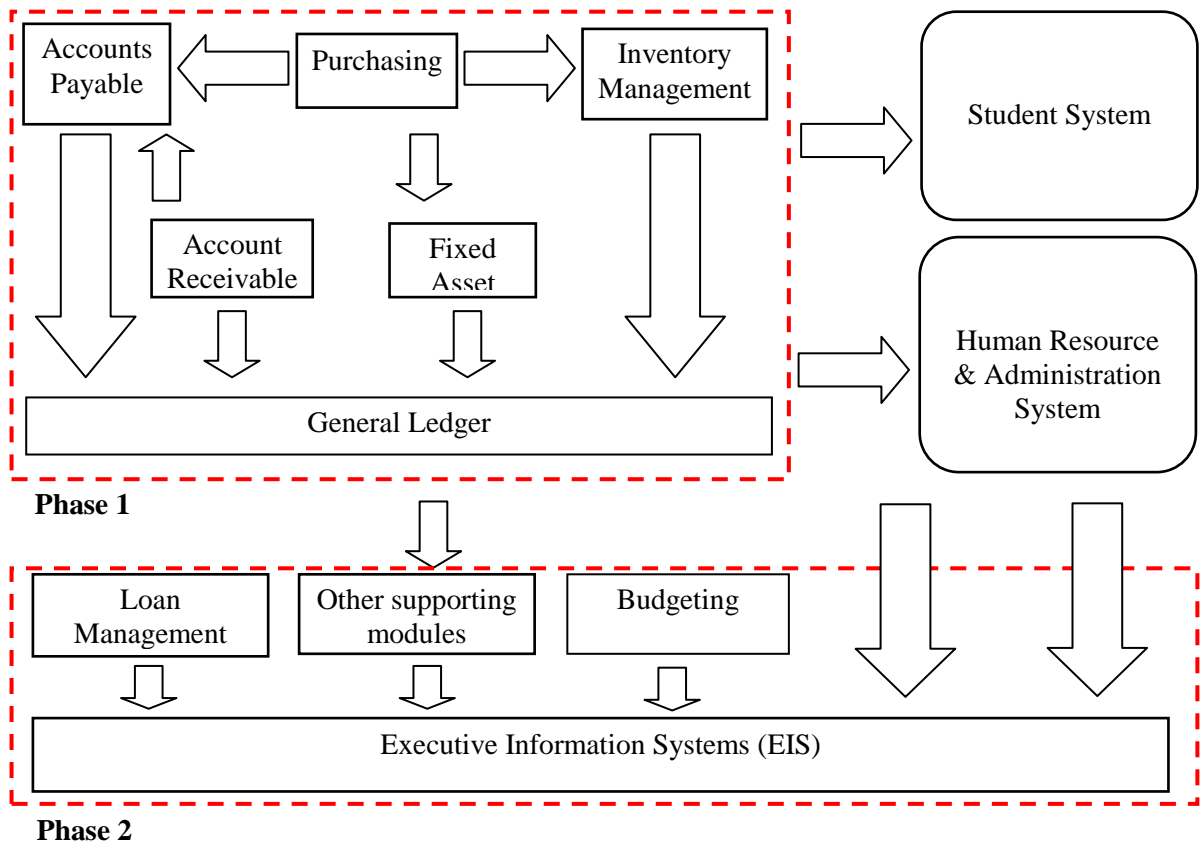
Figure 21: Finance system development by phase

At the vendor level, the vendor was delighted to accept the offer to continue with the development. It was their expectation to fully complete the system and create a so-called best practice financial system for universities. In other words, success in delivering the full blown system to their client would be one step in meeting their expectation on the project. It was during the maintenance contract period that the vendor continuously developed the balance of the system. Thus the 4-month period allocated for the contract was easy for the vendor. At the same time, the coalitions with the users provided a stable requirement to make the development possible. Combined with the vendor's rational unified process of system development, this improved the vendor's development efficiency. The vendor's strong relationship with the clients created a coalition between them. The client was satisfied and confident of the quality

of work done by the vendor. Further to the completion of the development and as a result of their strong coalition, the vendor was also offered a maintenance contract for one year.

The new systems had in a way overcome the limitation of the legacy systems (W15). The integrated nature of the new systems had ensured efficient optimization of resources. This was shown through the number of finance staff needed to support the number of staff and students. It also solved the issues of redundancy of work due to the un-integrated nature of the legacy systems. The new systems had also improved the organizational transparency. The new systems were embedded with process controls which ensured valid activities were carried out throughout the process. In addition, the improved financial reporting, without having to worry about duplication of data or unverifiable data from other systems, had strengthened the financial governance of the university as a whole. In other words, compared with their legacy systems, the new system had improved their way of doing work, their operations. The integration between modules intra- and inter-departmentally was seamless. This successfully solved their problem of work redundancy and reporting inconsistencies. Their confidence over the new system was shown when the users claimed that they had the best practice system for universities and they were very sure that other universities were able to replicate and use the system that they had now. They also claimed that their systems exceeded any requirement for a university system. It was a complete campus solution system. As a government agency, they were burdened with the need to use the SAGA compliance system and what they had now it could accommodate more than SAGA required. But as always, any new systems require changes to existing work process and these changes had made the use of the new system more efficient and effective. In general, the new integrated system had ensured a more transparent process thus improving accountability.

At the work level, the users were very satisfied with the new system. The new system met all users' expectations especially after modification and changes were made. The use of the new system improved the users' operational efficiency. The new integrated system deployed managed not only to fulfil their entire requirement but also provide a

best practice for a university finance systems. This was a result of the embedded operational best practice within the system, and was due to the fact the systems do not only cover operational requirements but also incorporate applicable standards and procedures.

For the vendor, the completion of the project, although with some drama, had upgraded their base system to a new level of best practice. The ten-year operational robustness of the client's business processes had pushed the vendor's system to a new level of completeness. The validity of the users' work process had ensured a more robust financial system for education. The new project would further improve the system capabilities and functionalities, making it applicable to other universities.

At the project level, the need for a new integrated system to support operations and reporting requirement was achieved with several challenges along the way. As the project completed, the users broke away from the project and left the ICT developers continuously maintaining the system through modification and enhancement assisting the vendor. It was through this coalition that the ICT developers gained knowledge and skills on development. For the IT developers, the knowledge gathered through their hands-on experiences dealing with the users and through their intimate co-operation with the vendor had improved their understanding towards the overall picture of the systems. It had therefore increased their capability to accommodate any changes or modification (P16).

In this case study, we focused on the implementation of IMS for finance. As a result of several major critical incidents, the development of the finance system was divided into two major phases. The first phase involved all critical operational modules which included general ledger, accounts receivable, accounts payable, procurement and fixed asset. It was after the completion of the first phase system modules that the vendor brought it to other clients (Case 3). The second phase generally involved supplementary modules like budgeting system, loan management system, executive information system (EIS) and other supporting systems. The full completion of the integrated financial

systems after the second phase increased the vendor's confidence to introduce it to Case 1.

6.5   Horizontal and vertical analysis

6.5.1   Horizontal analysis

It is evident in Case 2 how the vendor change affected the progress of the project. The vendor (Vendor 1) came into the project with the base system developed in Case 1. During the 12 months of the project, the vendor managed to develop and implement 80 percent of the finance system. This finance system was an improvement from the original base system due to Case 2 more robust and complete business processes that the vendor could work on. However, a punctuation occurred when the vendor had to leave project site due to an internal conflict (the financial arrangement with the main contractor). This action (leaving the project) caused conflicts that created gaps within the project elements (V9). Gaps were created between the vendor (people), system development (task) and the project team (structure). However, the conflicts were resolved when the ICT developers took charge of the system modification and enhancement. Even though the ICT developers had successfully managed users change requests, they were not able to complete the remaining 20 percent of the system.

A new vendor (Vendor 2) was appointed by Case 2 to complete the remaining 20 percent of the system (P13). Although initially the appointment was seen as a change that could improve the project it ended with another punctuation emerging within the project when the vendor 2 failed to understand the existing system structure and to complete the system. They were later fired from the project (P14). As explained by one of the finance users:

"We tendered the system to another company; we requested them to start with the budget modules. But they failed to complete the development. Their reason is that they need time to study the existing system structure and system design (script)… In their team there is only 1 senior developer that really knows the application program whilst the other is a junior staff who is only learning to use the program. Of course they will not be able to complete the development. Finally, we terminated their contract."

User 3, February 2009

187

At this stage, although the ICT developers had improved their development skills, they were tied up with the modification and enhancement of the existing system and had no time to develop the remaining systems.

The finance department then decided to appoint the original vendor (Vendor 1) in April 2008 to complete the system (P15). This appointment managed to resolve conflicts within the project level. The vendor's vast experience and knowledge on the system enabled smooth development of the remaining 20 percent of the system. Once completed the system was continuously being maintained and supported by the ICT developers.

6.5.2   Vertical analysis

Vertical analysis attempts to understand the interdependencies between different project levels. In Case 2, it was approximately one year after the start of the project that the finance system was rolled out and the users started using the system (P8). Since the users were currently using the existing system, the deployment faced several criticism or resistance (W8). The users were too attached to their existing systems and this created conflicts between the new system (technology) and their daily activities (task). However, as mentioned by project coordinator, these conflicts were resolved through continuous training and at the same time, continuous modification of the system by the vendor. Similarly, another interaction between the vendor and the work level occurred for the deployment of the remaining 20 percent of the system in August 2008 (P15). Started in April, it took only 4 months for Vendor 1 to complete the system. At W15, the users were satisfied with the level of completeness and user-friendliness of the system.

In Case 2, these interdependencies between project levels were not only established during system deployment but also during other stages of the development. One relevant event that occurred in the vendor level that affected work level activities was the data migration exercise (V5, W5). Due to the vast amount of data being transferred

to the new database, problems occurred during the exercise. The data migrated to the new database did not tally with the control report from the old database. Thus a reconciliation exercise was conducted that created a gap between finance staff and daily operations due to the additional task of account reconciliation.

Another critical event in the project level that affected the work level was the ICT developers' failure to conduct effective system changes and modification. This was largely due to their lack of knowledge on the system structure and programming (P11). This created conflicts between ICT developers (people), new system (technology) and system modification (task). As a result of these inconsistencies, the users were frustrated with the unfriendly and incomplete system. It created conflicts between the new system (technology), users (people) and daily operations (task) at the work level (W11).

In Case 2, our horizontal analysis shows how change in vendor (software developers) affects project outcomes. Our vertical analysis of Case 2 shows that vertical interactions not only occur during system deployment alone but also during other project activities, in this case, data migration exercise (vendor activities) and unstable system modification (project level activities) that affected work level activities.

6.6   Summary

This chapter attempts to explain and narrate the implementation process of integrated financial systems in Case 2. The project was started due to conflict at the work level when the users demonstrated their concern over the failure of the legacy system to support their operations. However, throughout the project, coalition between stakeholders within all project levels was established that ensured minimal hiccups. Among major conflicts that arose was when the vendor terminated their contract with the main contractor due to the commercial issue of non-payment. This caused the clients to appoint a new contractor to continue with the project, which further proved disastrous. Another major conflict that arose was when the data migrated from the legacy system were not stable and caused additional tasks for the users and the vendors. This established a domino effect when the users' plan to conduct a parallel deployment

strategy was scrapped due to the vendor's failure to complete the development. However, due to strong communication and knowledge structure, the project was completed and fully used.

CHAPTER SEVEN

7   Findings - Case 3

7.1   Introduction

Chapter Seven presents the analysis of Case 3. It attempts to illustrate the project trajectory erected based on the PSIC model as presented in Figure 22 on pages 192 to 195. During the analysis, we attempt to identify the critical events that occurred during the implementation and at the same time identify the stakeholders involved. The identification of the critical events suggests the gaps that were created among the socio-technical elements. Further analysis on the stakeholders identifies their interests and expectations of each event and how conflicts and coalition emerged between these stakeholders that caused the gaps. Although Case 3 in general is similar to Case 1 and Case 2 which is a university, it has some interesting organizational and managerial uniqueness that were uncovered during the analysis process.

7.2   Antecedent conditions

7.2.1   Antecedent conditions: Organizational structure

Although it was seen that the merger was a policy driven strategy, the operationalisation of the organizational management was much more complicated and complex. Previously, these institutes were separate legal entities although they were governed by the same agency under the ministry. Thus the merger of these twelve institutes within ten campuses had proven to be difficult.

7.2.2   Antecedent conditions: Problems with the legacy system

The whole campus finance division was currently using a stand-alone off-the-shelf system. Data from source documents (e.g: receipts, invoices and payment vouchers) were manually input into the system for verification and posted into individual ledgers. At each month-end, all campuses were required to send their back-up disk of their monthly transactions for consolidation by the headquarters for the purpose of management reporting.

Organizational Context

Technology

People   Task

Structure

Project Level issues

| Major functionalities missing | | Overall system roll-out |

Project Level

P14   P17

Vendor Level

V14   V15   V16   V19   Contract terminated

Vendor Level issues

| Senior developer leaves | 2nd data migration | Appointment & termination BA | | Vendor leaves project site |

Work Level issues

Audit process   32% system completion

Work Level

W15   W17   W18   W19

July 2008

February 2009

194

Figure 22: Project trajectory - Case 3

This allowed each of the campuses to create their own processes as long as the required output was generated. Any information required from other departments was gathered through hardcopy documents and individually updated into the systems (e.g: sponsor status and hostels bookings). As the university was implementing a cash-based system, no student invoices were generated. Revenue was recognized from cash collected from students during registration or based on the amount banked by the students directly. The individual students banked their money directly into the university's accounts and presented the bank slip during registration. Through these manual processes changes to the student data were made as and when they were required. In the existing system, changes to student courses were updated manually upon advice from respective department.

7.2.3 Antecedent condition: The new integrated management (IMS) system for education

This integrated system was initially jointly developed by Company A, a public limited company and a public university (Case 1) in 2002 through a joint development agreement. Through this synergy, this integrated system had managed to support the ever challenging nature of university operations. This system had gone through several test beds i.e prior projects. Therefore, this system had been tried and tested within the university environment. One of the most relevant tests was the deployment of the system in Case 2. The Case 2 project provides a more robust and stable development of the integrated finance system, largely due to Case 2's more stable and complete business processes, coupled with Case 2 users' vast experiences. The latest version of Case 2 integrated finance system was used as the base system in the Case 3 project. Figure 23 provides a depiction of the integrated finance system framework.
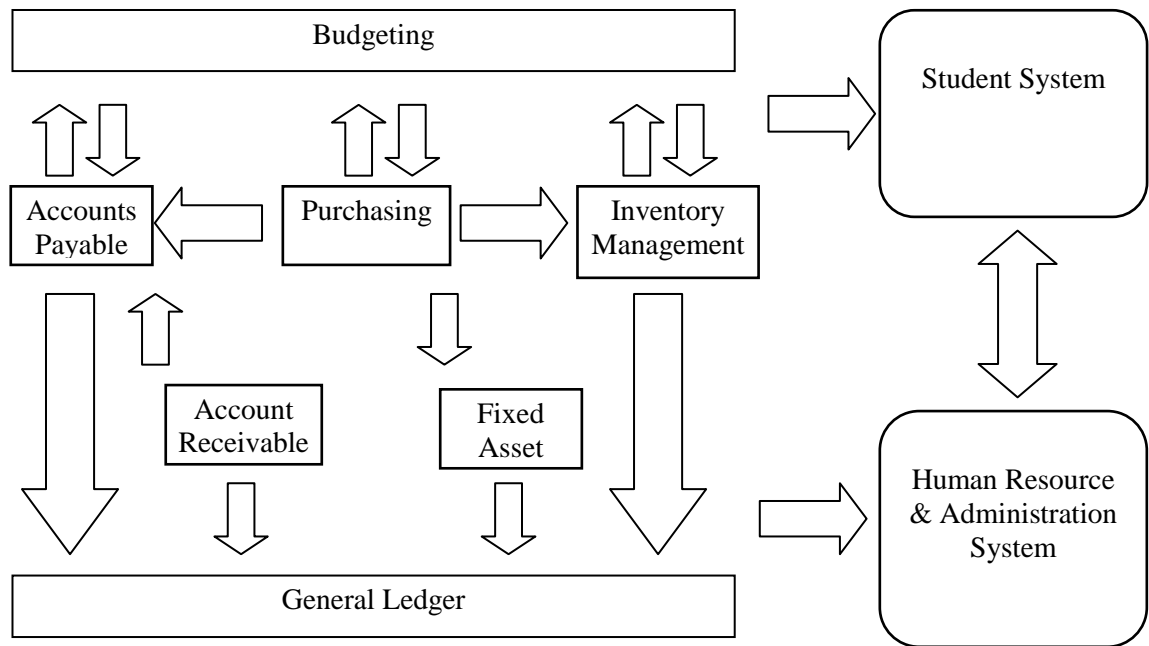
Figure 23: Integrated management system (IMS) framework

In general, the integrated system covers three main important modules: the student system, the finance system and the human resource and administration system. As shown by the above figure, each of these systems was integrated or interconnected to the others. In this case study, the focus was on the implementation project for the finance modules.

7.3 Project implementation

The inception – The merger exercise of the ten campuses had proven to be challenging not only at the organizational level but also at the operational level. These campuses, which had been operated individually although within the same industry, had conducted their business differently. This was apparent from their business processes which were diverse. Therefore, the need for a new system was not only to streamline their business processes among campuses but also to integrate their business functions within campuses.

There were several reasons for the organization to initiate the implementation of the enterprise system, including to support expanding operations, to improvise process efficiency, to reduce operational cost, to replace the legacy system and act as a means to streamline the diverse business processes among different institutes. Upon establishing

the strategic reasoning for the implementation, the next daunting task was to identify alternative systems that were available for consideration. The dilemma that was faced by the committee was to choose either a locally developed system or a standard package offered by international companies e.g. SAP and Peoplesoft.

A locally developed enterprise system was perceived to be more relevant and suited to its environment, whilst the standard package enterprise systems were more complicated, less user-friendly and costly. The identification of suitable systems was carried out through visiting project sites. A visit was made by a group of users to the other university that already implemented the system which was locally developed. A presentation was made by their users, followed by a question and answer session. Through this, the users were able to understand the system that they were going to work with and were able to get an idea of what the system would look like. This was a way to enable them to get a grasp of the future challenges. A unanimous decision was made upon deliberation with users. In this case the locally developed system was chosen over the packaged software due to its applicability to the university environment and its user-friendliness. Concerns were very much placed over the student system compared to any other modules. The other users were just following whatever was chosen and working with it.

7.3.1   The project team – steering committee

The steering committee comprised the university's deputy president who acted as the chairman and all heads of departments. In this project the head of Information Technology Department (ITD) was designated as the project owner.

7.3.2   The project team – finance working committee

The finance working committee was established by invitation from the head of finance. During the initial working committee meeting, all persons in charge of finance from all campuses were invited plus another user level representative. With ten campuses, each working committee meeting was attended by at least 20 members. Due to the fact that these campuses were different in their practices, their involvement was hoped to streamline the processes and thus enable the generation of a more robust and complete business requirement.

7.3.3   The project team – the software developer

The vendor (software vendor) came into the project with an integrated university system which had been successfully developed and deployed in several other universities, including Case 1 and Case 2. In this project, the vendor's intention was to "plug and play" whatever was being used in another university to this project site. This simplicity was shown through the allocation of a 24-month (two-year) project period. The vendor's assumption was that the client, being just another university, would be able to adopt whatever was being used with minimal customization. Similar to their other development projects, the vendor was currently attempting to establish a best practice for the university enterprise system. The vendor's finance development team leader had vast knowledge and experience on finance system development. Other team members included a senior vendor who had excellent technical skills and a good understanding of finance business process who was assisted by a junior vendor who had sound technical skills but lacked business knowledge. Through this structure, it was expected that the junior vendor would accumulate his/her knowledge on business process through transfers of knowledge from users and also their seniors. This three-layer structure was intended to be maintained in order to support the overall system development project.

7.3.4   The project team – the project manager(s)
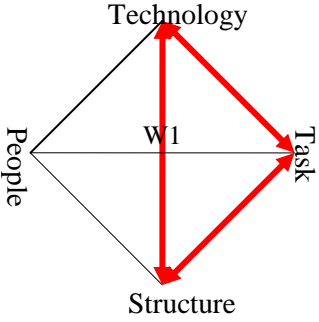
The appointment of the project managers was to plan, to organize and to control the process of system development project. At the same time, they were the middle men between the client and the contractor, the users and the developers. It was pertinent to ensure that the project manager had not only technical skills in abundance but also interpersonal skills. As will be narrated, this project experienced four project managers over the project life with their own stories to tell.

7.3.5   The project team – IT department

As mentioned earlier, the IT department was the project owner. However, although they owned it, they had no control over it. They left it to the users to decide what they required from the system. At the same time, they had a pool of IT analysts to provide technical support to the project but as the project unfolded these IT analysts were seen as mere project coordinators, setting up meetings which they did not even attend.

7.4   Detailed chronological narratives of project trajectory

Case 3 is a university which was established in 2002 based on a merger of seven institutes governed by a government agency. The main intention of the merger exercise was to upgrade the level of graduates in engineering which were currently at diploma level. Over the years three more institutes were brought under the university umbrella (W1).

Technology / People — W1 — Task / Structure (diagram)	The merger of different institutions created the need for a more robust financial system compared to the existing stand alone systems which were currently supporting their operations. Due to this merger also, a new campus which housed three faculties was established. It also acted as the university headquarters for the campuses, as the nucleus for the university operations and administration. This new structure also created the need for a new integrated system to replace the legacy system. Thus it created a gap between technology and task (being a legacy system not capable of supporting the expanding workload), technology and structure (the merger caused the legacy system to be obsolete) and also between task and structure (the establishment of headquarters created new functions in the organization) at the work level. *Stakeholder Analysis* *The merger was seen as a stepping stone in improving the level of education for the student and at the same time to improve the use and allocation of resources. However this change created conflict for other elements of the organization. Each institute that was merged had its own business process. The new structure (structure) created a conflict with these business processes (structure) due to their inconsistency and lack of standardization where each campus had its own unique business processes.* *This merger exercise/new structure (structure) also created conflict with the existing legacy system (technology) used by the institutes. Although the legacy system used was relatively similar in nature the applications were unique and diverse. This was largely due to the diverse business process (structure) embedded within each institute. Thus the merger of different institutions created the need for a more robust financial system compared to the existing stand alone systems which were currently supporting their operations.* *Due to this merger also, a new campus which housed three faculties was established which also acted as the headquarters for the campuses. It was the nucleus for the university operations and administration. The creation of campuses headquarters also created conflict between the new structure (structure) and its co-ordination task (task). As such this new structure also created the need for a new integrated system to replace the legacy system. As a result of these conflicts within the work system, a need to replace the legacy system arose.*

While the organizational structure remained manageable, they were having trouble with the individual campuses' divergent work processes. Thus, the notion of implementing a system was introduced with its main purpose to streamline the campuses business processes. As highlighted by the head of the finance working committee:

"…the implementation of the finance system is to make sure that the processes are standardized throughout the campuses…"

<div align="right">Head of Finance, July 2008</div>

As a result, the integrated management system (IMS) was chosen due to its functionality fit, especially its student system whereas the other supporting systems were required to adapt to the organizational processes.
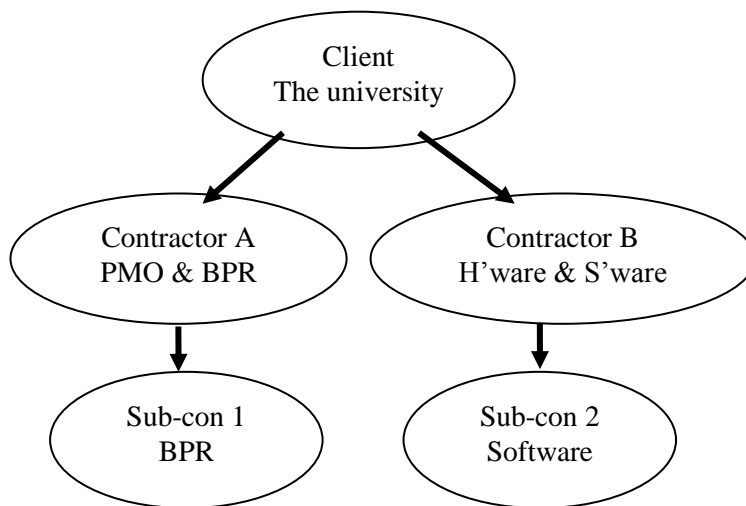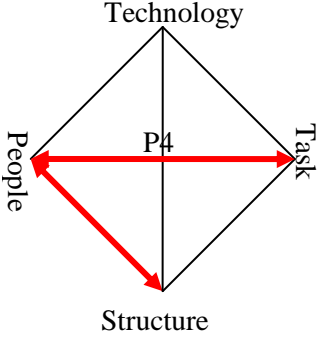
Figure 24: Project contract structure

The contract comprised three parties. The project contract was made between the university as the client, the project management office and business process re-engineering (BPR) contractor (Contractor A) and the hardware and software supplier (Contractor B) contractor. These two contractors further sub-contracted certain parts of the project. Contractor A sub-contracted the BPR parts (sub-contractor 1) and contractor B sub-contracted the software development task (sub-contractor 2). Consequently, sub-contractor 2 will be referred to as the vendor. The arrangement of the contract is depicted in Figure 24 above.

The first project manager (PM) had developed a strategy which concentrated on a project management tool. This tool was required to ensure project deliverables were on time. Using the verification cross-reference matrix (VCRM) approach, project milestones were established and risk identified. The project manager adopted the traditional system development life cycle (TSDLC) as his system development approach. Through this approach, development was expected to be completed in phases. Following this he started with the project risk identification.

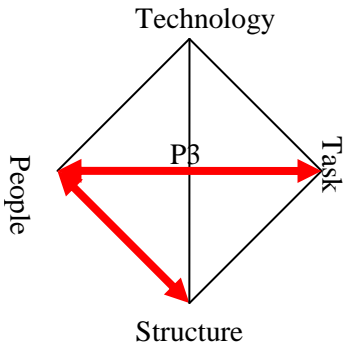|	
Technology People — P4 — Task Structure	Within two months of the PM's appointment, he was terminated due his part-time nature and also due to internal politics. This termination caused the project team structure to weaken and the task / job of the project manager was left hanging. This created a gap between people and task and people and structure. *Stakeholder Analysis* *The project was in balance when punctuation occurred. Within two months of the PM's appointment, he was terminated due his part-time nature and also due to internal politics. The decision was made as a result of the conflict between the Project Manager (people) and the Steering Committee (people). He left the project while he was still preparing his project risk management strategy and due to the nature of his termination, he did not leave any documentation for further continuation and deliberation. This termination caused the project team structure to weaken and the task of the project manager was left hanging thus creating conflict between project manager (people) and project team (structure). The termination also created a conflict between the project manager (people) and the project management task (task). Ironically, it seems that this termination did not have any impact on the vendor's development work. This was because the vendor was experienced enough to identify their own task and work independently to the project manager. During this time, the vendor started and continually conducted their business requirement session (BRS) with the users. Using Rational Unified Process (RUP), the vendor conducted a gap analysis based on the system process flow from their previous clients.*
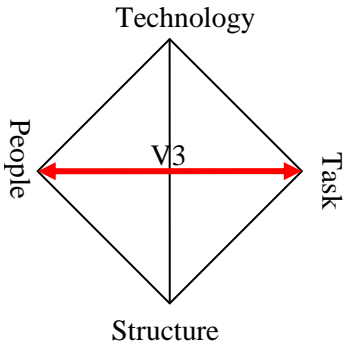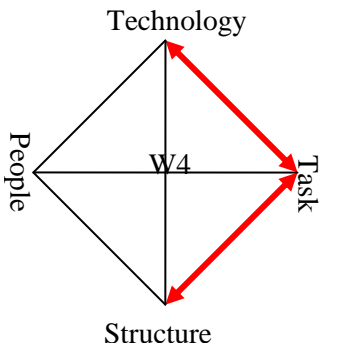
The project was in balance when punctuation occurred (P4). Due to the nature of his appointment and also political issues, the project manager was terminated. Ironically, it seems that this termination did not have any impact on the vendor's development work. This was because the vendor was experienced enough to identify their own task and work independently to the project manager. During this time, the vendor started and

continually conducted their business requirement session (BRS) with the users. Using Rational Unified Process (RUP), the vendor conducted a gap analysis based on the system process flow from their previous clients.

During the planning stage of the project, all project resources were identified and confirmed: however, when the project started, certain parts of the project team were unable to commit to the project. The BPR team who was supposed to carry out their task prior to the development withdrew from the project (P3).

Technology / People / P3 / Task / Structure	At the project level, the omission of the BPR team in the project widened the gap between people and structure where this missing link weakened the project team structure. Since these BPR activities were to be conducted by an expert, without them it could cause incomplete / inefficient process re-engineering, thus widening the gap between the people and task.
	Stakeholder Analysis
	The BPR team was expected to be in charge of the business process re-engineering (BPR) exercise, where through this BPR exercise, the process of radical redesign of existing work process commenced. Similarly, the need for this process re-engineering was critical to improve and to streamline the diverse business process of the different campuses. However, conflict between the BPR team (people) and project team (structure) arose when the BPR team withdrew themselves at the last minute. As such, further conflict arose between the BPR team (people) and BPR (task) when the expectation of the BPR exercise collapsed due to failure to conduct BPR.

As a result, the development started without any process being re-engineered. The vendor either failed to understand the complexities of the BPR process, or in trying to push the project forward, had agreed to absorb the re-engineering task. They planned to conduct the re-engineering of the users' multi-faceted processes in parallel to the development activities (V3).

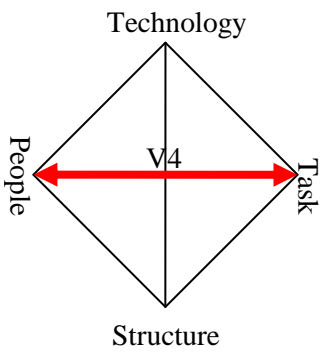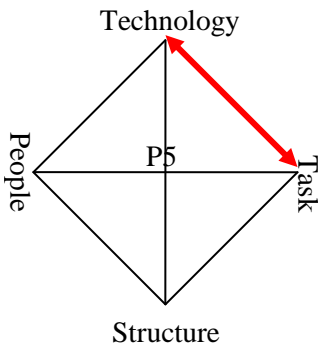|	
Technology People — V3 — Task Structure	At a different level, the absence of the BPR team caused the vendor (who was in the process of building up their reputation from their last project) to accept the challenge to conduct the BPR, when clearly they knew that they did not have qualified staff to conduct such activities. At the same time, they already had an existing load of development work. This created a gap between people and task. *Stakeholder Analysis* *The conflict that arose at the project level (P3) affected vendor level events. The vendor acknowledged that a specific BPR team was required to conduct an efficient BPR exercise with the use of their vast knowledge. However, when the BPR team failed to fulfil this obligation, the vendor was obliged to conduct the BPR exercise. This additional task created conflict between the vendor (people) and system development (task) when the vendor had to redirect some of their resources towards the new task.*
Technology People — W4 — Task Structure	At the work level, divergent legacy account code structure between campuses created problems in establishing streamlined account codes, thus creating a gap between structure and task. In the attempts by the vendor to simplify the account codes, the user emphasized that they wanted to maintain the legacy system 13-digit existing account code structure. This created a gap between technology and task. *Stakeholder Analysis* *The diverse business processes among the campuses also affected the account code structure of each campus. Each campus had a different account code structure. These diverse code structures (structure) caused conflict with the process of streamlining the account code (task). In addition to this, the legacy system (technology) that was currently embedded with the existing code structure also restricted the streamlining process (task) when the users were determined to maintain their old code structures. These inconsistent account code structures called for a process of streamlining that was expected to be problematic.*

In developing an integrated system, the vendor started the requirement session with the general ledger (GL) module, which was the heart of a finance system. In GL modules, the most fundamental task was to establish account code structures. During the requirement gathering exercise, the vendor presented to the finance committee team the previous client's account code structure and asked them about the applicability of the structure to their own (W4).

As mentioned earlier, there being no control on individual campuses processes in generating output, the campuses' account code structures were also different. Thus, before any discussion on account code structure was carried out, the existing account codes had to be streamlined. Since the vendor acted as the BPR team, they were entrusted with this task. The only positive note on the campuses code structure was that they had the same core structure, however, the detailing of the structure was problematic. For example the same account code number could be used differently by different campuses or similar items were being coded differently. The only thing that the vendor could do was to identify the differences and present them back to the committee for deliberation.

During that period, the vendor employed a business analyst to assist in the task. With assistance from the business analyst, the vendor tried to get the committee's agreement on the new account code structure which was based on the previous client. The committee rejected the suggested code structure and requested a new code structure, which was supposedly friendlier and reflected their processes. Their intention was to be able to identify the code item from just reading the account code. They wanted to see branch code, department code, division code, section code, unit code, program code, course code, activity code, financing code and the object code in one. They had come up with a twenty two-digit account code. The business analyst and the vendor's argument that an integrated system does not require an extended account code was not accepted. They were comparing it with their existing code structure which had thirteen digits (V4).

	At the vendor level, although the vendor tried to reduce their knowledge gap in BPR by appointing a business analyst, it did not assist in lobbying the use of the new account code structure to the user; the user even rejected the notion directly. With prior gaps not solved, this widened the existing gap between people and task. *Stakeholder Analysis* *At the vendor level, to accommodate the BPR process, they appointed a business analyst (BA). The task of the BA was to streamline the diverse account codes of the campuses into the new account code structure. This new account code structure was embedded in the vendor's new system. The coalition between the BA and the new code structure provided a strong reason for the users to follow. But the users were attached to their existing account code structure, which according to them*

	provided clearer pictures of the account. And they insisted that the vendor should follow the old structure. This created a conflict between the BA (people) and streamlining process (task). As a result, the BA had to continue lobbying for the use of the new account code structure.
Technology People — P5 — Task Structure	When the new PM took office, this was in a way strengthened the project team structure but at the same time introduced new gaps to the project. When she came in, she failed to revise the previous project structure and approach. She came in with a new project approach, a rapid approach. She shunned the previous traditional development approach. In accordance with this, she agreed with the steering committee to bring forward the system roll-out date to coincide with the student intake, thus reducing the development time to only six months. To accommodate this change, it was also suggested and agreed that the six-month development would only cover student related modules and deployment would be on a pilot site only. The appointment of the new PM although closing the gap between people and structure, also created gaps at the vendor level. The introduction of this new approach and strategy created a gap between technology and task at the project level. *Stakeholder Analysis* *The project was currently adrift without anyone to co-ordinate the development activities. The vendors continuously developed the system based on their existing base system. The vendor's previous experience in developing integrated systems created networks of potential project managers. With this coalition, the vendor suggested a project manager, who they believed could manage the project to success. With this coalition the steering committee decided to appoint the project manager. However, conflict arose between the new PM development approach, which was RAD (technology) and the existing system development activity (task) when the RAD implementation affected the overall system development approach. This caused an abrupt change to the existing project activities.*

Whilst finalizing the chart of accounts, the replacement project manager was appointed (P5). The appointment of the new project manager was based on the vendor's suggestion and agreed by the steering committee. Unexpectedly, the appointment of the new project manager had created a stir to the vendor plan. The project manager came into the project with a concept or a method that ensured project success, which had induced the top management to change the existing development plans. Her concept of rapid application development (RAD) had convinced the top management to change several major implementation plans. As highlighted by the project manager 2:

"…so far [an] IT project fails because it takes too long to finish the development."

Project Manager 2, July 2008

Thus the application of the RAD method was seen as an assurance of project success. Confident over the application of the RAD method, the top management had made suggestion to the project manager for a change to the date of the system roll-out. They suggested bringing forward the system deployment by two months. This rescheduling was to fit with the university student registration date. The project manager agreed to this suggestion with two conditions. These conditions required a further two changes to the project plan and were required in order to accommodate the six-month project deliverables. The first condition was to conduct a pilot approach. This pilot deployment involved three sites or campuses and secondly, the development had to be divided into modules and the pilot phase only concentrated on student related modules. Only if these conditions were met would they be able to achieve their target. The introduction of the pilot approach was seen as a good strategy, since it enabled transfer of experience between campuses from the pilot sites to the other sites. The pilot site acted as a reference point. The selection of the three pilot sites was based on three different reasons. Firstly, the site was the furthest campus from main server, this was to test the infrastructure capabilities; secondly, the site was the campus with largest number of students; and thirdly, the site was the headquarters where three institutes were located.

The pilot deployment concentrated on the student related modules which were involved during the student registration day. Among the modules involved were the student registration module, student hostel registration module, student invoicing and receipting. The new six-month project period had created confusion to the users in terms of the overall development approach, from a phased approach (developing the student system first followed by the other systems) to a parallel approach where all systems were developed simultaneously. Being an integrated system, the users were expecting the student system to be stable first before the finance system could start development. One of the problems with the new PM was that adopting her RAD method she concentrated only on the development of the modules for the pilot sites deployment. With the deployment date identified and the task established, the PM worked backwards identifying detailed project activities. Failure to understand the overall project construct, the PM's approach showed no project continuity.

Retrospectively, the PM's reason for accommodating the top management request was to create a relationship with the top management or the steering committee because according to her only a project with a good relationship would be successful. In addition, through her prior experience with the vendor, she was confident that the vendor had the pre-requisites to adopt the RAD method. Following the RAD method, it was assumed that it would be a joint development approach where the vendor together with the IT department would collaborate and develop the system and any modification or enhancement to the system could be internally solved. Given this, she was confident that the application of the rapid methodology would be a success. However, it was a different story with the top management. They had a different reason for change requests. They just wanted to test whether the PM was able to successfully complete this project.

Technology People V5 Task Structure	At the vendor level, the RAD approach and strategy caused the vendor to halt all existing development activities and focus on the student related modules. Thus the development of the account code structure was abandoned without any finalization. A gap was created between task and technology, people and task and people and technology. *Stakeholder Analysis* *When she came in, she failed to revise the previous project structure and approach. She came in with a new project approach, a rapid approach. She shunned the previous traditional development approach. This change created conflicts at the vendor level. Following the RAD approach, the project was broken into modules to ensure efficient project deliverables. Therefore, the development of the modules would be based on priority which was decided to be student related modules. As a result, the vendor who was currently struggling with the finance GL module had to redirect all development activities to student related modules. This created conflict between the vendor (people), system development (task) and RAD approach (technology). The implementation of the RAD also created conflict between RAD (technology) and system development (task) where abrupt changes in the development caused confusion among vendors and users.*

The problem with this agreement was that it had caused the development team to change their plans drastically (V5). With six months development time, they had to leave everything they were currently doing and start adapting to the new plan. During the requirement session, the vendor presented the system prototype from the previous

client and tried to map with the committee request. Any changes required by the committee were recorded in an observation report (OR). Based on this report, the vendor customized the system accommodating these changes.

Technology W6 People / Task Structure	At the work level, the agreement to focus on the student related modules for the pilot site caused the working committee to change. Different people in charge from the pilot campuses attended with additional members being invited. Assuming that the processes were similar by campuses, this small fragment of users was expected to provide the complete requirement. This restructuring created gaps between task and people and people and structure. *Stakeholder Analysis* *At the work level, the steering committee's agreement to focus on the student related modules for the pilot site caused the working committee to change. The existing working committee (GL and reporting) were dissolved. This created conflict between the existing working committee and the new development strategy. Due to the change in the module being developed, different people in charge from only the pilot campuses were appointed and attended the sessions with additional members being invited. Assuming that the processes were similar by campuses, this small fragment of users would able to provide the complete requirement. The dissolution of the existing committee and the establishment of this new working committee created conflict between the users (people) and the existing committee (structure). This coalition between the new working committee and the new strategy was hoped to provide a stable system requirement. However, this change in working committee also created conflict between the users (people) and BRS (task) when they failed to assist in providing sound requirement for the development.*
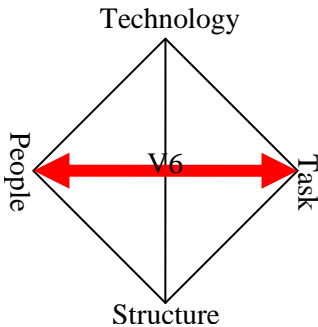
With this new plan in place, the finance committee only involved representatives from the pilot site and invited members from major campuses (W6). However, the committee needed time in order to come up with the requirements. Merging an organisation, standardisation or streamlining of business processes should involve all campuses, thus this approach had created a limitation to the overall development where the requirement was incomplete. The effect of this emerged as the project unfolded (P6). In order for them to come up with their requirement, they had to identify their existing manual processes, but since each of the campuses had different ways of doing things, the description of their existing processes became lengthy. At the same time, the vendor tried to inject new processes based on the previous client's processes as a means of re-engineering attempts. In this case, the vendor's attempts to streamline and to re-

engineer the processes had taken its toll. The vendor's limited resources had created confusion and frustration for the users and the vendor themselves. The vendor was facing problems in conducting the process re-engineering. A dedicated re-engineering team with vast and robust knowledge on finance operations would be able to visualize the overall process and streamline and consolidate the processes. In addition, this team would also be able to influence the users to change their existing process. But now, the vendor was dealing with the re-engineering and also the requirement gathering. Only the vendor's team leader had good knowledge of finance process, which had been accumulated through his experience of developing finance systems while the other members just took notes and updated the OR.

Technology — People — P6 — Task — Structure	The new plan to concentrate on student related modules with a fragment of users had created a gap at the project level. The divergent processes of individual campuses, which needed to be streamlined, created a gap between task and structure. And with a limited number of users to comprehend multiple processes, most of the processes were incomplete and patchy. This created a new gap between task and people.

Stakeholder Analysis
When the new PM took office, it strengthened the project team structure. The PM2 came into the project with her concept of e-management, which included the tried and tested rapid application development (RAD) strategy. The application of this concept and strategy would ensure project success. This promise lured the steering committee to agree with the idea. Thus created a strong coalition between the PM2, the steering committee and the e-management concept.
As a result, with the support from the steering committee, PM2 decided to break the development into different modules that started with student related modules. This development was expected to be completed within only a 6-month period and focused on the pilot site alone. However, this created conflicts among project level stakeholders. Conflict arose between users (people) and system development (task) due to the fact that without proper BPR they were not able to provide a sound requirement for the vendors to work on. Another related conflict arose between the business process (structure) and system development (task) when the business processes were not streamlined and re-engineered. This was also due to the abrupt change in the development strategy agreed between the project manager and the steering committee. |

The vendor's strategy was that each requirement session must be headed either by the team leader or the senior vendor. A junior vendor would only attend and observe the process. Through this it was hoped that the requirements would be fully captured and

the observation report completely updated. Another strategy deployed by the vendor was that during sessions, they tried to identify the trouble maker in the group or the one with the ideas. From the vendor's experience, usually, they were the ones who had their say, while others just agreed to their ideas. Upon identification, focus was given to them, trying to understand their concerns and to accommodate them. If they were satisfied, it would be easier to control the sessions. Accommodating the rapid approach, the vendor then tried to fit the incomplete requirement to the system prototype (V6). The customized prototype was then presented to the committee and upon visualizing the prototype they requested some changes and modifications.
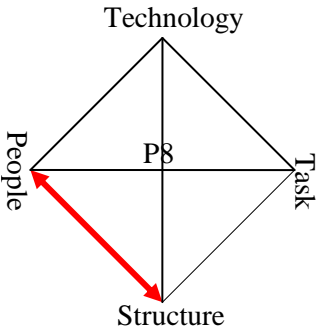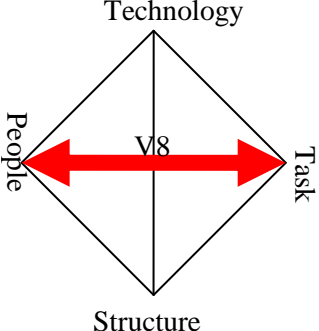
	The rapid approach of requirement gathering, developing and testing the prototype created more work for the vendor. The testing of the prototype enabled the user to have a good visualisation of the system thus requiring changes and modification and creating a loop of testing and modification that was burdening the vendor. Adding it to the vendor's pile of existing work thus created a wider gap between people and task.
	Stakeholder Analysis
	At the vendor level, there were different expectations towards the development strategy. For the vendor it was their intention to accommodate the strategy and part of the strategy was the prototype based development. The vendor was applying their base system as their initial prototype. This was a strong coalition for the vendor to work on. But the RAD approach was more than just prototype based development. It also involved continuous development, modification and enhancement. This created conflict with the vendor's expectations of the strategy. This created conflict between the vendor (people) and the system development (task) whereby the vendor was unable to do more than only development. This resulted in the vendor being bogged down with multiple tasks.

The diagram in the left cell shows a diamond with Technology at top, People at left, Task at right, Structure at bottom, with a double-headed arrow labeled V6 between People and Task.

Nearing the pilot site deployment, the data migration (DM) team was appointed. For this purpose, the user prepared the data for migration, which was taken from their legacy system. The team requested for the whole year of 2007 detailed transaction data for migration. The first attempt of the data migration failed because the DM team failed to understand the client's business process and at the same time failed to understand the new system's data structures. Due to this, they had just simply migrated all the data that was given to them without any consideration of the new system's data structures. The weak relationship between the DM team and the vendor team was also one of the reasons for the failure. As highlighted by the senior developer:

"The data migration failed because there was no co-operation from us. Initially I thought that the company in charge of the data migration was a third party, but I was informed that they were hired by our company, it was during the end that I knew this … if I had known it earlier, I would have helped them a bit more to ensure success."
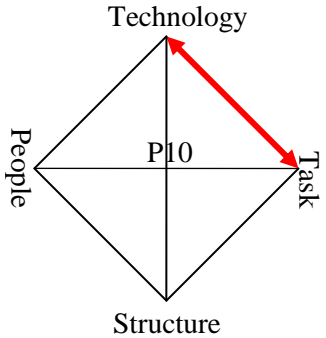
Senior Vendor Developer, February 2009
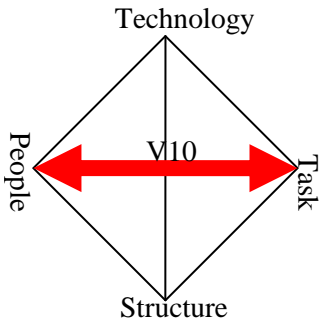
The data migration team was later terminated due to their incompetence (P8). The departure of the DM team caused the vendor to take over the task. The reason was that the DM team was a part of the vendor team and it was the vendor's responsibility to complete their task. This additional task increased the vendor's existing development activities. Although the vendor did not face issues with the data migration exercise, it seems that the time spent to migrate the data could have been used by the vendor to complete other critical development tasks (V8).

	The termination of the DM team weakened the project team structure thus created a gap between people and structure in the project level. This also impacted the vendor level. *Stakeholder Analysis* *Data migration was the most critical exercise in any system development. At the project level, the data migration was appointed to carry out this task. For this purpose, the users prepared the data based on their legacy system database. The DMT without any knowledge of the business process and the system structure migrated the data and failed, thus created a conflict between the DMT and the data. This failure further created conflict with the steering committee which resulted in the termination of the team, which created another conflict between the data migration team (people) and project team (structure). This termination also impacted the vendor level.*
	The departure of the DM team caused the vendor to take over the task. The reason was that the DM team was a part of the vendor team and it was the vendor's responsibility to complete their task. This increased the vendor's mammoth task, thus created a greater gap between people and task. Although the vendor did not face issues with the data migration it seems that the time spent to migrate the data could have been used by the vendor to complete other critical development tasks. *Stakeholder Analysis* *The termination of the data migration team affected the vendor development activities when the vendor agreed to conduct the data migration themselves. This created conflict between the vendor (people) and the system development (task), when the vendor was bogged down with other task and had to redirect all the resources to this task, which delayed actual*

	development activities. Compared to the previous data migration team, the vendor had full knowledge of the business process and the new system data structure. The only conflict was the huge legacy system data which needed to be migrated. The vendor was taking an as-is basis for the migration. Although the vendor did not face issues with the data migration it seems that the time spent to migrate the data could have been used by the vendor to complete other critical development tasks.

Before the deployment, the PM2 had arranged for a user acceptance testing (UAT) for a fundamental module – invoice set-up. During testing, the system was hanged and at the same time the users found out that some of the campuses' requirements were not catered for in the system. Although the vendor was aware of the needs for system tests due to the time constraint, no testing was conducted by the vendor prior to the user acceptance test that had caused these issues to emerge. The un-catered for requirement was mainly due to the fact that the campus was not invited during the requirement sessions. In view of that, the PM2 decided to proceed with the session as a walk through test only (P10). At the vendor level, the failure of the initial system test had caused the vendor to modify the system and update it with new additional functionalities (V10).

	The initial user acceptance test (UAT) session ended as a mere walk-through test due to the fact that the system hanged during the session and the users noticed that there were major missing functionalities to the system. These functionalities were not spelled out during the requirement session by the user representatives. It created a gap in the project level between task and technology.
	Stakeholder Analysis
	The UAT was the process where users test the new system functionalities to ensure it suits their requirement. For the project manager, in a rapid development environment UAT should only be carried out after the users had tried and updated the systems, since following the rapid nature, the functionalities were always incomplete. But for the vendor, UAT was the point where they could submit the progress claim. So the earlier the UAT was completed, the faster the claim would be received. This different intention for the UAT created conflict among the stakeholders. During the UAT, the users found that the system functionalities were incomplete. In view of this, the PM2 then decided that the exercise was just a walkthrough test rather than a UAT, thus the users did not sign the UAT. Since the users did not sign the UAT, the vendor was not able to submit their claim. The vendor had to complete the development before another UAT could be carried out. This created conflict between the new system (technology) and UAT (task) since the task was not successful due to incomplete

The diagram in the left cell shows a diamond with vertices labeled: Technology (top), People (left), Task (right), Structure (bottom), with "P10" near the center and a red double arrow between the center and the Task/Technology vertices.

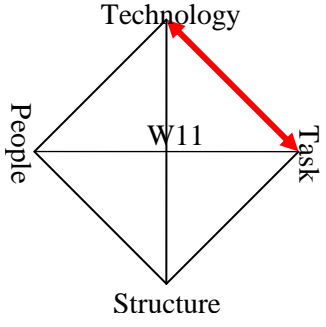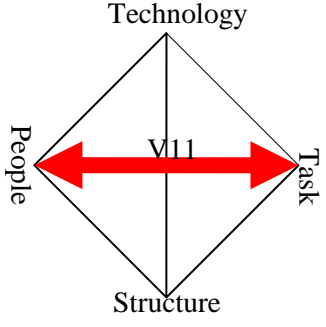|	*system functionalities.*
Technology / People / V10 / Task / Structure	At the vendor level, the failure of the initial system test caused the vendor to modify the system and update it with new additional functionalities. This maintained the gap between people and task, where the success of the data migration process was replaced with new modification to the system. *Stakeholder Analysis* *The testing of the new developed system was expected to improve the stability, functionality and usability of the system. However, during the system testing, the users found gaps or incompleteness in the new system. As a result, the vendor had to make modifications and enhancements to the system before it could actually be tested and its usefulness verified. This additional task created conflict between the vendor (people) and their system development activities (task). With limited time left before the pilot site deployment, the vendor was rushed to complete the modification and other development.*

In July 2007, six months after the new project manager took office, the system was deployed during the student registration day. The registration process went successfully on the surface, with close to perfect integrated functionalities. Following stakeholder analysis, at the project level, the pilot site deployment was seen as a good strategy for the project. For the project manager, the deployment was seen as a success in adopting the rapid development approach. As for the steering committee, the deployment indicated that the project was on its way to success. Most importantly, for the users, the pilot site deployment acted as a reference point for other campuses. Any system problems would be solved at the pilot site and smooth deployment for other campuses later. This alignment of interest and expectation towards the pilot site implementation strategy created strong coalition between the stakeholders.

However, detrimental issues emerged on the back end process (W11). This was the posting to ledgers functionality for finance systems. Any issues encountered by the users were directly communicated to the vendor for changes and modifications. For the project manager, the successful deployment was a trigger for a smooth system users' acceptance test (UAT). However, the proposal for UAT was rejected by the head of finance working committee with the argument that the finance system that was being deployed was mere surface functionalities, i.e. creation of invoices and receipts. According to her, there were more critical issues that needed to be settled, especially the back-end process of the issuance of invoices and receipts, before any acceptance testing

could be carried out. The posting to general ledger functionality was missing, due to the fact that the account code structures were yet to be finalized, thus the vendor was not able to incorporate the posting functions.

Technology People W11 Task Structure	Although the pilot site system deployment did not create any gaps at the project level, it caused a stir at the working level. The deployment of the system showed the benefit of system integration, but it also showed the patchiness or the incompleteness of the system. The previous development of the GL modules having been halted to accommodate the new rapid approach took its toll. It caused the student financial system to be hanging without ending its posting to GL. The system that they had developed only covered the operational part of the system and ignored completely the posting functionality. This created a gap at the work level between technology and task. *Stakeholder Analysis* *At the work level, the users were comparing between the legacy system and the new system capabilities. Although the legacy system was manual in terms of its operations, the back-end process (GL) was complete and stable. For the new system, although it provided an integrated system the back-end (GL) process was weak or incomplete. This was due to the development of the GL modules which had been halted to accommodate the new rapid approach. This caused the student financial system to be hanging without ending its posting to GL. The system that they had developed only covered the operational part of the system and ignored completely the posting functionality. This created a coalition between the users and the legacy system and at the same time created conflict between the new system (technology) and the users' daily operations (task). As a result, upon deployment, the new system provided limited use whereby it only supported daily operations but not the reporting functions. This incomplete system functionality initiated further request for system changes.*
Technology People W11 Task Structure	The after effect of the pilot site deployment caused major turmoil to the vendor. The users' experience in using the system caused more modification and changes to the system. The users did the system walk through test and identified system defects. With the PM biased towards the user, she pressured the vendor to accommodate the users' requests, thus piling up the vendors' existing workload that maintained the gap between people and task. *Stakeholder Analysis* *The deployment of the new system at the pilot site was expected to provide support to their operations. However, incomplete functionalities of the system created the need for system modification. Conflict arose at the vendor level since the vendor, after the pilot deployment was expected to continue with the development of other modules. But due to these*

	requests for change, the vendor resources were channelled to the system modification. This ever increasing task of system modification created conflict between the vendor (people) and the other modules development (task). That meant less time was spent to develop the other modules. These conflicts resulted in the vendor's failure to complete the development of other modules on time.

The system roll-out had caused the users to be able to feel the system thus creating the need for system changes. The users called it a fine tuning process. This had inevitably increased the workload of the vendor developers (V11). At the same time, it had caused the user to identify system flaws and inevitably labelled the system as low quality and not comprehensive. They had failed to understand that it was the nature of the rapid development to develop modules only at 60 percent completion. The reason was to enable the users to feel and modify the system. As mentioned by the project manager 2:

"…to be successful, this system owner… should understand the nature of system development and rapid approach because they can't expect the software to be perfect at the 1st time when it was installed. Because of the rapid development we just deploy the 1st draft so that the user could start using it and start improving it based on their actual requirement… the system owner must be aware that they were evolving in the system development, it was part of the software development, it was not like having a complete software, this was a process of software development that the system owner must be involved 100 percent in the development and improvement of the software…"
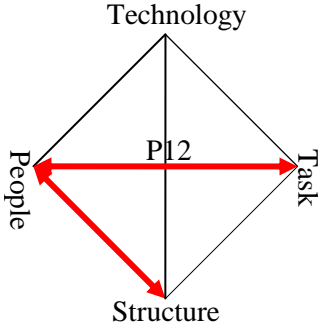
<div align="right">Project Manager 2, July 2008</div>

After the pilot sites system deployment, the PM2 had been involved directly with the development rather than planning the next step for the development. During this time she requested the vendor to follow the users' request, biased towards the users and not being able to view project issues in totality. The PM was pressing the vendor to complete their development on time. Whilst the PM was trying to create a relationship with the users by accommodating requests, the users together with the steering committee were trying to gain control over the projects.

On the brighter side, the application of the pilot approach had shown its benefits. During the pilot deployment, the issues faced by the users were being dealt with. The used systems were being fine tuned and modified. The pilot sites especially the headquarters were preparing themselves as the reference point to the other campuses in order to minimize problems during overall deployment. It was said that the vendor would face more problems if a big bang approach was deployed since different campuses had different issues. As experienced by the users:

"…and in a way we always had a reference point if anything happened… and I do think that the pilot site strategy was a very good one… it was because, whatever we were experiencing in the campuses, our problems, when we referred it to them, they were able to handle it."

User, July 2008

Technology P12 People · Task Structure	At the project level, the PM's departure caused project drift. There was no control over project activities thus no major activities were carried out on the project level, due to an incomplete project team. The departure created a gap between people and structure. At the same time, having no control and no project activities created a gap between people and task. *Stakeholder Analysis* *It was the intention of the PM2 to assist the project to its success through the adoption of the e-management concept. But the steering committee were only interested in completing the new integrated system to enable them to streamline the diverse business process. Equally, the vendor was only interested to complete the system in order for them to further commercialize and create a best-practice system. This caused conflicts between the PM2 and the steering committee, together with the vendor. Their diverse intention between the PM2 and the other project team towards the project caused problems in the project. The steering committee failed to understand that developing a large system required understanding and partnership between the project team. At the same time, the vendor failed to educate its developer on the rapid development approach. This caused frustration to the PM2 who decided to leave the project. The departure of the project manager from the project created conflict between the people and structure due to weakening project team structure. The departure also created conflict between the project manager (people) and the project management activities (task) since there was no-one to co-ordinate and manage the project.*

After seven months in office, the project manager left the project due to personal problems (P12). Some say that the real reason was that she was frustrated because she
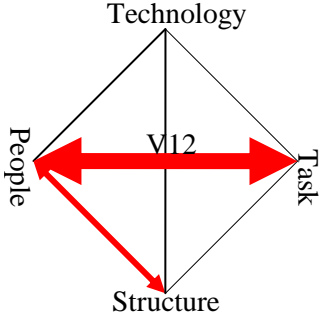
was not able to control the users. However, according to her, the users were very supportive of her and had a very good knowledge of their business processes. The main reason for her departure was due to the top management's attitude towards the project. Their failure to respect her knowledge of system development and also their failure to see the project as a partnership had caused her to make this decision. The top management created a gap between the vendors and the clients and the top management advocated that there should be no partnership or no joint development during the development project. This contradicted her e-management principle of partnership and joint development as a pre-requisite for project success. The other reason for her departure was the quality of the vendor. In rapid development methodology, the vendor plays a vital role in not only ensuring speedy development and modification of the system but also ensuring knowledge transfer to the users. In this project these two pre-requisites were missing. According to her, the vendor was trying too hard to complete the modules before deployment which could never be achieved. She could only continue in the project if they were able to accept her methodology and her e-management principle. As elaborated by the project manager herself:

"I left the project because I knew that the project going to fail because it does not meet the pre-requisite of an e-management concept. So, I think I should not be there. I only go into projects that could adopt the e-management principles. If you want to follow a conventional route, you had to take a conventional based project manager. Half of the e-management concept was not being fulfilled, so I cannot continue. I had told them earlier that I cannot be here. That was the top management was not being professional, the developer was giving me problems the quality was very bad."

<div align="right">Project Manager 2, February 2009</div>

In contrast, according to the vendor, the PM's failure to efficiently control the project team was the main reason for the inconveniences. Due to her intention to create a relationship, she failed to control the steering committee that was later controlling the project. Her failure to obtain agreement for project changes and her weak communication with the project team had increased the project risk which was never considered during the project. The PM's lack of control over the project had also caused a different approach for different module development. In addition, her RAD approach

advocated continuous development, which ignores documentation. As a result project control was omitted.

Technology People ←→ V12 →→ Task Structure	The project manager's departure created more pressure on the vendor, where the clients were dealing directly with them. Any changes required were without proper change request format. These frequent changes and the nature of the change caused the senior vendor to leave the project. This created a new gap at the vendor level between people and structure and a bigger gap between people and task. *Stakeholder Analysis* *The project manager's departure created conflict at the vendor level due to the increased pressure from the clients and users, who were now dealing directly with them. Although the vendor and their developers were trying to accommodate the requests, the users' requests were unreasonable, being sometimes just to make their life easier without considering actual system standards and functionalities. This created conflict between the vendor/vendor developers (people) and system modification (task). These overwhelming tasks of system modification coupled with the nature of each change resulted in the senior vendor leaving the project. This further created conflict between the vendor developers (people) and the project team (structure) where the senior developers brought with him his experience and skills on the project and the system.*
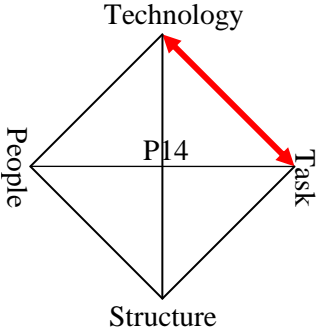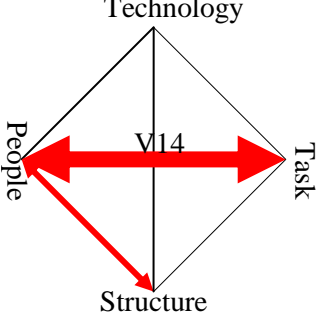
At the vendor level (V12), the project manager's departure created more pressure and resulted in the senior developer leaving the project. According to him the changes required by the users were absurd and clashed with fundamental standards. The vendor was working with a system that had been used and tested for its compliance with guidelines and standards. As a result, with increased pressure, mammoth change requests and limited resources, the vendor was facing serious development issues. A new senior vendor was brought into the project from a completed project. This maintained the vendor's structure in the project. But due to a failure to hand over the work, the new senior vendor joining the team had to study the existing system structure before continuing with the development. At the same time, the project management office appointed a new project manager to lead the implementation. At this point of development and implementation, the users had gone through different development approaches, from traditional SDLC to rapid development. The new project manager approach was to follow whatever seemed to be favourable to the users due to the users' dominance in the project. The project manager, whose task was supposed to be

controlling the users, was not able to do so. He was a novice in project management. He was later terminated due to the latter problem, and at the same time, the contractor in charge of the project management office also terminated their contract. The project team was now left with the client and the main contractor for hardware and software: and due to the hardware supplies having been duly completed, the main contractor ignored the project, and all the work was left to the software vendor, who was a sub-contractor. Physically, on the project site, only the vendor was left, struggling to complete the development at the same time as modifying the used systems.

The information technology department (ITD) of the university then took charge of the project manager function. The ITD had just received a new manager, who had experience in dealing with system development and project management. The first function of the new project manager was to deploy the student registration system to other campuses. It was a year or two semesters after the first pilot deployment. As usual, change in project manager caused the development approach to change as well. For the fourth time, the development approach changed to the traditional approach, the following phases starting with SRS development. The ITD being the project manager, decided to adopt the traditional system development. They were trying to impose the need for project documentation especially during the requirement session that was the system requirement specification (SRS). The introduction of the SRS was a win-win situation for both vendor and the users. The vendor used the SRS as a binding agreement with the users to avoid changes to their requirements. The existing OR was used as the basis for the SRS development. For the users, with SRS, they were able to view the process step-by-step, which had been missing before. For the PM, the SRS was considered as a project control mechanism to ensure deliverables and in dealing with change requests (P13).

The departure of the third project manager caused another drift in the project. PM3 was a novice and failed to guide the development and thus was terminated. The steering committee decided that the ICT department should take control of the development and act as the project manager. The function of the project manager was to co-ordinate the system development project. Thus a coalition agreeing to the need of a new project

manager was achieved. And for this purpose, they (PM) had suggested that the system UAT should be carried out first to ensure that the systems were stable enough for full deployment. The vendor meanwhile was still busy updating and modifying the system to adhere to the suggestion. The UAT was attended by all campuses thus including those who were not involved during the requirement sessions. This was due to the fact that the head of finance working committee was confident that the requirements from the pilot sites were complete enough.

Technology People P14 Task Structure	Testing a system which was derived from requirements from fragments of campuses took its toll. The confidence of the head of the working committee that the requirements posted by the pilot campuses were complete enough was challenged. During UAT for the other campuses' deployment, the users saw a major functionality not catered for in the system. Thus the systems offered were not able to accommodate their operations, thus created a gap between technology and task at the project level. *Stakeholder Analysis* *According to the vendor, although UAT acted as the basis for their claims, due to the rapid development strategy employed, the system functionalities were not complete. The system's incompleteness was also due to the incomplete requirements which were derived from fragments of campuses. The confidence of the head of the working committee that the requirement posted by the pilot campuses were complete enough was challenged during UAT for the other campuses' deployment. The users found that a major functionality was not catered for in the system. This created multiple conflicts between the vendor, the users, the new system and the UAT itself. This conflict resulted in the vendor making modifications to the additional requirement to the system. However, the limited functionalities of the new system (technology) created frustration during the UAT (task). As a result, the vendor had to modify the missing functionalities before the overall system deployment could take place.*
Technology People V14 Task Structure	At the vendor level, this omission caused a major setback to the vendor development activities. When the vendor should have been continuing with the development of other modules, they had to revisit their programming scripts and make changes to accommodate the additional functionalities. Being an integrated system, introduction of new functionalities not only required stabilization of the functionalities alone but also their integration with other functionalities. To add to their difficulties, everything needed to be completed before the overall deployment of the system, and due to the endless pressure, their senior developer left the project. This created a gap between the people and structure and widened the gap between people and task. *Stakeholder Analysis*

	The discovery of the missing functionalities on the system created a major setback to the vendor. The vendor was frustrated with the pilot site users for failing to identify such a prominent process in the system. As a result, the vendor had to modify the system to accommodate this missing requirement. This created conflicts between the vendor (people) and the system development of other modules (task) where focus was given to the modification rather than the development of new modules. It was a very large modification since it was a major functionality. According to the senior developers, it was like developing the system from scratch especially due to its integrated nature. Changes in one form or table impacted other forms and tables. In addition, these modifications were expected to be completed before the overall deployment. This limited timeline created conflict between the vendor (people) and project timeline (structure). In addition, this intense pressure caused the senior developer to leave the project thus created another conflict between the vendor (people) and the project team (structure).
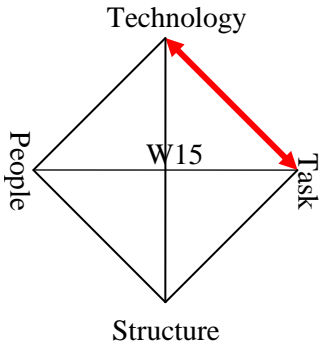
During the UAT (P14), the users found that there were major functionalities not catered for in the system, which had been overlooked by the pilot sites. And the head of the working committee without hesitation requested the vendor simply to follow the users' request. The change that was required involved major system reconstruction and due to its integrated nature, the vendor also had to ensure all related modules were modified and tested. These changes impacted the overall vendor's development time which needed to be focused on new modules. The users used the fine tuning ticket request for modification and enhancement to avoid additional charges. The users' testing had in a way made the users' life easier but at the same time burdened the vendor. As highlighted by the senior developer:

"…the requirement itself took 3 months, plus the development time, and modification after testing… it was usually like that since the top level management did not see what was being done by the lower level staff. Since the operations people were going to use the system, the only thing was that we just had to follow the users. After the testing, we needed to customize the developed screens. And most of the changes were major changes plus new functionalities… the effect was, it tensed me up. In my mind I was thinking the users were the worst. There's a lot of my work needs to be done again, has been made redundant. It has been a burden rather than work."

Senior developer 2, February 2009
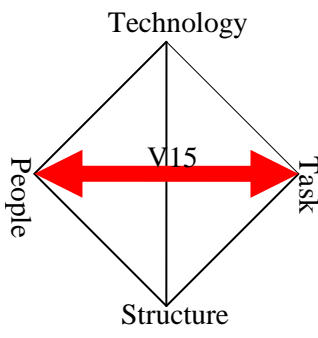
Due to the extensive amount of work required in the development, upon completion of the new system enhancement, the senior vendor left the project for a better career (V14). And now the vendor's team was left with a team leader who was now only on a part-time basis (i.e as and when he was required) and the junior vendor who was still struggling to understand the clients' business processes. In other words the vendor project team was very weak, especially in comprehending the users' ever changing requests.

At the same time the vendor also had to conduct the data migration process for the other campuses for the purpose of other campuses' system deployment. To simplify the data migration process, the committee had decided that the migration would involve month end balances rather than individual transactions. These figures were derived from their individual legacy systems. All of these figures were converted into an Excel format. In general the data migration process was successful. According to the vendor all data were successfully migrated and it was up to the users to check the correctness of the data. For the vendor, they just accepted the data as it was and migrated it to the new system database. Upon initial checking of the migrated data, the vendor noticed that there were discrepancies in the details of the data. According to the vendor, the validity and the correctness of the data should be checked by the users, being the owner of the data.

Technology People — W15 — Task Structure	The 2nd data migration process created another problem to the project. The omission of data verification and data conversion process caused the migrated data to be problematic. Previously, since the campuses' legacy stood alone, the issue on duplication of data never arose. Thus during the migration of data, this issue although critical was not being communicated to the vendor by the users. As a result, the vendor just migrated whatever data was received on an as-it-is basis assuming that the data had been verified by the users. Also, the system formats of the date for the campuses were also different which also caused problems during the migration. This created a gap at the work level between technology and task. *Stakeholder Analysis* *At the work level, the users from other campuses were preparing their data for migration which was based on their legacy system. This time the data migration exercise would be performed by the vendor himself and this provided assurances for a sound data migration process due to his vast experience. The users failed to realize that their data structure was*

The user, upon checking the migrated data, found that there were discrepancies in the migrated data (W15). Reconciliations between reports from the legacy system and the new system did not tally. There were various reasons for this. The users were condemning the vendor's data migration approach for a lack of system control by omitting the reject list. But on the vendor's side the data presented to them was not verified. The legacy system allowed data key duplication between campuses. Each of the campuses did not have a unique identification of data. To make things worse, the data structures between campuses were also different. For example, the date formats were not standardized. So when the data were being migrated, although in total the figures tallied, when dissected into campuses it crumbled. The only way to solve the problem was to conduct reconciliations manually by campuses. To accommodate this reconciliation, all the reconciliations that were completed by the users were passed to the vendor. The vendor then updated the database with the correct details. Like a ripple effect, any issues that emerged within the project had created more work for the vendor (V15).

It was not only that the data migration process occupied the vendor's development time but the after effect of the process occupied more time than anticipated. Assistance given to the users on updating the reconciled data was not as easy as it sounds. The vendor had to identify each reconciled item and their corresponding changes and update the database. With only the junior developer available at present, all other development halted. This widened the existing gap between people and task.

Stakeholder Analysis
The process of second data migration created conflict at the vendor level. For the data migration, the vendor was using the data provided by the users on an as-is basis. This meant that the vendor migrated the data based on what was given by the users. Conflict arose when the data provided by the users consists of duplicated numbers and different date formats which has not been informed to the vendor. This resulted in an incorrect data migration.
It was not only that the data migration process occupied the

With the vendor team leader only available on a part-time basis, the junior vendors were bogged down with modifying the existing system, patching up the system to update the reconciled data, and also the requirement session for new modules. The vendor was being criticized for not employing enough developers with experience to support the project. To accommodate the situation, the vendor appointed a junior vendor and a business analyst to assist with the development. For the vendor, the appointment of the business analyst was considered as an additional cost incurred for the project which was now unprofitable, or bleeding. The main task of the business analyst was to speed up the development process, ensuring completeness and correctness of the requirements for new modules and map it to existing systems. Accommodating the request from the PM, the business analyst assisted the user requirement session by trying to introduce the use of SRS, but this had diverged from the vendor's initial approach of using the observation report, due to the fact that it was a customization project rather than a built-from-scratch project. According to the users, the introduction of the SRS had enabled them to better visualize the system compared to previously, where the vendor had only updated their observation reports. At the same time, the business analyst also educated the junior vendor on finance processes during and after sessions. According to the vendor, the business analyst was like a lifeline, as a reference point for them in understanding users' complex requirements. The business analyst came in a few months after the first deployment and during that time the users were still engrossed with the new system and busily fine tuning and trying to improve the system as they wanted. Thus, the business analyst, who was supposedly pushing the development forward, was bogged down with users' reiterations over the used systems while complaining over the weak reporting and similar issues. There were two main reasons for the weak reporting capabilities: first, the incomplete reporting structure and secondly, the data instability caused by the migration. Although the restructuring of the report was manageable she also had to make sure the data going into the reports were correct. Most of her time was

therefore spent doing unproductive tasks rather than pushing forward project activities. After 14 months and two contract extensions, the business analyst service was terminated by the vendor (V16).

Technology People — V16 — Task Structure	The appointment of the business analyst, although improving the vendor development team structure (reducing the previous gap between people and structure) failed to reduce the gap between people and task. The raison d'être of the business analyst did not materialize. The pre-conceived workload and actual work done did not match. The vendor's hope that the business analyst would speed up the development process was held back with the users' mounting requests for change. Considering that the cost did not match the benefit of appointing the business analyst, the vendor decided to terminate her services. This created the gap between the people and structure and people and task at the vendor level. *Stakeholder Analysis* *The appointment of the business analyst (BA) had multiple reasons. First the BA was expected to assist in completing the system requirement specification (SRS) process. Secondly, for the developers, the BA was expected to assist in understanding business process in order to ensure proper system design. As such, the appointment of the BA was seen to create a coalition between the stakeholders in improving the development process of other modules. However, upon dealing with the users, the BA was bogged down with users' operational efficiency rather than her actual task in hand. This created conflict between the BA (people) and her task when she failed to assist the development. The vendor had high hopes that the BA would speed up the development but this was not materialize. Since the cost of appointing the BA was considerable, the vendor decided to terminate the BA from the project. This termination weakened the project team through reduced support to the developers thus created conflict between the BA (people) and the project team (structure).*

The termination was not due to her individual incompetence but mainly because of project immovables. She was not able to speed up the development process. Most of the time she was stuck with improving existing processes rather than developing a new process. Her failure to inject new ideas on business processes had also created frustration for her. As commented by the vendor team leader:

"For nearly 9 months the impact was still the same. We were not condemning the credibility of the [business analyst] since her CV showed she had good knowledge and experience in delivering such a system. She had been through every phase of system development in the user side. We did not doubt her capability… especially in delivering a financial system. After she completed her contract in January 2009, we evaluated her

accomplishment in the project… we saw that although we put someone with a vast experience in financial system development, there was not much difference in the pace of development. She was not able to speed up the process."

<div align="right">Vendor team leader, February 2009</div>
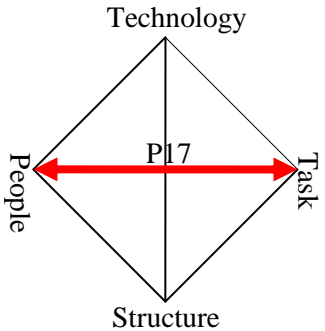
He further added:

"If she herself was not able to control the development process, what would be the control mechanism to ensure proper development was being carried out on-time according to project schedules?"
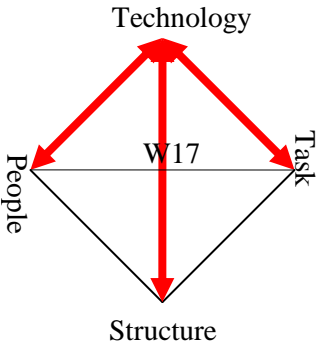
<div align="right">Vendor team leader, February 2009</div>

Her termination had also created frustration to the users and also the junior vendor who had no one to refer to, having to deal with the users directly.

Being a finance system at the receiving end, the users were complaining to the steering committee that they were having problems in developing the system without other systems completed and stable first. The steering committee without much consideration approved the deferral of finance system development for two months, failing to identify details on decisions made.
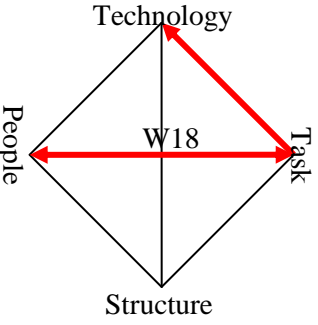
Technology People — P17 — Task Structure	Due to the time constraints and major changes required to the system, the system roll-out for the other campuses was carried out without proper testing to the modified system. The system was still in work-in-progress status where functionalities and the integrations were still weak. The vendor's failure to conduct the system testing prior to the deployment created a gap between the people and task. *Stakeholder Analysis* *It was the steering committee's decision to roll out the system to other campuses, although the vendor had yet to complete the modifications to the system based on the pilot system roll out. The users at the pilot site still had issues with the new system. According to the users, it was a management directive. This created conflicts between the users (people) and the steering committee (people). At the same time, conflict arose between the users (people) and the vendor (people) due to the delay caused by the vendor during system modification. The limited time before system deployment also created conflict between the vendor (people) and the system testing (task) where no testing was conducted prior to the deployment. This resulted in an unstable system roll-out to the campuses.*

However, the system continued to be used by the users to support their operations. For the deployment for other campuses, a parallel implementation strategy was being employed, based on the suggestion from top management. The motive for such an approach was to ensure that any hiccups from the new system were supported by the legacy system. But due to the number of transactions for the campuses, maintaining two systems was difficult. After two months, they ceased the plan and continued with the new system. However, according to the users, the functionalities of the new system were better than their legacy system and the integrated nature of the system had improved their way of doing things. But at the same time they were still fine tuning their processes, which caused more modification to the existing system (W17).

	The users plan to apply a parallel deployment approach was unsuccessful. Maintaining two systems created more problems than expected due to the large amount of data produced. As a result, they ceased the plan and only used the new system. This created a gap between technology and structure. At the same time, the new system, although it was being used, still required modification and enhancement. The system's failure to support the users' operations and the users' failure to understand system functionalities created gaps between technology and task and technology and people.
	Stakeholder Analysis
	At the work level, the deployment to other campuses created more conflicts. The initial expectation of the development of the new system was to improve and streamline the operations of the organization. However, due to limited project time, these processes were not streamlined and only catered for the pilot site requirement. This created conflict between the new system (technology) and the campuses (people) when their processes were not embedded in the system. At the same time, conflict arose between daily operations (task) and new system (technology) due to the incomplete functionalities of the new system. This resulted in the use of an unstable system and continual change requests. In all, the conflict that arose between the project timeline (structure) and the new system (technology) had a domino effect on other conflicts.
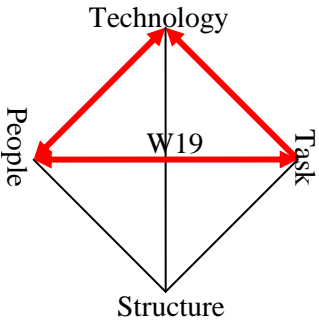
While the vendor team only consisted of the junior vendor, changes to the system were not being done in totality. This created more problems to the existing system. And due to this, any inconsistencies of output were being put down to the instability with the system rather than the users' failure to follow system usage guidelines.

During the 2007 year end closing of accounts, they were still using the legacy system and the auditors considered that they were still in the process of developing a system, disregarding any difference between the debtors aging report and the ledger, noting that this issue should be settled by next year's audit exercise.

	During the 2008 audit process, the accounts prepared by finance were on the verge of being qualified due to their incapability to support the financial figures. They blamed it on the system for not being able to provide stable reports to fulfil the requirement. In the end, their accounts were prepared based on source documents listing from the system rather than the system reports. For them, it showed the instability of the system. This created gaps between technology and task and people and task.
Technology *People* W18 *Task* *Structure*	*Stakeholder Analysis* *During the 2008 audit exercise, the users were expecting to use all information generated from the new system to prepare the financial reports, which at the time were not supported by the system. The accounts were prepared using the legacy system functionalities, while the figures came from the new system. Although the users prepared the accounts based on the new system reports, they were not able to support their figures. This created conflict between the users, accounts and the new system. They were trying to work around the system to accommodate the audit requirements. However, the users (people) were shocked to find that the system failed to provide a sound system report that they could rely on. Every day the figures for the generated report changed. It seemed it had a life of its own. As a result, the users (people) were not able to prepare a valid financial report (task) to be audited by the auditors thus created a conflict. As such, the users had to prepare financial reports directly from source documents and erected it manually. The new system (technology) was not able to support the audit exercise (task).*

During the 2008 year end closing, they had the problem of meeting the auditor's expectations and requirements (W18). Whilst the data reconciliation was still ongoing and the vendor was busily updating, modifying ever increasing change requests and developing new modules, the patching up of reconciled data was in the vendor's low priority list. As in the previous year, the closing of accounts was carried out using the legacy system. The users used the reports generated from the new system and ran it through the legacy system. Upon checking the results, there were differences between the reports generated from the new system and the legacy system which, should have

matched. Due to high reconciling differences, the head of finance decided to reverse all journals from the legacy system and start from scratch. According to the users, the new system's posting functionalities were still unstable, which caused the output to be incomplete. She had also decided that to ensure completeness, they had to gather the information from the transaction listing from the source systems. i.e invoice transaction listing, receipt transaction listing and credit note transaction listing inter alia. Using Excel worksheets, they mapped the corresponding data and derived a balance figure, which was then used for posting in the legacy system. Finally, they managed to reduce the reconciling figures and pass through the audit exercise. The auditors warned that they were required to identify all reconciling items in the reconciliations.

Technology People W19 Task Structure	With only 32 percent completion, the users did not even have one full module of the finance system. It only covered part of the student financial modules. Due to this incompleteness, further modification and enhancement was required to the system, thus maintaining the gaps between technology and people and technology and task, at the same time a new gap was created between people and task – with the users having problems in carrying out their operations. *Stakeholder Analysis* *At the work level, the users continued to use the student financial system that had been deployed. In all, the finance system was only 32 percent completed. This created conflicts between the users (people) and the existing systems (technology).* *Compared to their legacy system, the new system provided them with an integrated system to support their operations. However, some of their daily operations were not supported by the new system functionalities. This created conflict between the existing system (technology) and the operations (task). As a result, the users conducted a system work around in order to accomplish their task that created another conflict between the users (people) and daily operations (task).*

The users continued using the system with change requests escalating with many complaints (W19). With only six months to the date of completion, and with only thirty two percent system development completion, the vendor was applying for project time extension. Prior discussion with the project manager showed it was likely that the application would be granted. The vendor's six-month plan seemed workable and achievable. A project critical path was established and agreed verbally between the project manager and the vendor. During the steering committee meeting, the application for project time extension was tabled and discussed. During the discussion, the project

manager, who initially agreed to the vendors plan for the extension, did a U-turn and condemned the plans stressing the inability of the vendors to complete the project with the same development team strength. This notion was then supported by the head of finance, arguing the need for a full-time senior vendor replacing the team leader. Thus the application was rejected and the vendor was required to develop firmer extension plans. During the steering committee meeting, the vendor felt that the different background of the users had significantly impacted the decision. Some of the users' heads had had prior experience on system usage and some had not. And thus the decision that was made was mainly due to complaints made by the less experienced heads.

At the same time, the project manager, without the knowledge of the vendor, communicated with the main contractor giving options in order to solve the development issues. The first option was to suggest or recommend the vendor to appoint a senior vendor to replace the team leader, who was currently on a part-time basis. Only with this replacement did they think the project could be completed. Option number two suggested that the main contractor should find a stable and tested finance and human resource systems to be integrated with the existing student system. Through this option, the main contractor was to bear the cost of the new system. The third and final option was to continue using the legacy system and integrate it with the existing student system. These arrangements should not be communicated to the vendor to avoid them leaving the project site.

The vendor on the other hand was confident that they were able to complete the development within the restricted time if there were no changes to the users' requirements and at the same time, the vendor rejected the suggestion to employ a senior vendor. This was due to the fact that it would not in any way improve the development process speed as experienced with the business analyst. Improvement to the project success would be due to the users themselves. During this time, the vendor's approach towards the development was just to follow users' requirements and submit claims. At the same time, the users together with the PM were establishing new requirements for verifying the vendor's claims. The vendor was trying to abide with the

requirements to ensure claims were being processed, ignoring the system completion. Up to that time, although the development was based on SRS, the users' requirements kept changing with introduction of new functionalities. Discussion deliberating change requests caused the project to be delayed. Negotiations over change requests became endless due to the fact that the original project scope was not adhered to. At this point there were no changes to the project condition.

Technology People — V19 — Task Structure	The vendor's reason for leaving the project because of project time lapsed was just an excuse to free themselves from a bleeding project. The cuts made on their progress claims were the limit to everything they had been holding on. They had accommodated every user's request without additional charges yet the users were deducting their claims for completed work. The vendor's decision to leave the project caused a halt in the project and vendor level. The vendor's decision to leave the project site further widened the gaps between people and task and widened the gaps between people and structure. *Stakeholder Analysis* *The system development project had a two-year project timeline. This timeline was based on the vendor's expectation that the project would be a "plug and play" of a fully tested integrated system. However, during the actual development, the vendor carried out additional task (BPR and data migration) and was faced with requirement specification challenges that caused delay in the project. Due to this additional task and unforeseen challenges, conflict arose between the vendor (people) and the project timeline (structure). The vendor decided to leave the project when the two-year project timeline lapsed. Although the finance system was only at thirty-two percent completion, the vendor had no resources available to continue the project and at the same time they were not given any extension of time to complete the system. This action created conflict between the vendor (people) and system development (task) due to no system development on the project. Obviously, this decision also created another conflict between the vendor (people) and the project team (structure).*

In February 2009, the project period lapsed and the vendor left the project site (V19). According to the vendor, there were many reasons for the departure. Professionally, the departure was due to the project period coming to an end and no time extension being granted. Another reason was that the project financing itself was bleeding. The project was running at a loss. The longer they stayed the bigger the loss. And at the same time, the finance department was creating issues with the vendor's invoices, disputing the validity of the claims. After the vendor's departure, their intention was to find a more

stable system to support their operations. New prospective vendors were coming to give presentations on their systems but considering the cost, everyone was turned down since it was above and beyond their budget. As a result the steering committee had decided to continue using the existing system to support their operations (P20). The student system was successfully deployed and used while the finance system was still at thirty-two percent of completion, although it was being used. Sadly, the human resource and administration systems were totally abandoned.

At the work level, the users, acknowledging the new integrated system benefits, were still using the system with work around. The users were combining manual process with the new system to improve operational capabilities. There were instances where the users made manual updates to the systems. Any request for modification went through the ITD system analyst who only recently had been trying to understand how the systems worked. The only difficulty that the users had to face was during audits, where they still had to conduct reconciliations between the new and the legacy system that was still in use. The users were frustrated with the existing condition of the system, which was incomplete and had created more work for them (W20). Thus this maintained the gaps between the technology, task and people. Following stakeholder analysis, the conflicts from event W19 were maintained. The users continued to use the system with various work-around to fit their operations. This maintained the previous conflict between the users (people) and the existing system (technology) as their operations were not running as smoothly as expected. However at the same time, at the campus level, although they were using the system, they used it around their normal process. Conflict arose when different campuses had a different process for the same task. As a result, due to these un-streamlined processes, the users were continuously frustrated with the new system.

With the users' intention to continue using the system, it was up to the IT department to make changes and minor modifications to support the finance system. Currently, there were two IT analysts to support the finance system but their confidence on modifying the system was still lacking. Whilst technically it could be learned, their low confidence level was causing them to get agitated when the users requested changes,
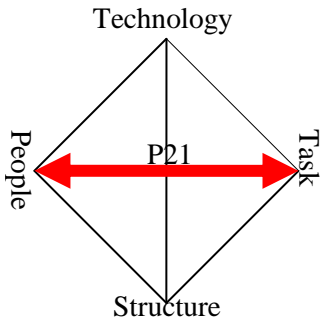
even a simple issue. Since they were becoming the backbone of the finance system, although the proposals to invite the ex-vendor to come and train the analyst were rejected several times, it needed to be done. Lastly, they managed to get the vendor to come to provide training for five days at a huge cost.

During these five days, the vendor explained the architecture and design structure of the system, followed by hands-on modification of the system based on actual users' requests. According to the vendor, the level of knowledge of the analyst was enough to do the modifications but the confidence needed to be built, and fast, since their users never stopped requesting changes. Also during these five days, the vendor and the analyst ran a session with the finance users to discuss the outstanding issues on the system and from there the analyst was able to capture the skills of understanding users' request. According to the users' head, if possible they needed the vendor back to continue developing the system. It only needed a bit of modification to make it foolproof. Although the IT analysts were doing it currently, they took time to solve even simple issues, while they needed it for their daily operations. The intention to bring back the vendor continued to the project manager's level but stopped at the top management. The chairman of the steering committee was already fed up with the vendor. Thus he decided that all modification and enhancement to the system would be carried out by the IT department.

The IT developers who were currently in charge of the system maintenance and support were pressured with the task. This was mostly due to their lack of knowledge the systems and also lack of confidence in dealing with the users. Although they were trained by the vendors to deal with such issues, they failed to perform their task. This created gaps between technology and people and people and task.

Stakeholder Analysis
At the project level, with the vendor having left the project, the main contractor and the PM4 made a coalition and agreed to look for a new system to replace or to add on to the existing system. But they faced challenges to find a system that could suit their limited budget.
With the existing system already deployed and all resources having been put into it, the steering committee decided to continue using the existing system and ITD had been requested to support and maintain the system. This decision created conflict between the ITD (people) and the system maintenance and support (task).This was due to the fact that ITD did not have enough resources to support or maintain the system. The

	ITD analyst was not involved directly during the development and did not have knowledge of the system structure. This lack of system knowledge further created conflict between the ITD analyst (people) and the new system (technology). As a result, the PM4 decided to appoint the vendor to provide training to the ITD analyst. Through this training, it was expected that the ITD analyst would be able to support the existing system.

Now the IT department was dealing with the finance users directly on their requests for system modification and enhancement (P21). They conducted a gap analysis between the current system and the users' expectations of the system, in other words, changes required to the existing system. In total there were approximately more than 200 man days needed to complete all their requests, from low to high severity. The IT department complained that the users kept changing their requests from one day to another, which caused problems for them to do the planning.

Technology / People — P21 — Task / Structure	The IT department in dealing with the users was doing everything to ensure continuous modification and enhancement to the systems. Their attempts to understand the users' request for changes failed when the users kept changing their requirements. Due to this, the IT department were not able do efficient planning especially in allocating their limited resources. This widened the gap between the people and task. *Stakeholder Analysis* *At the project level, the ITD faced challenges in supporting and maintaining the use of the existing system. Although the ITD received training from the vendor to handle change request and modify the system, it took time for them to absorb the skills. This increased the frustration of the users with the system. This complex system structure created more intense conflict between the ITD analyst (people) and system maintenance and support task (task). The ITD at the same time were also frustrated with the users who kept requesting changes. Especially for development of new system, the users kept changing their requirement. This created conflict between the ITD (people) and the users (people).*

On 1st May 2010, a major restructuring was made in the finance department. Although the initial reason for the restructuring was due to one individual, the head of finance took this opportunity to restructure the whole division, taking into consideration the future of the new half-completed system. The manager who was currently in charge of the system development matters was being re-positioned to head a campus, and another head of campus would be replacing him. During the development of the system, she had been a major contributor during the requirement session. With her previous experience

developing a finance system, it was hoped that she would be able to revisit the systems and identify system issues and refer them to the IT analyst.

7.5 Horizontal and vertical analysis

7.5.1 Horizontal analysis

In Case 3, the project trajectory depicted how changes in project personnel affected project activities. The first phenomenon was the change in project managers during the project life which affected the project level activities. It was evident that each project managers had their own interest and expectation concerning the project. Each project manager's tenure could also be seen as an episode or an era of controls. In Case 3, the life of the first project manager (PM1) was relatively short which ended with an abrupt termination of his contract. In essence, PM1 followed a more structured development strategy through the adoption of traditional SDLC. However, due to organizational politics, PM1's contract was terminated. This termination caused conflicts between the project members (people), risk management (task) and project team structure (structure) (P4). As mentioned by one of the vendor team members:

"During the initial project management office (PMO), he (PM1) is in the process of preparing the risk plan. But he was then being fired by his boss due to internal politics. There are a lot of things that get affected when there is a changed in PMO. The new PM (PM2) coming in is without knowledge and understanding."

Vendor developer, February 2009

However, the PM1 termination failed to affect the vendors' activities whose had continuously developing the system. The appointment of the second project manager (PM2) onto the project, strengthened the project team structure, but it also created new conflicts at the project level. PM2 came into the project with RAD methodology which was embedded within the e-management strategy. The deployment of this methodology into the project created conflicts not only at project level but also at the vendor level (P5, V5). The existing development strategy was abolished and the new RAD strategy took centre stage. Following this methodology, the system was developed by modules and deployed in phases starting with the pilot campuses. The system development reached pilot site deployment when PM2 decided to resign. The reason for her

resignation was due to her frustration over the top management's attitude and the vendor's quality of work on the project that related directly to her RAD methodology. As expressed by PM2:

"…then again the challenge is the top management of Case 3, the attitude of the top management is not facilitating, and they are not encouraging… I am quite frustrated… very frustrated with the attitude of the top management."

Project Manager 2, February 2009

The PM2's decision to leave the project caused conflicts between the project members (people), project planning (task) and project team structure (structure) (P12). The project was drifting without proper control over the activities.

Top management decided that the IT department (PM3) would be in charge of the development planning and they decided to go back to the traditional approach of system development rather than continuing with the RAD strategy (P13). They attempted to fill in the documentation gaps created by the rapid approach and conducted UAT prior to the system deployment to other campuses. They were shocked to find that major system functionalities were unavailable in the system. They decided that the vendor had to modify the system prior to the deployment. Due to limited time, the system was deployed to other campuses with only minimal testing done on the modified system. The project was left with only the IT developers when the vendor decided to leave the project (V19). At 32 percent used of system, the steering committee decided to use the system and the IT department and their developers were expected to support and maintain the existing system (P20).

Case 3's project trajectory also depicted a horizontal pattern at the vendor level. There was a stage during the development that the vendor was faced with multiple changes of personnel − senior developers (SD). Every change in the senior developer caused disruption to the vendor team structure which mainly consists of a senior and several junior developers with the team leader working on a part time basis. The first change occurred when the senior developer (SD1) who was frustrated with the level of users'

knowledge and willingness to accept their recommendation, left the project. This created a new conflict between the team members (people) and vendor team structure (structure) (V12). At the same time, this event triggered a bigger gap between the team members (people) and the system development (task) due to smaller number of developers left to complete the project.

Another senior developer (SD2) was appointed to stabilize the vendor team structure. With the junior developers needing to be trained at the same time that new systems needed to be developed and existing systems modified and changed, the new senior developer (SD2) felt overwhelmed with the task and decided to leave the project. Again, conflict emerged between the team members (people) and team structure (structure) and at the same time this maintained the gaps between team members and development task (V14). At this stage, the vendor team was left with only junior developers with a mammoth of task to be completed.

Because of the difficulty of finding a senior developer for replacement, the vendor decided to a appoint business analyst (BA) to support the vendor team especially the junior developers who still needed training. The initial responsibility of the BA was to speed up the development of new modules through establishment of business processes. However, the users were more interested in improving the existing system rather than developing new systems. Thus, it failed to achieve its objective of speeding up the development process that resulted in the vendor terminating the contract of the BA. Again, for the third time, a gap was created between the team members (people) and team structure (structure) and maintaining the gap between the team members and development task (V16). This analysis shows that no matter how experienced or knowledgeable the team members were, if the project was already in a chaotic state, it could not be revived. According to the IT department, the only way that the vendor could turnaround the project was by investing in more senior developers to conduct modification on the existing system and development of new systems. However, the vendor was not in a good financial health to accommodate these requests.

In Case 3, the antecedent condition or the history of the organization played a vital role in determining the path of the project. The merging of 12 institutes although being acknowledged by the vendor as part of the project uniqueness, its corresponding issue of business process diversity had not been resolved prior to system development. No re-engineering process to streamline the business process was carried out. This resulted in the vendor's unstable and incomplete system development which ultimately caused continual modification to the system.

7.5.2 Vertical analysis

During the project, interaction between levels was not only evident between the project and work levels but also between project and vendor levels. In this case, events that occurred at the project level had a direct effect at the vendor level. The first incident was the retraction of the BPR team from the project which occurred during the initial stage of the project. The purpose of the BPR was to standardize and integrate the business processes across the twelve campuses. Ideally, this exercise should be carried out by a specific team with vast experience, in this case, in finance processes. However, considering the time taken to find a new team and with limited project timeline, the vendor decided to absorb the task of conducting the BPR exercise. Their intention was to conduct it in parallel with the business requirement sessions (BRS). This decision created gaps between project team (people), BPR (task) and project team (structure) due to the fact that the existing vendor project team had not had any experience in dealing with BPR (V3). The decision made was political in nature. Their (the vendor team) limited knowledge on finance processes created further conflicts during their course of work.

Another set of interactions between the project and the vendor level occurred when the data migration team failed to conduct the data migration exercise. The team failed to understand the new system structure which resulted in the problematic data migration. Again, the vendor decided to absorb the task although they were currently experiencing conflicts in the project. Although the data migration exercise was considered a simple task, it affected the overall time allocation for system development, thus creating a further gap between the project team members and their task (V8).

Another event that illustrates inter-level interactions was the result of the user acceptance testing (UAT) that exposed the missing system functionalities. Missing system functionalities meant that the system had to go through another level of system checking by the vendor and modification. In this scenario, the functionalities omitted by the pilot campus users were considered fundamental to the overall system checking and modification. With other new modules under development, this additional task created tensions and pressure on the vendor developers that resulted in the senior developer leaving the project. This departure created further conflicts at the vendor level due to the unstable project team.

In Case 3 there were two instances that depicted interactions between project level and work level and both were related to new system deployment. First, was the deployment of student related finance systems at the pilot sites (three campuses). At the work level, this deployment created another set of work processes to support their existing system. The new system was working in parallel with the existing system. While the new system concentrated more on daily operations of student financial system, the existing system supported monthly reporting functionalities whose information was fed from the new system. This situation was inevitable because the new systems were not fully completed.

Similar to the earlier incident, the second interaction between the project and work level was the deployment of the student financial systems at other campuses. This deployment incorporated the new functionalities which were missing earlier. Although the deployment exercise was considered a success, and campuses were able to access the systems, users were facing difficulties in making sense of the new student financial systems. Although the systems were already being used by the pilot campuses, they failed to satisfy the users in other campuses thus creating multiple gaps at the work level (W17).

In Case 3, our analysis shows that how changes in project managers (project level) and senior developers (vendor level) affect a project's trajectory. Our findings shows that while change in project managers could result in change in the respective vendor

activities – vertical interactions, change in the vendor's senior developers only had a heavy impact on the vendor activities. Similar to Case 2, vertical analysis shows that interactions between different levels not only occur during system deployment. Multi-level interactions also occurs during other project activities, in this case, the retraction of BPR team and the termination of DM team had affected vendor level activities through their agreement to absorb the task.

7.6   Summary

The analysis of Case 3 depicts the project trajectory of the integrated financial systems implementation. This analysis shows how a change in project manager could affect the project's "health" diachronically. In this case, at the project level, there were four changes in project managers throughout the project life. Each of the project managers' different ideas and strategy severely impacted the overall implementation of the project. Changes in development strategy and the introduction of new development tools at the project level caused major setbacks to the vendor and also the users. In this case, the increasing width of the gaps was clearly evident (see V4 to V19) due to the continual conflicts that arose. This Case 3 project ended with the vendor leaving the project site and the IT department deciding to undertake all maintenance and support tasks.

<center>**CHAPTER EIGHT**</center>

8   Analysis and Discussion

8.1   Introduction

We start this chapter by revisiting our research questions of how can a process model (e.g. the PSIC model) improve our understanding of complex information system development initiatives and in what ways does the process of translation and black boxing through stakeholder conflicts and coalitions add to our understanding of information systems development and the inter-organizational transfer of technology.

8.2   PSIC model and IS development complexity

Computer-based information systems are complex socio-technical entities (Longenecker, 1994). In view to this, continuous research in information systems is being conducted to understand its complexity with various approaches (Mukerjee, 2008; Geraldi, 2009; Schoenharr et al., 2010).

The existing PSIC model supports the socio-technical nature of the information system development process. Within the PSIC model, the adoption of the Leavitt socio-technical model supports this issue of change. The Leavitt (1965) socio-technical model assumes that organizational elements (task, technology, people and structure) are always in equilibrium. It is only when there are changes to any of the elements that cause the balance or the equilibrium to collapse that caused gaps to be created. The PSIC model adopts the Leavitt socio-technical model to understand the engine or the content of change. Each critical event that was identified was structured into this form with corresponding task, technology, structure and people. While the PSIC model encapsulates different levels of activities, different levels have different sets of task, technology, people and structure. This groups the organizational elements into different sections, where each group consists of different members. For example, in the PSIC model, actors in the building system include "individuals or groups of stakeholders who can set forward claims or benefit from system development" (Lyytinen and Newman, 2008). They further identified actors as customers, managers, developers and users.

Technology in the building system covers software and hardware technology, design methods and tools and ICT infrastructure.

Within the PSIC model, the elaboration or the detailing of these actors was captured during the narrative explanation of the critical events. During the explanation reasons for gap creation were detailed. In this study, the detailed narrative explanation for Case 1, Case 2 and Case 3 was captured in Chapter Five, Six and Seven respectively.

The PSIC model suggests that critical events are events that create gaps between the organizational elements: task, technology, structure and people (Lyytinen and Newman, 2008). There are various reasons why gaps are created. In general, gaps are created due to changes in activities that occur either internally or externally to the project. In relation to the external or the environmental aspect of the project, this include change that occurs due to human interaction and change in leadership (Newman and Robey, 1992; Robey and Newman, 1996), change in business structure or economic environment (Pettigrew, 1987; Walsham, 1993) and change in business strategy and information system and structural alignments (Sabherwal et al., 2001). On the other hand, gaps also occur due to change within the project itself or an internal aspect of the project.

In this research we attempted to face the challenge of events identification within PSIC model mentioned by Lyytinen and Newman (2008). While prior technique of events identification involves the eyeballing technique, we followed a more structured way of events identification of grounded theory (GT) technique. We used CAQDAS – Nvivo8 to assist us in managing our pool of data especially the interview transcripts. With NVivo8, transcript were coded line by line into free nodes and further classified into relevant tree nodes. These activities correspond directly with the GT technique of open coding, axial coding and selective coding.

We also attempted to incorporate stakeholder analysis within the PSIC model by identifying each socio-technical element as a human or non-human stakeholder.

Following stakeholder analysis, we identified the interests and expectations of each stakeholder towards identified critical events. From our findings, we found that interactions between these stakeholders had caused either conflicts or coalitions that resulted in gap creation or gap resolution. Our analysis also identified that some of the conflicts or coalitions resulted from an explicit reason which derived from each stakeholder. Among the reasons are the level of knowledge, the degree of relationship, existence of communication channel and identification of project leaders or project champions.

8.2.1   PSIC model – horizontal and vertical analysis

Based on the revised PSIC model, gaps could be created at different levels, either at work level, project level or at vendor level. Following Leavitt (1965), gaps occur because of change in project structure, change in project team, where key people leave the project, or the introduction of new technological systems (Lyytinen and Newman, 2008). According to Lyytinen and Newman (2008), this multi level feature of the PSIC model improves the analytical capability of the model. The horizontal and vertical interactions between different layers provide a more meaningful understanding of the project. While prior research incorporate two layers of work and building (project), we introduced another layer called the vendor. This vendor level differentiates between activities occurred in the building (project) level and activities specifically involves the vendor (software developers). The establishment of new vendor level for analysis is made possible because of our large empirical data relating to the vendor. However, we sometimes found it difficult to justify the allocation of events either into a building (project) or vendor level. This was solved by incorporating the vertical interaction lines between levels. As a result, this addition provides a clearer identification of the vendor's activities and issues they encountered. This is shown clearly in the project trajectories for each case.

As mentioned by Lyytinen and Newman (2008), horizontal analysis attempts to reveal the path dependency of events during a project. In our case studies, the analysis provided us with the evidence of how changes in individual personnel or a group of individuals (VC, software developer, project manager and senior developer during Case 1, Case 2 and Case 3 respectively), could influence project success or failure i.e its path.

More importantly, our findings also provided evidence of how these changes or events resulted in punctuations – the disarray of project activities or structure that caused project non-linearity. However, there were also incremental change events that appear to have no immediate impact on the overall project activities.

Since our data comprises of three case studies and the PSIC model, which provides multi level analysis, our findings provide empirical evidence of how change in a single level and multiple levels affect project outcomes. In Case 1 and Case 2, critical changes occurred in a single level (the change in VC and software developers respectively) that resulted in positive outcomes i.e project completion. However, in Case 3, critical punctuations occurred at both the project level (change in project managers) and the vendor level (change in senior developers) that affected the outcome of the project – only 32 percent of the finance system was ever completed.

Additional observations show that some critical events could either result in negative or positive effects to the project. Examples of events that resulted in negative effect include the appointment of VC 2 in Case 1 that resulted in a system that was nearly abandoned and the appointment of vendor 2 in Case 2 who had failed to complete the system. However, there was also an incident which was expected to cause a major turbulence to the project – the resignation and termination of project managers in Case 3 – that resulted in only minor conflict. In this case, we found that the strong support from the vendor to continue with the development and fast replacement of new project managers were evident in ensuring project continuity.

There were also critical incidents that resulted in a more positive outcome. These include the appointment of VC 3 in Case 1. The VC 3's strong support towards the system enhancement project through the approval of additional budget enabled the system to be revived. The re-appointment of vendor 1 in Case 2 project in April 2008 also proved to be a success. Their vast knowledge and experience in the project assisted them in ensuring project completion.

It was evident from our findings that changes in the higher level management (vice chancellors) could result in a deep impact to the project where in Case 1, changes in VC could either resulted in project abandonment and returning to manual process or system revival – supporting system enhancement. In comparison, changes in middle or lower level personnel (project managers and vendor senior developers) impacted only on specific aspects of the project (e.g. a change in development strategy).

There is another interesting aspect of the analysis which is the effect of the antecedent conditions or history of the case studies to the overall project path. The analysis of our three case studies shows that the antecedent condition could either resulted in positive or negative effect to the project. In Case 2, the legacy system which was currently in use and the BPR which was being conducted provided a strong support to the project especially at the vendor level activities. Their stable business process which was embedded in their legacy system supported the vendor development work. This has resulted in a system roll-out in just 12 months. However, in Case 1 and Case 3, the antecedents affected the project negatively. For Case 1, their previous status as a branch campus resulted in users' lack of knowledge on their business processes which affected the vendor's development activities. However, this conflict was resolved with the vendor's strong base system which was embedded with standard accounting processes. In Case 3 however, the conflicts that were created by the diverse business processes of 12 institutes remained unresolved and resulted in bigger gaps especially within the vendor's level activities.

According to Lyytinen and Newman (2008), vertical analysis attempts to unpack interdependencies between levels – project, vendor and work. Based on our analysis of the three case studies, it is evident that interdependencies were established between levels during system deployment or roll-out. As a result, certain deployment or system roll-out had positive or negative impacts on the work level activities. Patterns emerged within the findings for all three case studies. Each had at least two interactions which were due to system deployment and the first interactions resulted in conflicts between users (people), new system (technology) and daily operations (task).

Interestingly, in Case 2 and Case 3, interdependencies not only emerged due to system deployment alone. Interactions also occurred between project, vendor and work levels during other events such as the data migration exercise (Case 2 and Case 3), unstable system modifications (Case 2) and absorption of additional tasks (Case 3) among others. However, these interactions largely created conflicts or gaps or resulted in more intense conflicts or bigger gaps. Through the analysis of projects' path dependencies and inter-level interactions, we find support for the PSIC model's capability to improve our understanding of IS development complexity.

8.3 The process of translation (Callon, 1986) and IS black-boxing - Complementary explanatory perspectives for gap creation and resolution

ANT in general provides the means to interpret and understand the socio-technical complexities of organizational change (Brooks, 2008). The four moments of translation (problematisation, interessement, enrolment and mobilisation) and the inscription of a stable network advocated by Callon (1986) provide us with a process analysis of our case studies. According to Mitev (2009), following ANT, unpredictable translation occurred that failed to follow predetermined and natural route. This is evident in our case studies that certain events or a sequence of events resulted in a punctuation or project disarray.

Black box is the inscription of a stable network alignment. It is advocated that more research is required in analysing the interplay that resulted in black box (the process of black boxing) rather than to study its effect (Cordella and Shaikh, 2006). According to Callon (1986), the punctualisation through unpacking or collapsing the complexity of the network into an actor is considered as the process of black boxing. It is evident in our case studies that the process of IS development is the actual process of black boxing in creating IS artefact – an integrated systems.

The application of the socio-technical model by Leavitt within the PSIC model shows the importance of identifying social and technical elements of information system development projects. But the structured identification of these elements reduced the in-depth understanding of each specific element. Therefore, following Pouloudi et al.

(2004), we extended the PSIC model to incorporate the elements of task, technology, structure and people with human and non-human actors or actants (Latour, 1999).

The idea behind this concept was to apply stakeholder analysis as a support to actor and actor-network identification. While stakeholder analysis supports human stakeholder identification, the paper attempts to apply a similar approach to identify non-human stakeholders. This was done through the application of stakeholder identification and analysis principles introduced by Pouloudi (1999). According to Pouloudi (1998), each stakeholder identifies further stakeholders through their interactions during the projects. This was in correlation with the ANT concept of "follow the actors" (Latour, 1987). As is the case for non-human stakeholders, the concept of representation (Pouloudi and Whitley, 2000) or speaking on behalf of the non-human stakeholder (Pouloudi et al., 2004) was applied.

Following the identification of the human and non-human stakeholders, further identification of the multiple stakeholders' expectations and interest towards the information system development project was essential. Differing expectations among stakeholders create gaps or conflicts; and alignment of interests among stakeholders creates coalitions. The concept of stakeholders' coalition of interests and the stakeholders' conflicts was adopted from Pan's (2005) stakeholder analytical framework for evaluating project abandonment which includes 1) Identification of human and non-human stakeholders, 2) Identification of stakeholders' roles, interests and expectations and 3) Evaluation of stakeholders' roles, interests and expectations – identification of conflicts and coalition.

Prior research in applying stakeholder analysis focuses on the identification of stakeholders and their corresponding roles, interest and expectations. Further analysis on inter- and intra-group conflicts and coalitions were also conducted. In understanding project outcomes, Lyytinen also introduced the term expectation failure to capture the understanding of project failure that is related to meeting stakeholders' expectations (Lyytinen, 1988). If we follow the PSIC model, each conflict and coalition will create an outcome or result. This outcome or result was considered as a critical event which

sometimes caused a punctuation in the project. Gaps between the elements were identified as consistent with the critical events that occurred throughout each project. At the same time, we further identify the human and non-human stakeholders that involved within each gaps being created or gaps being resolved. Based on our findings, we found out that gaps could either be created or resolved through incremental adjustment or revolutionary change or upheaval. We had attempted to provide an extended version of the PSIC model following the stakeholder guideline however, due to space limitation we only managed to incorporate the extension within the detail project trajectory analysis (see Chapters Five to Seven).

This research suggests that change created gaps in the form of conflicts that emerged between actants or human and non-human stakeholders involved in each particular event. To achieve this purpose, for each identified event, a corresponding actant involved in the events was also identified. Further to this, expectations of each actant towards the events were also identified. These processes of events, actants and expectation identification were based on the empirical data collected, following the guidelines mentioned above.

8.3.1   PSIC model and the process of translation

Based on our findings, we identified similarities as well as differences among these three case studies. Observation of the three case studies is summarised in Table 18. Detail discussion of these themes is deliberated through narratives, project trajectories and diagrams for each of the cases.

Project starts / initiation	Project can start from either coalition of interests and expectations or conflict of roles and expectations
Creation and resolution of conflicts	Conflict emerged due to differing expectations and interests Conflict resolution emerged through coalition or agreement
Coalitions	Coalitions are the result of alignment of interests and expectations
Project outcomes	Project outcomes are determined by critical events that emerge from conflicts and coalition
Evolution of system	Actors' interests and expectations of project and forms change over time

Table 18: PSIC model and patterns of conflict and coalition

8.3.1.1   <u>Project start or initiation</u>

Table 19 illustrates that projects were initiated due to work level issues or project level (organizational context) issues. In Case 1, the project started off with coalition between

project elements at both project level and also vendor level. The alignment of interests and expectations ensured a strong coalition.

Case 1	Case 2	Case 3
Project initiation (network creation - problematization)		
Expectations of project: Top management: to assist in achieving organizational mission – need for an integrated system User: to assist in daily operations Coalition: alignment of expectations of project between top management (people) and users (people)	Expectations of legacy system: Reporting structure: to follow government requirement Reporting task: efficient delivery of task Users: friendly use of system Conflict: legacy system (technology) fails to support daily operations and reporting requirement (task) – lack of functionality	Expectations of new structure – merger: New structure: efficient use and allocation of resources Business process: accommodating different institutes' operations Legacy system: support daily operations of different institutes Conflict 1: New structure – business process = diverse business process Conflict 2: New structure – legacy system = inconsistent/non-standardized use of system
Network creation		
Coalition: Appointment of Head of ICT Appointment of vendor	Coalition: Appointment of vendor – Joint application development	Coalition: Appointment of project manager (PM1) Appointment of vendor

Table 19: Project initiation - network creation

In Case 1, the initiation of the project was introduced by the VC whose mission was to create a future organization through implementing an integrated system. In ANT terms, this was the problematization phase. The objective was to create a future organization and in achieving this, an integrated system needed to be in place. The VC was positioning himself as the obligatory passage point (OPP), as the solution to the problem (Whitley and Pouloudi, 2001). The appointment of the head of ICT in the organization strengthened the need for an integrated system. She came into the organization with the intention of assisting in achieving the organizational objective. The head of ICT came in with an e-management concept which was a proven ingredient for development success. The phase of interessement and enrolment flowed seamlessly for the VC in meeting his objective (Figure 25). The appointment of the vendor to supply the integrated system was seen as another point of interessement and enrolment. The dotted circles in Figure 22 show the enrolment and intessement for both the new head of IT and the vendor. The vendor came into the project with a base system which was developed to fit a university environment. The appointment of the new head of IT

and the vendor created a stronger network, with everyone agreeing to the task and responsibility of achieving the objectives or interests of the VC.

Internal network
- Building future organization

Top management

IT department

Users

New Head of IT

E-management concept

Base system

Vendor
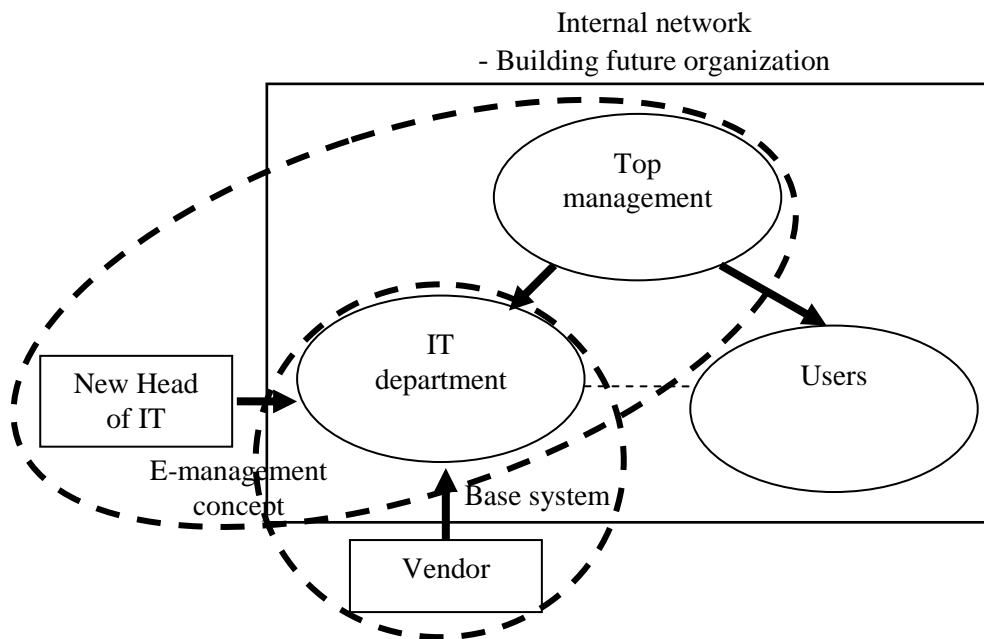
Figure 25: Case 1 - Internal network creation

However, for Case 2 and Case 3, the initiation of the project was built up at the work level, where limitations in using the legacy system created the need for a new integrated system. In Case 2, the project was initiated due to legacy system incapability to support expanding operations with the number of students growing every year. The users problematized the situation with the need to develop a new integrated system that could support their operations. Thus in Case 2, the users were the focal actor. They were the main actors that created the need for new system development. In order for the users to achieve their objective in developing an integrated system, they had to ensure all related parties that would be involved in the project would be aligned towards the development. Among them were the internal groups that included the top management, the ICT head and ICT developers and also the external groups which included the main contractor and the vendor. To their relief, all members within the internal groups were in full support of the initiative and were fully aligned. The alignment of interests for the external members was rather more challenging. The process of interessement was carried out through the tendering process. The users had to provide their requirements and only contractors that were interested in taking part would respond. The tender process, which involved evaluation and negotiation, would become the enrolment phase

where the users and the contractors would sign the contract. In Case 2, there was another twist. The winning contractor was actually a network on its own – a coalition of actors to support the new project. Within this there was a network of the software developers and the hardware suppliers. It was the software developers (vendor) who would provide the system application. As for the vendor, they came into the project with a base system which, to be precise, was also a black box. This base system consisted of a network of the previous base system, business processes, and the vendor's knowledge and skills. In this case, all of these actants were aligned to ensure success for the development project.

Case 3 was a different story compared to Case 1 and Case 2. In Case 1 and Case 2, the focal actor could easily be identified, being an individual or groups of individuals that created the need for system development: in ANT terms - the problematization stage. In Case 1, the first VC knew what he wanted and saw the need for an integrated system to fulfil those needs. In Case 2, the top level users group found themselves trapped in an un-expandable legacy system that could not support their operations. Thus they initiated the call for an integrated system to fully support their expanding operations. However, in Case 3, it was agreed that there was a need for an integrated system that would streamline their business processes, but no-one took charge of the project. The steering committee, the IT department and the users only knew that they needed a system that could streamline their business processes, therefore they proceeded from this alignment of interests, but again there was no-one driving the project. In my opinion they were taking the group approach to the project – being the steering committee, the IT department and the users.

In Case 3, a string of coalitions were established. The project continued with the tendering process, followed by the appointment of contractors and project managers. For the external groups such as the main contractor and the project manager, the process of tendering reflected the interessement and enrolment phase of translation. For the interessement phase, only interested parties cared to take part in the tender invitation. The tender evaluation, negotiation and the signing of the tender contract represented the enrolment phase of the translation process. The appointment of the project manager

provided a certain degree of direction for the project. With the project manager's recommendation, they decided that a traditional development approach would best suit the project. At the same time, the main contractor, which comprised the software application developers (vendor) and the hardware supplier, had already set up their base and proceeded accordingly. Following the project manager's plan, the vendor started the development of the finance system with the heart of the system, which was the general ledger (GL) module. The vendor's strong base system and their developer's knowledge of the university's business processes enabled them to proceed.

8.3.1.2   Critical events, episodes of conflicts and coalitions in IS development

The three case studies, although depicting some similar critical events during the project, also provide different patterns of conflict creation and coalition emergence. Table 19 provides a chronology of conflicts creation and resolution by cases. In this section, we will discuss the events that resulted in the creation of a network through a coalition among stakeholder and also events that resulted in network dissolution due to conflict or network betrayal. In this section, we will also discuss the events that create and resolve conflict based on our findings for each of our case studies. In each of the cases, during the implementation of the systems, we found that there is a sequence of events that either creates conflicts or resolves the conflicts. However, in comparing the three cases, there is an emerging pattern created by this sequence of events. This sequence of events is also being depicted in our detail project trajectory in the finding chapters (Chapters Five to Seven).

Based on Table 20 below, Case 1 has gone through several episodes of conflicts creation and resolution. While some of the conflicts were resolved, other conflicts remain unsettled. However, compared with Case 2, although it can be seen that several conflicts emerged, they were resolved systematically. With Case 3, it was different. Most of the resolutions to conflict were unstable and temporary. For example, the vendor agreement to absorb the BPR exercise was merely an excuse for them to continue with the project – to re-establish their name in the market. As a result, later in the project the vendor was not able to satisfy the users even during establishing the account codes – they did not have the capability to exercise such activities. The next section will re-capture several critical events that created and resolved conflicts.

Network betrayal – conflicts creation and resolution		
Case 1	Case 2	Case 3
Conflict: Weak working committee – lack of knowledge *Conflict resolution:* *Appointment of finance consultant – vast knowledge*	Conflict: Limited project time – no transfer of knowledge	Conflict: Missing BPR team *Conflict resolution:* *Vendor to absorb BPR initiatives*
Conflict: ICT developers lack of knowledge *Conflict resolution:* *Transfer of knowledge from vendor*	Conflict: Vendor to match base system with users' legacy system *Conflict resolution:* *Vendor agreed users' request – improve systems functionalities*	Conflict: PM1 terminated *Conflict resolution:* *Appointment of PM2* Coalition: PM2, RAD and steering committee – change in development strategy
Conflict: Enhancement project - Vague tender specification – tacit knowledge	Conflict: Data migration – data structure incompatible *Conflict resolution:* *Vendor conduct data cleansing*	Conflict: Non streamlined business processes by campuses – vendor failure to get users agreement
Conflict: Existing system structure – unstable (patchy modification) *Conflict resolution:* *Vendor to restructure and test system programming – vast knowledge*	Conflict: Unstable data migration – user to conduct data reconciliation	Conflict: Data migration team failure to migrate data – lack of knowledge *Conflict resolution:* *Vendor to absorb data migration task*
Conflict: Unstable system deployment – ICT developers lack of knowledge	Conflict: Users' resistance to use system – requirement not in system *Conflict resolution:* *Vendor agreed to accommodate changes*	Conflict: UAT – system failure (hung)
Conflict: Finance department restructuring	Conflict: Non-payment of work done *Conflict resolution:* *Contract termination* Coalition: maintenance agreement signed – transfer of knowledge	Conflict: PM2 left project – lack of support from SC and vendor – weak relationship
	Conflict: High number of change request by users - ICT developers failure to cope with modification *Conflict resolution:* *Inter-departmental meeting*	Conflict: Senior developer left project – frustrated with users' request *Conflict resolution:* *Appointment of new senior developer*
	Conflict: Incomplete system (80% completion)	Conflict: UAT – missing major functionalities – vendor to make

	Conflict resolution: *Appointment of new* *contractor*	modifications
	Conflict: New contractor failed to accommodate users' request – contractor terminated *Conflict resolution:* *Appointment of previous* *vendor to complete systems*	Conflict: Senior developer left project – mammoth change to system *Conflict resolution:* *Appointment of business analyst*
		Conflict: Data migration – duplication of data by campuses – need to reconcile
		Conflict: Business analyst terminated – failure to speed development process
		Conflict: Audit process – unstable reporting
		Conflict: Vendor left project – non- payment of claims *Conflict resolution:* *ITD to support and maintain* *systems*
		Conflict: ITD failure to support system – lack of knowledge User's frustration with incomplete systems

Table 20: Project conflicts and coalition

In Case 1, the initial conflict was created at work level. Lack of existing finance staff created conflict in establishing a stable working committee. Their lack of knowledge of the business processes created further conflict at the work level. This business process was supposed to be the basis for business process re-engineering. At the same time, lack of stable business processes created further conflicts at the vendor level. This incomplete business process was shown in their incomplete system prototype presented to the users. *This episode of conflict was solved with the appointment of a finance consultant.* The finance consultant managed, with the assistance of the users, to establish a complete business process for the vendor to work on. In this scenario, the consultant positioned himself as the solution the problem or the OPP. The users felt the need for the system but due to their lack of knowledge, failed to fulfil their needs. With the assistance and guidance from the consultant the users managed to identify their requirements. With the new more complete system, the users started to use the system.

The continuous use of the new system created the need to change certain functionalities. Following the rapid application development advocated by the project management, users' request for change was a sign of system maturity. At the project level, these changes to the system created conflict between the ICT developers and the new system. Again, the parallel modification and development advocated by the rapid application development created this conflict. The ICT developers were pressured to complete the development and at the same time to entertain users' requests for change. Coupled with their lack of firm knowledge of the system structure, this created unsolved conflict. Over time, the ICT developers acquired enough knowledge to properly modify and develop systems. *This was possible through the support from the steering committee to provide adequate resources, support from the vendors to transfer their knowledge* whenever possible and also through their own initiative to learn the system. The coalition between users, steering committee, ICT developers and the new system ensured that the project continued towards success.

A new episode of conflict emerged in the project when the VC1 tenure was not renewed and the new VC was appointed. He had a different view on managing the university, a laissez-faire approach. He created a new network in achieving his objective, which was to oppose the project. He appointed a new head of ICT to replace the existing one, who was transferred to the faculty. The coalition to demolish the system was stronger when the IT department was restructured. The existing ICT developers currently maintaining and supporting the system were transferred to another unit. A new group of ICT developers was appointed to assist the users in modifying and developing the system. This string of events has successfully reduced the level of systems usage and indirectly allows for manual systems. Another episode of events occurred when a new VC was appointed who had a more strategic mission. At the same time, a new head of finance and head of ICT were also appointed. The new head of finance saw an opportunity in the existing system thus initiated the improvement and enhancement of the existing system and positioned himself as the OPP for the network. There were several key actors that he needed to convince in order to ensure success. These include the users, the VC, the head of ICT and the vendor. It was the head of finance's intention to appoint the original vendor into this project. Their understanding and knowledge of the

existing system was priceless in ensuring proper enhancement of the system. Upon agreement of the contract amount, the vendor was appointed to enhance the system.

A new conflict emerged between the vendor, the users and their tender specification. According to the vendor, the users' tender specification was incomplete and vague. They had failed to detail their requirements in the tender document. The vendor, who had prepared the project timeline and price estimate based on the tender document, was caught out by this incompleteness. Another conflict emerged between the vendor, the users and their business processes. Apparently, although the users were very well versed in their business processes, they failed to document them; it was more a tacit knowledge of the users. Thus when specifying their requirements, they kept changing. These unstable requirements created conflict with the vendor who needed firm requirements to work on.

At the same time, another conflict arose at the vendor level, the developers were caught by surprise when they reviewed the programming of the existing system. It was problematic and patchy. The previous ICT developers, who had failed to understand the system structure, had disabled certain functions and created new programming to solve problems. As a result, the developers had to correct and test the programmes of the existing system before they could proceed with actual system modification and enhancement. *These conflicts were solved by the application of the vendor's developer's vast knowledge of the system.* Their capability to solve the users' unstable requirements and ICT developers' patchy modification was outstanding. Further to this, the enhancement of the system, which was based on the vendor's base system, was carried out smoothly. At the same time, the conflict of miscalculation of the vendor's project timeline that occurred due to the vagueness of the users' requirements, and the additional time required to critically revise the existing system, was solved when the head of finance granted an extension of three months to the vendor. This coalition ensured that the enhancement project was completed by the vendor.

At the point of the researcher's last visit, two more episodes of conflict emerged. The first episode was the system deployment issue. The ICT developers were in charge of

the deployment of the new enhanced system. The vendor would provide the completed system together with the list of instructions to be followed. The ICT developers, due to their lack of knowledge of the system, failed to deploy the system. The users upon using the system were prompted with error codes. It was after the system was finally running smoothly that the VC decided to restructure the finance department. This restructuring meant that new users would be using the enhanced system and some of these users were not involved during the enhancement project. Thus the tendency for them to request changes to follow their way of working was very high. The head of finance, anticipating this issue, ruled that changes could only be made for fundamental functionalities and not for individual needs. This controlled change environment ensured system stability. In summary, in Case 1, we can see that there is a string of events that creates conflicts that were either being resolved or left unsolved.

In Case 2, it was decided that this project would be a joint development project between the vendor and the ICT developers. This approach was adopted to ensure continuous support and maintenance would be made available by the ICT developers without relying on the vendors. This project would also provide an opportunity for the vendor to improve their system marketability (Figure 26). However, the limited project timeline restricted the vendor in transferring their knowledge to the ICT developers. This failure was also due to the fact that the ICT developers themselves were not ready technically to capture the knowledge from the vendor. They needed a step-by-step guide to understand the system. And with the vendor under time pressure, this was not possible. This could be considered as a betrayal of the network, where the actions were not aligned to the objectives.

The users' existing operations were supported by their legacy system, which according to them was at its best. The legacy system had gone through major modification which embedded their business processes. The only problem with the legacy system was the integration functions with other systems. It was currently a stand alone system. A conflict arose when the users requested the vendor to accommodate all the legacy system functionalities into the base system before any work could proceed.
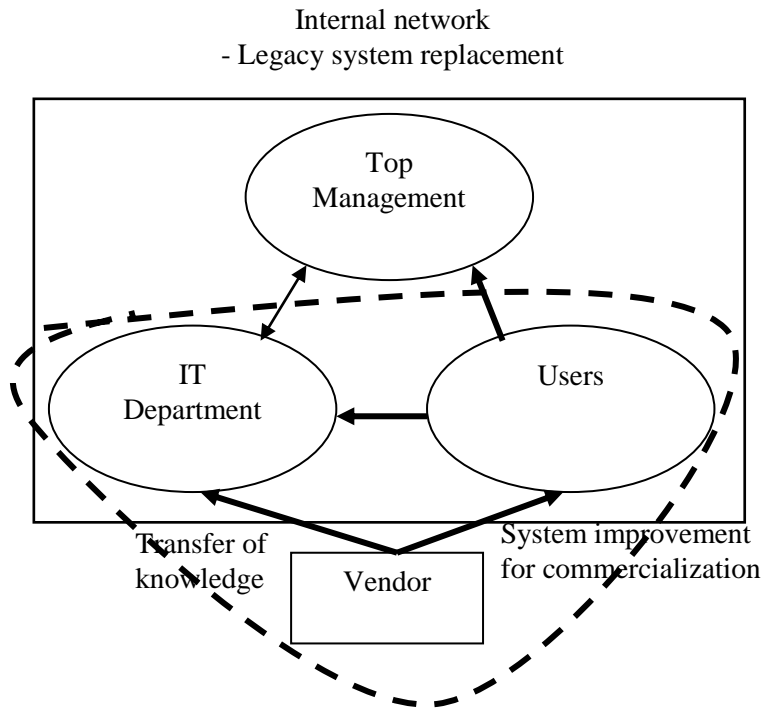
Figure 26: Case 2 - Vendor network formation

This conflict was solved when the vendor agreed to consolidate their base system with the legacy system. The vendor agreed to this considering the value of the embedded business process within the legacy system. According to the vendor, the users' business processes were much more mature and stable compared with their base system. This coalition not only strengthened the users' network but also the vendor's network.

Inadvertently, another conflict emerged from the data migration process which was one of the major parts in the system development. The legacy system network itself comprised various actants which worked together to form the network. It included the data and the data structure which held the data in place. The vendor, upon receiving the data from the users, noticed that the data structure of the legacy system and the new system were different. This created a conflict since the legacy data could not be migrated into the new system database. *The vendor has decided to take the responsibility to 'cleanse' the data, that is, to re-structure to follow the new system database that resolved the conflict.*

Another conflict emerged after the data was migrated. Upon verifying the migrated data, it was found that the data migration was not stable. The users could not match the figures from the reports generated. Thus the users had to manually prepare a data reconciliation. Once the reconciliation was completed, the vendor had to update the data into the new system database. These unforeseen yet critical conflicts caused a major setback to the vendor's project timeline. It seems that the users and the project team failed to identify the data migration process as one of the actants that needed to be aligned into their network.

In Case 2, the users were segregated into different levels, which include top level users, mostly supervisory levels and operational level users. The top level users who were the focal actors in the network strategically involved the operational level users during the requirement sessions. This was to ensure that the requirement was complete. During the requirement process, these operational level users would spell out their needs from the new system to their respective supervisors, identifying what additional functionalities were required for the system. Their supervisors would present their departmental ideas during the working committee meetings to streamline the requirements from other units and departments. However, conflict emerged at the work level when the operational users resisted the use of the new system after the deployment. They noticed that their requirements were not in the system. According to them the new system was not user friendly in that it failed to accommodate their requests. In this instance the top level users' failure to accommodate the operational level users' requirements could be considered a betrayal of their own network. This resistance, if it persisted, would jeopardise the overall development. The users' concerns presented to the vendor for modification. *The vendor, who saw this project as part of their strategy to improvise the system and make it a standard, agreed to make the modification to accommodate the users' requests.* At the same time, other resistance was solved through continuous training.

At the vendor level, a conflict arose between the main contractor and the vendor. This was a network on its own due to the fact that the main contractor in tendering for the project, had to partner or establish a coalition with the vendor and the hardware

suppliers. In this network, the main contractor was the focal actor, being the one in charge of the tender. The vendor, who wished to market their system, saw this as an opportunity and agreed to be involved. The conflict arose when the main contractor failed to make payment to the vendor for the work completed, even though the client had already made the payment to main contractor. *The conflict ended with the vendor terminating the contract with the main contractor.* Thus the main contractor's network was impaired. The vendor reported their inconvenience to the client and due to the client's strong relationship with the vendor this resulted in the client terminating their contract with the main contractor. At this point, although the users' network was affected with the termination of the main contractor, the use and maintenance of the system still continued. *The strong relationship between the users and the vendor resulted in the users signing a maintenance contract with the vendor.* It was during this one year maintenance period that the vendor could make up for their earlier failure to transfer the knowledge to the ICT developers. Throughout this maintenance period, the ICT developers were able to systematically understand the structure behind the system through the vendor's guidance and support. This transfer of knowledge and skills strengthened the users' network.

Another string of events emerged at the work level. The users were becoming comfortable with the new system's functionalities. Even so, they still requested changes to make the system more functionality friendly. During this period, it was the ICT developer's turn to make use of the knowledge that they had absorbed from the vendor. But the amount of change requested by the users was so overwhelming that the ICT not only failed to make the correct modification, they made it worse. This in turn caused frustration for the users who were currently relying on the system for their operations. *In this project, they had a very strong communication channel. Any issues or conflicts that emerged would be discussed openly in a meeting. This time the finance system project co-ordinator and the head of ICT met to discuss the extent of the request for changes by the users.* During the discussion it was found out the changes requested by the users sometimes pertained to the same screens or functionalities and sometimes the requests were contradictory. As a solution, the meeting decided that there would be an ICT developer stationed in the finance department to screen all requests from the users. The ICT developer would then pass the requests to the respective ICT developers and if

the requests were contradictory, it would pass them to the respective supervisors to discuss further with their users. This more systematic alignment of the issues created a smooth change request process.

The system was at eighty percent completion when the vendor stopped development. The twenty percent balance was mainly supporting systems which did not impact daily operations directly. Therefore, a new tender was issued by the users for the remaining twenty percent of the system. Through the tendering process, a new contractor was appointed, being a new addition to the users' network. The users requested the new contractor to look at the budgeting system which the vendor had half completed. After several attempts, the new contractor failed to understand the structure of the system, and thus was not able to continue with the development. In addition, the new contractor's limited working hours showed their low commitment towards the project. For the users, the main contractor had betrayed their agreement to the network and as a result the new contractor was terminated. Again the network experienced instability. *However, this conflict was resolved when a new tender was opened and the vendor was appointed as the new contractor.* The appointment of the vendor strengthened the users' network. The vendor's four-month project timeline was completed easily. Based on their base system and the users' vast knowledge and stable business process, they managed to complete the development on time. The users also agreed to sign a one-year maintenance contract with the vendor to ensure all project deliverables were completed. The users' network of development of the new integrated system was continuously maintained with the users' high satisfaction with the system and the ICT developer's capability to maintain and support the system.

In Case 2, similar to Case 1, there are a string of events that creates conflicts and resolves it. However, in Case 2 all conflicts were resolved by certain degree of coalition between the stakeholders.

In Case 3, it was more interesting. The first conflict emerged at the start of the project when the BPR team, who were responsible for streamlining the users' business processes withdrew from the project. However, t*his conflict was temporarily solved*

when the vendor – who knew that they did not have the expertise and vast knowledge of business processes – agreed to absorb the re-engineering task within their development activities.

Another conflict emerged at the project level when the steering committee decided to terminate the project manager's contract because of his failure to provide full commitment towards the project. *As a resolution to the conflict, the steering committee, on the recommendation of the vendor, decided to appoint a new project manager to manage the project.* The vendor had previous experience of working with the project manager, and was thus confident in her capability to manage the project. The steering committee with the help of the vendor managed to lock the project manager into the network. The agreement from the project manager to get involved in the project represents the enrolment phase of the project manager into the network.
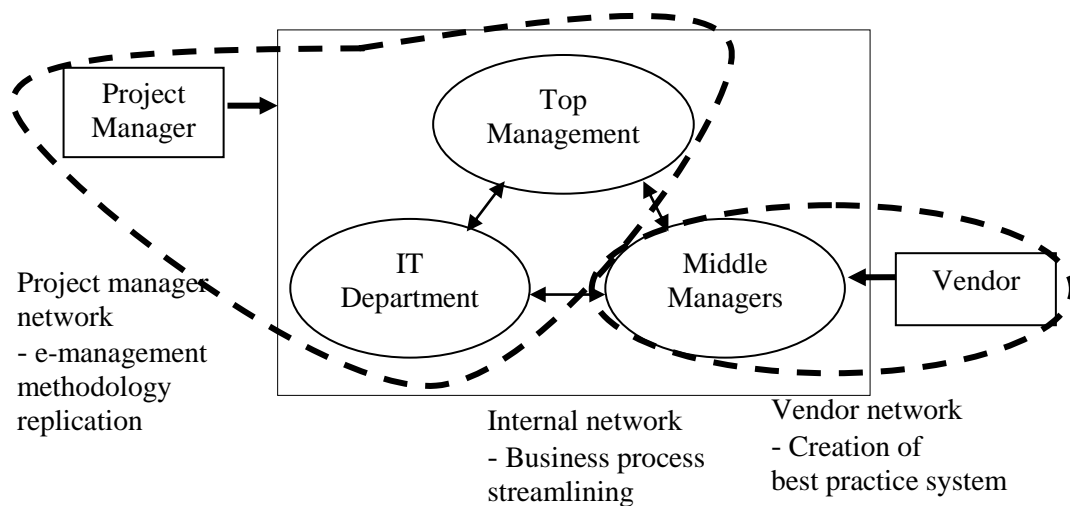
Figure 27: Project manager (PM2) and vendor network formation

The project manager came into the project with a network of allies. She came in with her own project management concept of e-management. She planned to adopt her concept and method into the project. In order for her to achieve this objective, she identified the steering committee's expectations of the project and strategized from there. She acknowledged the university structure of multiple campuses but ignored the business process streamlining. Following her RAD method, she suggested to the steering committee that the focus of development should be on student related system modules. These student modules had to be developed before the new student intake

which was in approximately six months. Again failing to acknowledge that the diverse business processes between campuses needed to be aligned, she suggested that deployment should be made to a pilot site which consisted of three campuses. The steering committee were impressed with her strategy and agreed to adopt it (Figure 27).

At the project level, a conflict emerged when, upon presentation of the business processes by campuses, they found out that there were differences in the ways these campuses were handling their operations. It took a long time for them to agree to a streamlined process. The vendor, who was supposed to be in charge of the re-engineering exercise, failed to provide sound suggestions, the vendor kept showing the prototype from their base system, which was from another university that in this case was not compatible. With the six-month timeline, the vendor started to work with these unstable and incomplete requirements.

At the vendor level, as part of the rapid development method, their development was based on a working prototype, which although not compatible had to be used to save time. The dateline for the deployment was approaching and the vendor needed the system to be tested and accepted by the users before it could be deployed. It was also the vendor's expectation that once the acceptance test pulled through, they could start to submit progress claims which were currently based on a signed acceptance test. But the UAT ended with just a system walk through test when the system stopped working during the testing. The users also found missing functionalities on the system. This created another conflicts between the UAT and the users and project manager. The vendor failed to create the enrolment for the UAT to be accepted in the network.

With limited time, the vendor had to modify the system to accommodate the changes required by the users. But at the same time another conflict emerged at the project level. A specific data migration team was in charge of the data migration process. Their only task was to migrate the data received from the users, who extracted the data from the legacy system into the new system database. The data migration team failed to understand that there were differences between the legacy system and the new system structure which needed to be identified prior to migration. The migration into the new

database was problematic with irreconcilable differences. The data migration team was then terminated and the migrated data was deleted from the new database. *The data migration conflicts were solved when the vendor agreed to carry out the data migration.* With their full knowledge of the new system structure, they migrated the data seamlessly.

It was the intention of the PM2 to assist the project to success through the adoption of the e-management concept. As for the steering committee, they were only interested in completing the new integrated system to enable them to streamline the diverse business processes. Similarly, for the vendor they were only interested in completing the system in order for them to further commercialize and create a system best-practice. This caused conflicts between the PM2 and the steering committee, together with the vendor. Although they had similar interests in the project, they had diverse intentions. The diverse intentions between the PM2 and the other project team towards the project caused problems in the project. This caused frustration to the PM2 who decided to leave the project. At the project level, the PM 2's departure caused project drift. There was no control over project activities; consequently no major activities were carried out at the project level due to the incomplete project team. The project manager (PM2) left with her e-management concept and the rapid application development method breaking her self from the network (this is shown in Figure 28 by the PM2 and RAD star).

At the same time, at the project level, the project manager's departure created more pressure on the vendor, with whom the clients were now dealing directly. Any changes required were without a proper change request format. According to the vendor, the changes required by the users were absurd and clashed with the fundamental standard. The vendor was working with a system which had been used and tested for its compliance with guidelines and standards. With increased pressure, mammoth change requests and limited resources created conflict between the developers and the request for modification.
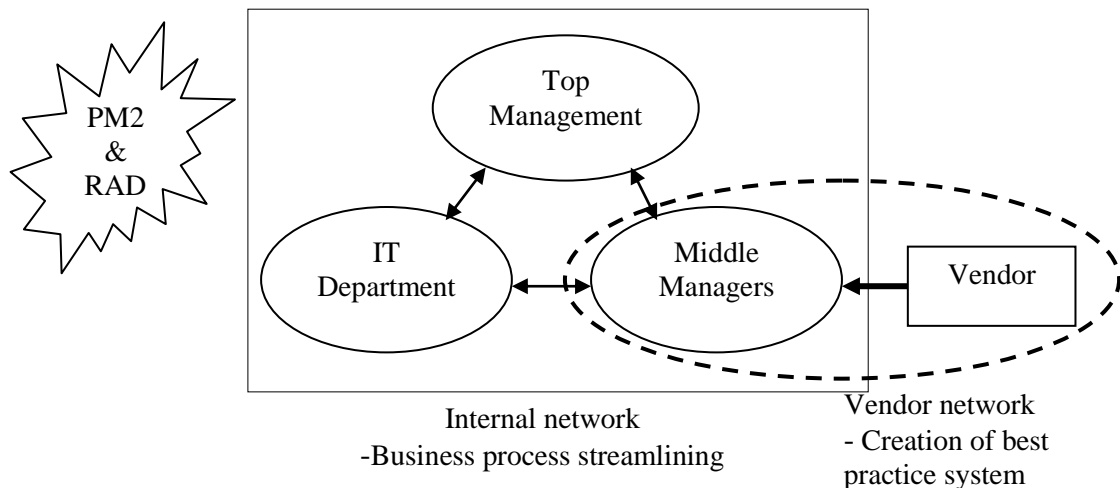
Figure 28: PM network dissolution – PM 2 left project

These frequent changes and the nature of the change had resulted in another conflict when the senior developer leaving the project. This conflict weakened the vendor's network of alliances. The senior developer was the pillar of the development. The vendor had to find a replacement to ensure project success.

The role of the third project manager was brief. The departure of the third project manager caused another drift in the project. He was a novice and failed to guide and manage the project and was thus terminated. The steering committee decided that the ICT department should take control of the development and act as the project manager. The confidence of the head of finance working committee that the requirements posted by the pilot campuses were sufficiently complete was challenged when, during UAT for the other campuses, major functionalities not catered for in the system were discovered. The head of the working committee acknowledged the situation and requested the vendor to make modifications to the system before it could go live. This created multiple conflicts between the vendor, the users, the new system and the UAT itself. This conflict resulted in the vendor making modifications to the additional requirements to the system. At this point the actor-network was becoming shaky and unstable. The ongoing modifications delayed the development of other modules.

At the vendor level, this overlooked or omitted requirement caused a major setback to the vendor development activities. When the vendor should have been able to continue

with the development of other modules, they had to revisit their programming scripts and make changes to accommodate the additional functionalities. Being an integrated system, introduction of new functionalities not only required stabilization of the functionalities but also its integration with other functionalities. To add to their misery, everything needed to be completed before the overall deployment of the system. This scenario created conflicts between the developers, the new system and the modification. Due to the increasing pressure of the overwhelming task, the senior developer left the project. The vendor network was again in a rocking boat. The developers' team was left only with a junior developer. At this point, the project encountered continuous conflicts of events which remained unsolved.

Prior to the overall campus student related system deployment, the vendor was burdened with another round of data migration exercises. The second data migration process created another problem for the project. Omission of data verification and data conversion on the original data from the legacy system caused the migrated data to be problematic. Since the campuses' legacy systems were not integrated, the issue of duplication of data never arose. The issue of duplication of data was not being communicated to the vendor by the users. As a result, the vendor merely migrated whatever data was received on an as-it-is basis, assuming that the data had been verified by the users. In addition, the system formats of the data for the campuses were different, which also caused problems during the migration. This duplication of data created conflicts between the campuses and the data itself. Not only did the data migration process occupy the vendor development time but the after effects of the process occupied more time than anticipated. Assistance given to the users on updating the reconciled data was not as easy as it sounds. The vendor had to identify for each reconciled item the corresponding changes that needed to be made and update the database. With only the junior developer available at that time, this resulted in all other development being halted. It seemed at this stage that it was the vendor alone who was trying to keep the network together, trying to align development processes towards the objective. The so-called focal actor of the steering committee, the ICT department, and especially the users were not contributing to the project.

The appointment of the business analyst, while improving the vendor development team structure by created coalition with the developers, also created conflicts with other actants. The raison d'être of the business analyst, which was to speed up the development, did not materialize. The pre-conceived workload and actual work done did not match. The vendor's hope that the business analyst would speed up the development process was held back by the users' mounting requests for change. This created conflict between the business analyst and the vendor. Although the business analyst created a coalition with the users, it was still slow. As a result, since the cost did not match the benefit of appointing the business analyst, the vendor decided to terminate her services. In this instance, again, the strategy carried out by the vendor was challenged by the users, who failed to understand the need for the business analyst, which was to speed up the development rather than modifying the existing system.

The year end audit exercise was the ultimate test of the system itself. During the 2008 audit process, the accounts prepared by finance were on the verge of being qualified. The accounts were prepared using the legacy system functionalities, whereas the figures came from the new system. Although the users prepared the accounts based on the new system reports, they were not able to support their figures. The system failed to provide them with the figures as required. This created conflict between the users, accounts and the new system. The users blamed the new system for not being able to provide stable reports to fulfil the requirement. As a result, to accommodate the auditor's request, the users had to prepare a new account. This time their accounts were prepared based on source documents in the system rather than the system reports. For them, it showed the instability of the system.

The reason that the vendor stated for leaving the project was that it was just an excuse to free themselves from a bleeding project. It was coincidental that the project period of two years had lapsed (Figure 29). The cuts on their progress claims were the limit to everything they had been holding on to. They had absorbed the workload and the cost for the BPR and the data migration exercise. They had accommodated every request to change without charges yet the users were deducting their claims for completed work. This created conflict between the vendors and the claims. The vendor's decision to

leave the project caused a halt in the project at vendor level (this is shown in Figure 34 by the vendor and best practice star). Only the focal actors in the network now remained – the steering committee, the ICT department and the users.
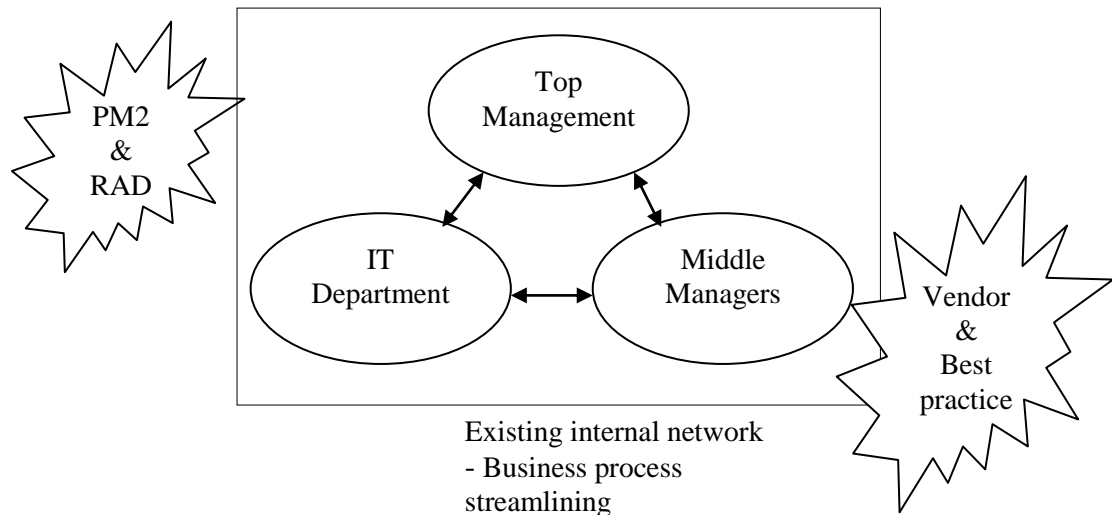
Figure 29: Vendor network dissolution – vendor left project

With the existing system already deployed and all resources having been put into it, the steering committee decided to continue using the existing system and the IT department requested to support and maintain the system. This decision created conflict between the IT department and the steering committee. This was due to the fact that the IT department did not have enough resources to support or maintain the system. The IT department analyst was not involved directly during the development and did not have knowledge of the system structure. As a result, the project manager decided to appoint the vendor to provide training to the IT analyst. Through this training, it was hoped that the IT analyst would be able to support the existing system. At the project level, the ITD faced challenges in supporting and maintaining the use of the existing system. Although the IT analyst received training from the vendor to handle change requests and modify the system, it took time for them to absorb the skills. This increased the frustration of the users with the system, where the modification carried out by the IT analyst was incomplete. This complex system structure created conflict between the IT analyst and the existing system. The project manager (the IT department) at the same time was also frustrated with the users who kept requesting changes to their requirement. This created conflict between the ITD and the users.

The actor-network for developing the new integrated system to streamline the diverse business processes had gone through challenges. Over the project timeline, inclusion and exclusion of new actors were active. Sadly most of the exclusion of actants from the network was due to conflicts that arose within the network. Case 3 also provide a string of unresolved conflicts and created more complications in the project. This is also shown by the thickening gaps in the project trajectory.

8.3.1.3 Project outcomes - conflict, coalition and system evolution – the process of black boxing

Applying the concepts of stakeholders and their roles and expectations within the PSIC model, we found that the actors or actants evolved over time. The most obvious evolution was the system or the software itself. Over time, through interactions with other actors within and between levels, it changed its form and content. This process of evolution supports the notion of black-boxing within the ANT itself. From this point forward, we adopt Walsham's interpretation of 'black box', which is a frozen network with properties of irreversibility. Irreversibility was further described as the degree to which it was impossible to go back to an alternative point where an alternative exists (Callon, 1991; Walsham, 1997). According to Callon (1986) the actors themselves are a black box which consists of complex interrelations between them. In this section we will recapture the essence of the system development process which was considered as the process of black-boxing. Following Lanzara (1999), the PSIC model enabled the tracking of the process of black-boxing rather than studying the effects of the black box which in this case was the financial integrated system. The section will start with the process of black boxing within cases followed by the between cases scenarios.

In Case 1, the initiation of the project was based on the VC's mission and vision in establishing a future organization. In order to support this mission an integrated system was deemed important. In this project, the base system was introduced by the vendor. Throughout the project life, the base system changed its form and content. The basic system was developed by a team of developers with previous experience, knowledge and skills on system development and business process. Their intention was similar, that was to introduce an integrated system for universities. In Case 2, the need for a new system became obvious when the existing system was unable to comprehend the ever

expanding organizational operations. The vendor came into the project with a base system. In Case 3, the vendor came in with a base system from Case 2. The vendor's initial plan was that this project would be a simple "plug and play" approach. Adopting the rational unified programming (RUP) approach, the base system acted as a prototype where users would test and request for modifications.

8.3.2 Knowledge, communication, relationship, leadership and control in IS development project

It was evident throughout the three case studies that knowledge, communication, relationships, leadership and control were vital to ensure system success or failure. Although not elaborated in detail, from the analysis of data, these were main reasons for the conflicts or coalitions to occur.

8.3.2.1 Knowledge and IS development project

Knowledge is a powerful tool for system development. Everyone who was involved in system development needs a certain level of knowledge. The users would require knowledge on business process and for the vendors and the IT developers they would require a more technical knowledge. It would be a bonus if both the users and the technical team had both business process and technical knowledge. In Case 1, on the one hand there were major differences between the level of knowledge of the users during the initial development and during the later enhancement project, and how it really affected the overall development process. On the other hand, due to the IT department restructuring exercise, the level of knowledge for the ICT developers involved in the system has declined. This has resulted in a failure to understand the integrated nature of the system – their actions corrupted the integrated system functionalities. Compared to Case 2, the users' level of knowledge was excellent and it was the ICT developers who were struggling to catch up with the users' change requirements. It was a different story in Case 3, where the users had different sets of knowledge – limited to their own manual operation processes – thus failing to see a wider view of their business process. Their failure to establish a stable and complete business process had a domino effect on the overall development project.

8.3.2.2 The power of communication and relationship in IS development project

Based on our study, communication and relationship were related to each other. Good communication emerged through a strong relationship between project team members.

And relationships were established through confidence in other project members. In Case 1, the relationship between the top management, users and ICT was formal in nature and the communication was hierarchical. The relationship between the head of ICT and the vendor was established prior to the project where they had worked together previously. Thus communication between the project team members flowed seamlessly throughout. The vendor only faced challenges in communicating with the users. The users were sceptical over the vendor's capability to develop a finance system, which thus affected their relationship. It was when the vendor appointed a business consultant that the users' confidence towards the system improved. In this case, knowledge also affected the relationship between team members. In Case 2, the strong bond between the users and the vendor was primarily due to acknowledgement of the high knowledge level of both parties. Both parties were confident of the other party's capabilities to satisfy development requirements. Other than the normal and formal meetings, this strong relationship further developed other communication channels during the development, which included text messages and also instant messages. This was in contrast with the vendor's relationship and communication with users in Case 3. One of the differences was the location of the vendor's developers. In Case 2, the vendor developers were stationed in the finance office, to ensure that all enquiries on requirements were discussed face to face. In Case 3, the vendor developers were stationed at the IT department office on different floors. It was the vendor developers' request not to station themselves in the finance office so that they could concentrate on the work. But according to the users, the developers would have been able to discuss any emerging issues if they had been stationed in the finance office. Thus meetings between the users and the vendors were usually held during the requirement sessions which were formal in nature and with limited time. Any enquiries were made through telephone calls during office hours or through e-mail correspondence. These restricted communication channels were mainly due to the weak relationship between them. The users were sceptical over the vendor's capability to develop the system while the vendor developers condemned the users' lack of knowledge and commitment towards the project.

8.3.2.3 Leadership and control in IS development project

In each of the cases, we found that leadership and control played a vital role in ensuring project continuity. In Case 1, it was evident that change in top management structure

affected the overall project initiatives. The first VC had attempted to achieve his mission to establish a future organization through implementing management systems by creating his network of alliances. However, it was totally destroyed with the appointment of new VC replacing him, who had a different view in managing the university. Through his laissez-faire approach, he created a new network to achieve his objective. He appointed a new head of ICT to replace the existing one, who was transferred to the faculty. The coalition to demolish the system was stronger when the IT department was restructured. Their coalition to demolish the system was a success when some users started to return to manual processes and the use of the existing system diminished. However, it was like a whole new day for the project when a new VC was appointed, whose objective was to improve organizational governance and performance. Subsequently, a new head of finance and head of ICT was appointed. The coalition of interest between these three actors had initiated the system enhancement project. They also appointed the original vendor in order to strengthen the network of the system enhancement project.

In Case 2, the head of the finance working committee was the main reference point especially when the committee was facing deadlock. Her vast experience in finance and her capability to make valid decisions ensured project continuation. According to her, although her knowledge of finance was at a higher level, her capability to understand issues at the operational level had enabled her to provide sound solutions. She added that sometimes problems arose when they (the operational level users) saw matters with a limited view, but when provided with other venues or solutions, they were more open and receptive. In Case 2, at the project operational levels, each of the heads of units were project champions where they were supposed to collate ideas and come up with a working process. But most importantly, there was the finance project co-ordinator who acted as the project watchdog to ensure smooth running of the project. His function covered being the mediator between the users, the IT department, the vendor and also other departments plus establishing and monitoring project milestones. According to him, project milestones are vital to ensure project success. Although they should not be too rigidly followed, any variance had to be properly justified. This justification was important in challenging the steering committee during meetings. At the same time, he also acted as the finance process consolidator where processes from each of the units

were consolidated and points of integration were identified. It was usually at this point that each of the units needed to give and take certain parts of their processes. In Case 2, the finance project co-ordinator worked independently of the head of finance committee, and the head would only be referred to if any major issues unsolved. But this was in contrast with Case 3 where the finance project co-ordinator was a mere label, and any decision would still be referred to the head of finance committee. They had low confidence in their capability to make decisions since they would generally be vetoed or altered by the head of finance.

In relation to Case 3, what is evident in the project is the frequent change in the project manager's position. Since project managers were involved in high level and strategic planning of the project, it had directly affected the continuity of the project in Case 3. As a result, at every point of change, conflict arose. It started off with the first project manager who advocated the use of traditional SDLC with complete and robust risk management planning. However, due to internal politics, he was terminated from the project. A new project manager (PM2) was appointed with a method that ensures project success – rapid application development (RAD). This new method entailed several abrupt changes to the existing development. Project timeline were changed and development approach was restructured to accommodate her RAD method. However, her high spirit to ensure project success was diminished when she sensed the lack of commitment from the top management and the vendor, who in this case have different agenda. Due to this frustration, she left the project. She was replaced with a new novice project manager who has no input into the project. At this point, the project was adrift. It was later when the steering committee decided to appoint the IT department to be in-charge of the project management task. The IT department decided to go back to basic, by re-structuring the development to follow traditional SDLC. Therefore, this research provides an empirical justification on how change in project leadership and control could affect the overall development of an information systems.

8.3.3 The evolution of system – vendor level transfer of technology

Although this research covered three case studies, it focused on one system that was developed by the vendor and applied across all of the three cases. Throughout the development of this system, it had gone through major changes and modifications from

its original base system. This section will discuss the evolution of the system through these three cases and understand how the socio-technical interaction created system black-boxing. Figure 30 provides a pictorial depiction of the evolution of the based system developed by the vendor from Case 1 to Case 3.
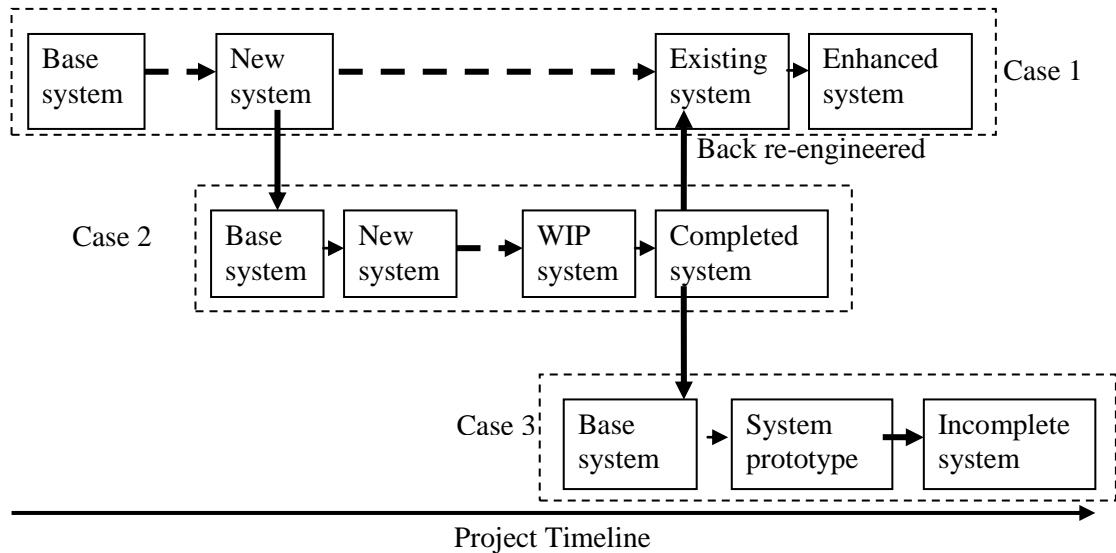
Figure 30: The evolution of the system – Vendor level transfer of technology.

The base system was developed by the vendor based on the developers' prior experience in system development in a university environment. Thus the base system was specifically aimed as a university management system. The system was first deployed in Case 1. It was the vendor's first ever project in system development. For Case 1, it was the Vice Chancellor's intention to develop an integrated management information system for the university which was then still in its infancy. The vendor and the base system were enrolled within the Vice Chancellor's network through their alignment of interests, i.e system development. For the finance system, the vendor faced problems in developing a stable system. This was due firstly, to the fact that since they were still in their infancy as a university, the number of staff able to get involved in the development was limited, and secondly, with their prior status as branch campuses, the business processes that they had gone through were incomplete. Therefore, during the business requirement session, the users failed to provide stable and complete business requirements for the vendor to work on. In most cases, the vendor would apply their own base system to support these incomplete user requirements. In this case, the system was considered as being black-boxed when the users accepted the system and started using it. This system was then being deployed in Case 2.

The users in Case 2 were so impressed with the system developed in Case 1 that they had decided to develop a similar system from the same vendor. The Case 2 users visited Case 1 to view the system in use and the integrated features of this system attracted the users in Case 2 to adopt it. Thus in Case 2, the vendor came with an improved version of the system from Case 1. It was early in the project when the vendor was shocked with the users' request to match their system with the users' legacy system. This meant that the base system being the black box had to be open to enable new actants to be aligned to the network. In this case, the new actants were the legacy system functionalities and Case 2 users' additional business processes, which were not available in the base system. During Case 2 system development, although there were conflicts that emerged during interactions between actors, these were solved through coalition or alignment of interest through the project team's strong communication, relationship and knowledge. The system development in Case 2 created a major improvement to the system, in that the black box was growing, with new functionalities and new system modules.

The success in the development of the new integrated financial system in Case 2 sparked an interest for Case 3 to visit the site. Case 3, in the midst of finding a suitable system that could streamline their diverse business processes, viewed the system in Case 2 as a major contender. The financial system, which suited the industry's standard accounting guidelines and had been locally developed, had been agreed to be adopted in Case 3. The vendor came into the project with the base system derived from the latest version of the Case 2 system. The prototype based development approach, which would have saved the vendor's development time, was totally scrapped when the users found that some of the functionalities and operations that were standard in the base system did not match theirs. The vendor's plan to "plug and play" the system from Case 2 was disrupted. Again, the black box was opened again and new actants came into play. The enrolment of the users and their requirements was achieved through the exercise of their power (Callon, 1986) as a client. The vendor recognized this process as a stabilizing means for the system. The users required changes to the fundamental parameters such as the accounting structure. To make matters worse, the unique business processes on each campus were not streamlined and re-engineered. In addition, the limited timeline

posed through the rapid development approach advocated by the project manager meant that development was mostly incomplete and unstable. With the rapid development approach, this half developed system would be deployed and users would request continuous change, which the developers would be expected to incorporate into the system until it was stable. But with the users' business processes still being problematic, changes and modifications were unstable and incomplete. Thus, in a vicious circle, the users continuously requested further changes and modification. With the IT department not involved directly with the development, the vendor's developers became frustrated with the changes and left the project. At the same time, the departure of the project manager caused the process to continue as if it had a life of its own. With the other actants, such as the data migration process and the legacy system data, betraying the network, the vendor's work became incommensurable. According to the vendor, it was a bleeding project. They had sacrificed time and skills to complete the system but new conflicts kept emerging. Unfortunately the vendor decided to leave the project. The finance system was only at thirty two percent completion, but they acknowledged the beauty of the system especially the integrated functionalities. Thus they decided to continue using the system with work around where needed. The system was in a state of fluctuation during the research final visits. Even though in Case 3 the system did not achieve black box, it was still continuously being used and new actants (IT developers) were joining in to strengthen the system composition.

The completed system in Case 2 was simultaneously being introduced in Case 1, while at the same time initiating a system enhancement project for the finance system. Their existing finance system was at that time in a state of irreconcilability which needed to be uplifted to its initial form. The project was initiated by the newly appointed head of finance who saw the potential of the existing system. The process of enrolment of actors into the network faced users' resistance challenges. Through the exercise of power, he managed to persuade a majority of the users to agree with his ideas. The minority were excluded from the project by transferring them to other departments. The original vendor was invited specifically for the project due to the fact that the head of finance acknowledged the need for the actual vendor to enhance the system. In this case, the Case 1 black box of the existing system was re-opened to allow new actants to be aligned. Upon re-opening of the existing system, the vendor was shocked to see the

state of the system structure. According to the vendor's developers the system programming was problematic. The ICT developers had made modifications without understanding the actual structure of the system, which caused the programming to be patchy. They had failed to understand the integration system structure, thus disabling its functions. This had resulted in a low quality system being used by the users. The vendor's developers were using their skills and knowledge to re-configure the system to follow the original design, and testing the system before any further enhancement could proceed.
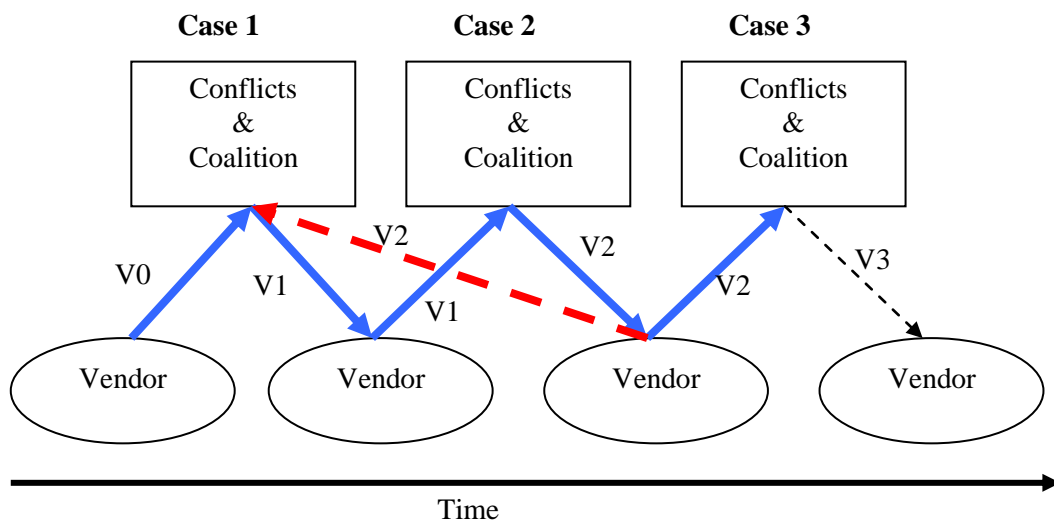
Figure 31: The evolution of the system – The transfer of technology between cases

In this case, the Case 2 system was maintained throughout the project. It was genuinely used as a prototype during the project. Conflicts that emerged during the project were solved through either the exercise of power, the strength of relationships and communication channels or the abundance of knowledge and skills. The new enhanced system was completed, deployed and used.

In summary, the integrated financial system evolved dramatically through time from version zero (V0) to probably version three (V3) (refer to Figure 31). Through multiple conflicts and coalition within each case that it had been through, the system had now been used to support the most critical organizational operations – financial operations, although in Case 3 the system completed the student financial system only. During each of the projects each version of the system was either re-opened to consider other actants

(Case 2 and Case 3) or the black box remained closed and was used as a prototype to enhance existing systems (Case 1).

8.4 Summary

This chapter revisited the research questions and attempted to answer the questions through the use of narratives and diagrams that elaborate and depict the interesting aspect of the three case studies. In understanding the complexity of IS development, the PSIC model provides a depiction of detailed project trajectory which unveil the project's sequence of critical events. This is further supported with the detailed narratives of each critical event through the integration with stakeholder approach. In a macro level analysis – horizontal and vertical analysis – PSIC model provide interesting patterns of positive and negative impact of change towards project path.

The process of translation provide an in depth understanding of how the intention, the interest and the expectation of stakeholders is carried out through actions through out the IS development projects. As such, this chapter attempts to discuss the major themes that emerged from the findings which include the scenarios of project initiation among the case studies, the process of network creation and network dissolution through coalition and conflicts or betrayal and project outcomes through IS black-boxing. In addition, this chapter also discusses the inter-relationship between the three cases under study through the notion of transfer of technology. It narrated the process of integrated financial systems black-boxing, where it was seen as a naturally occurring experiment among the three cases. This chapter also uncovers how knowledge, communication, relationship, leadership and control plays an information role in IS development. This discussion also elaborated how the intention or motives of one vendor to create a system of best practice was challenged through conflicts and supported through coalitions.

CHAPTER NINE

9   Conclusion

9.1   Introduction

This chapter attempts to conclude the overall research by starting with a chapter-based summary. This is followed by a summary of the contributions of the research to theory and practice. The chapter concludes with the limitations of the research and recommendations for future research efforts.

9.2   Research summary

It is evident from our study that IS development projects have similarities with house building projects. Both projects involve social and technical elements which are intertwined in ways that create project complexities. In our study, this close relationship created issues during the project. Due to their socio-technical interactions, IS development projects were also found to be dynamic and non-linear. This research attempted to understand information system development complexity through the combination of stakeholder and actor-network perspectives. Following the process research method, the PSIC model (Lyytinen and Newman, 2008) was adopted and extended to accommodate the vast empirical data collected. These vast data were gathered through semi-structured interviews from three case studies.

	Case 1	Case 2	Case 3
Year of establishment	2002	1997 (1922)	2002
Characteristics	New / small competency based university	Mature / large teaching university	Amalgamation of 12 institutes into 10 campuses – technology based
Modules implemented (Project start)	Full integrated modules (2002)	Full integrated modules (2003)	Full integrated modules (2007)
Rational for implementing ERP	To improve operational efficiency	To replace the legacy system – not integrated	To streamline business processes

Table 21: Summary of three case studies

This study focused on the implementation of an enterprise system in three higher education institutions in Malaysia. Table 21 tabularised the similarities and differences

among the three case studies. While the nature of business for each case study and the developed systems was similar, the different organizational characteristics played a vital role during the overall development project.

In this study, we have attempted to suggest an expansion of the PSIC model. Rather than just identifying the actors according to the respective organizational elements following Leavitt – task, technology, structure and people – we have expanded each element to include detailed tasks, technology, structure and people that were involved in each critical event. This detailed identification of task, technology, structure and people enables us to further identify their interest and expectation towards each event which is supported by the stakeholder perspective. Although this change eliminated the pattern building of the gaps between the elements, the identification of detailed actors enabled further identification of the diverse actors' interests and expectations. The similarity of their interests and expectations created coalitions between actors and their differences created conflicts. Based on the critical events that were identified using GT method and CAQDAS, we described the actors involved and identified their interests in and expectations of each event and how these interests and expectations are similar or different. We further identified that when interests and expectations collide, this creates conflict among actors which similarly creates gaps. At the same time, when a punctuation occurs, it could either create more conflicts or resolution of conflicts through a coalition of interests and the expectations of actors. The notions of interests and expectations and further conflicts and coalitions were relevant to the notion of translation or the alignment of interests within the actor-network perspective.

However, it was not the objective of this research to study or even to speculate or predict the outcome of each case. Based on our empirical evidence, the adoption of PSIC model provides us with a clear depiction of critical events throughout the projects' lifecycles. It entangles the complexity of understanding IS development project with the detailed analysis of socio-technical interactions. In this research, following Schultze (2000), we attempt to conduct an inductive interpretation of data in order to establish an account of localised events for each of the cases under study. At the same time, we also

attempt to generalize these events through a deductive application of frameworks and theories.

In addition, the PSIC model trajectory assists in understanding the actual process of technology black-boxing – the creation of artefacts or reaching the point of irreversibility. The PSIC model trajectory depicts critical events that occurred during the IS development project. In this study, we attempt to identify the IS development project outcomes through the creation of a black-box. This naturally occurring experiment provides us with not only a single valuable interpretation of IS black-boxing case study but also an inter-relationship between the three case studies.

The first chapter of the thesis serves as the introductory chapter of the research. It attempts to introduce the phenomena of information systems (IS) development with concentration on IS complexity and IS success failure. This is followed by the theoretical underpinnings of the phenomena under study through a review of the literature. A brief description of the PSIC model was also provided in this chapter. This chapter also briefly describes the qualitative research method adopted in this study which includes longitudinal multiple case study and semi-structured interviews as the main data collection method. This is followed by the description of the grounded theory technique which was used as the main data analysis method and the NVivo8 software as the assistive software. A summary of the findings was also provided in the introduction chapter. The chapter ends with the research questions.

This is followed by Chapter two which elaborates in detail the phenomena under study which is IS complexity and IS success and failure. A summary of the definitions and concepts gathered from the relevant literature is provided to ensure consistent understanding. This chapter also introduces the theoretical framework used in this research, which is stakeholder analysis and actor-network theory. Relevant theoretical concept is compared in its application and its relation to the context of study. Chapter three introduces the process model used in this study. It starts with the duality of IS research which is variance (factor) studies and process studies. Following this, the

evolution of process studies was elaborated in detail. This chapter ends with the position of process research model within two IS research extremes.

Chapter four provides a detailed description of the method of research applied during the study. It begins with examining qualitative research in information systems and ends with the researcher's position in the study. Within this chapter, the case study research method, the case studies and the context of the cases are described in detail. Following this the qualitative data source, which includes the empirical evidence and the conduct of longitudinal case study methods, was elaborated. This is followed by the mode of analysis conducted during this research. The grounded theory techniques and computer-assisted data analysis software, namely NVivo8, are introduced. The mode of analysis using chronologies and narratives is also described and elaborated upon.

The following chapters (Chapters five to seven) provide pictorial and narrative accounts of the research findings for each case study based on the PSIC model project trajectory. This PSIC model supports several complimentary theories that include process theories, punctuated equilibrium, multi-level systems and Leavitt's socio-technical theories. Within the PSIC model, critical events are identified for each of the project, vendor and work levels. For each identified event, following Gersick's punctuated equilibrium model, gaps are exposed and described. The findings also show how in any situation gaps between elements of the project can become wider over time.

In Chapter eight, the research questions were revisited and the notion of stakeholder, interest, expectations, human and non-human stakeholders/actors, actor-network, process of translation and black-boxing were re-introduced. Based on the findings in Chapters five to seven, this chapter attempts to compare and contrast these findings through different themes with detailed narratives and diagrams. The last chapter (Chapter nine) incorporates a research summary and followed by the implications and limitations of research and recommendation for future research.

9.3 Research contributions

9.3.1 PSIC model, human and non-human stakeholders and IS black-boxing
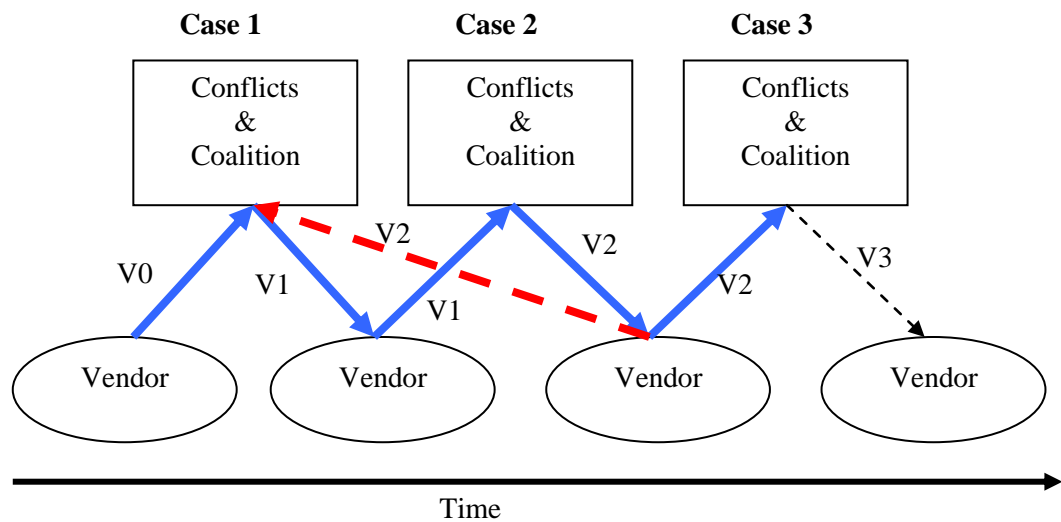
Figure 32: The transfer of technology between cases

In this study, we attempt to understand the outcome of IS development through the process of black-boxing – creating a stable network. We revisit Figure 31 (Figure 32) to recapture the essence of the process of transfer of technology amongst the three case studies. For this purpose we follow Lanzara (1999) who suggests studying "the interplay that results in a black box" or "track the process before the black box is closed". We adopt Lyytinen and Newman's (2008) PSIC model to understand the process of black-boxing as suggested by Lanzara (1999). For this purpose, we have modified several parts of the model to make it fit our data structures. As mentioned earlier, we have added another layer of the model to incorporate the vendor system level. The PSIC model adopts Leavitt's (1965) socio-technical framework as the change engine where according to the model, change in one of the organizational elements will cause change to other elements, whereby the organizational elements constitute task, people, technology and structure. While acknowledging the usefulness of the elements identification and how change to any of the elements would create gaps, based on our data, we found that most of the gaps that were created due to change were also due to the change in each of the actor's interests and expectations. While Leavitt's model identified them in groups of either task, technology, structure and people, we attempt to expand it to identify the actual elements within the task, technology, structure and

people and further identify their interests in and expectations of the critical events identified and how their interests either aligned or conflicted. We further narrate the critical events identified through the process of translation (Callon, 1986) starting from identification of focal actors to either actual enrolment of interest or even betrayal of interest.

Based on our findings and discussion, each of the projects described in the case studies went through several episodes of conflicts and coalitions. These strings of events dictated the composition of the creation of a best practice finance system. The three case studies under study were part of the vendor's many clients of the university integrated management system software. The base system is established from synergy of expertise from various backgrounds. This base system is then embedded into Case 1, a newly established university. The need for an integrated system is based on the Vice Chancellor's intention to establish a future university through system implementation. The strong bond between the VC, head of ICT and the vendor created a durable network that resulted in a usable system. It was at this point that the vendor used the system they had developed in this case for another university (Case 2). However, in Case 1, the limited VC tenure caused the network to dissolve. It was the hope of the head of ICT that the strong coalition between the users and the system would ensure network durability. However, the appointment of the new head of finance brought new life to the system network which was by then in poor shape. His intention was to rebuild the existing system rather than replace it with a new system. This new, emerging network was further strengthened with: 1) the involvement of users who supported the use of the existing system; and 2) the appointment of the original system vendor as the developer. On the same note, the vendor brought with them the system from Case 2 – the improved version of the Case 1 system. This was an improved version of the system due to the fact that Case 2 was more mature compared with Case 1. In Case 2, the users themselves had vast experience of finance business processes and dealing with systems. It could be considered as a user dominant approach of system development in Case 2. The users were well prepared for the system development. The vendor simply followed the users' requirements and conducted system testing as a fine tuning exercise. It was at the same time that the vendor took the system from Case 2 for their project in Case 3 – a newly merged university trying to streamline and integrate their business processes through system implementation. It was the vendor's intention to make their system fool

proof, fully tested and accepted at industry level. Thus transferring the same system to different universities would achieve this objective. Similarly to Case 2, Case 3 was also a user dominant development project but with limited knowledge of their business processes. With their newly merged organizational structure, business processes between the different institutes diverged. Without proper business process, re-engineering the project was a nightmare for all parties involved, especially the users and the vendors. Due to several changes in project managers, this project experienced the two extremes of development approach: i.e. from traditional system development to rapid application development. In Case 3, different stakeholders had different intention on the project. We had the top management, the ICT department and the users who had a similar intention to streamline and integrate the business processes, but undertook different routes in achieving this. At the same time, we also had the vendor who intended to "plug and play" the Case 2 system and the second project manager who came into the project with the e-management concept (RAD) assuming that their system and concepts were adaptable to any similar environment. This intertwining of different concepts, approaches and expectations of the project resulted in an undesirable outcome which was difficult to label a success or a failure. However, the integrated finance system was continuously used by the users although it was only thirty two percent completed and was still being modified and supported by the ICT developers. How long the system would last was uncertain. As for the vendor, the outcome from Case 3 was an improvement from Case 2 systems which the vendor has further implemented and improvised in other projects.

9.4 Contribution of the study – Practical implications

9.4.1 Researchers

This research provides several attempts to improve the methodological aspect of the PSIC model. First is the application of grounded theory (GT) technique and computer-assisted qualitative data analysis software (CAQDAS) to improve the events identification. It is mentioned in Lyytinen and Newman (2008) that the challenge faced by researchers in applying the PSIC model is identifying critical events that create gaps and the existing method is through the eyeballing technique, where researchers will scan the transcript and identify the critical events. This eyeballing technique is a skill which only develops with experience. In this study, we attempted to improve the

eyeballing technique as a method for critical events identification in the PSIC model by introducing the grounded theory (GT) technique to assist in event identification. Following Strauss and Corbin's (1990) grounded theory technique, transcripts were coded either line by line or paragraph by paragraph, depending on the nature of ideas. With fifty-nine transcripts to be coded, a computer-assisted qualitative data analysis software package (CAQDAS) was used to assist in the coding process. NVivo8 was used due to its easy access. Following Strauss and Corbin's approach and NVivo8's functionalities, transcripts were coded. The first level of coding was called open coding or in NVivo8 term, coded into a "free node". Once all transcripts were coded, each code or "free node" was revisited or re-read and these codes were re-arranged according to emerging themes (axial coding). Within NVivo8, these re-arrangement activities were done through "drag and drop" from the "free nodes" to the "tree nodes" which represents the themes. Further rearrangement to the codes or "tree nodes" was carried out during the selective coding. How do we identify the critical events? Based on this pool of events, following Lyytinen and Newman (2008), these identified events must have the potential to change some system states. For example, data migration failed, project manager terminated, senior vendor left project, etc. which from our interpretation of the preceding events created gaps in the project elements.

The second implication for researchers was in relation to the multi-level IS change where we attempt to improve the use of the model by creating an additional layer for analysis. The notion of a multi-level system was elaborated by Lyytinen et al. (1996) through their study of software risk management where they introduced three layers of socio-technical systems – management, project and system environment. Following this, the PSIC model was erected with the similar concept – organizational context/environment, building system and work system. While the work system concentrates on the actual work process in an organization, the building system reflects the actual organizational change process i.e. IS development. In this study, we have introduced another layer called vendor system/level. Coincidently, for all our three case studies, they employed the same vendor with the same base system and so the number of responses received from the vendor was substantial which enabled us to erect another layer to depict their work done during the project. As mentioned by Lyytinen and Newman (2008), the additional layer introduced was for the purpose of analysis only,

whereas in actual fact "they need to be viewed as co-evolving" and "cascading changes" across the layers through the horizontal and vertical analysis. In this study, the introduction of the vendor system level provided a clearer picture of how the vendor's work impacted the overall development process or how the vendor's interests, expectations and actions affected the project outcome. For example, in Case 3, the vendor came into the project with multiple interests and expectations. Other than for commercial reasons, the vendor was also trying to regain their marketability or recognition in the software industry which was tarnished due to their last project - the Case 2 project in this study. Another reason was to test or to prove the usability of the software they were developing. These interests and expectations on this project were shown from their behaviour on the project. From the vertical analysis conducted, we were able to unpack the interactions between different levels, in this case, between project and vendor level. The first instance was the absorption of the business process re-engineering exercise. According to the vendor team leader, although they recognized their limitations in knowledge and skill on business processes, they wanted to prove to the industry that they were credible. Another instance was the absorption of the data migration exercise. The vendor agreed to assist in the data migration exercise and although it appeared simple to them, this affected their overall development activities. As a result, combined with other development issues, the vendor failed to complete the development, which further tarnished their name in the software market. In my opinion, we would not have been able to understand clearly the effect of the vendor's action towards the development outcome if we had combined it at the project system level. From the horizontal analysis conducted for each of the case studies, we also found out that changes in the higher level management (vice chancellors) could result in a deeper impact compared to changes in lower level personnel (project managers and senior developers).

9.4.2 Practitioners

9.4.2.1 <u>Users – High degree of users' involvement</u>
It is evident from the case studies that users played an important part during the development of the system. From the case studies it can be seen that users' involvement would be a critical success or failure factor in system development. In Case 1, the users' involvement was limited due to their lack of knowledge on business processes; thus they were dependent on the vendor and the business consultant. But over time, they

gained better understanding and knowledge of their own business processes and further embedded this knowledge into the system. As a result during the enhancement project, they were able to spell out their requirements confidently, based on their accumulated knowledge. Compared this with Case 2, where the users had vast knowledge on their business processes and were able to establish stable requirements on the system from start. Also, the users were structured in functional units so that it was possible to gather requirements from each of the members. Case 3 was a different story. According to the second project manager, the users were motivated and knowledgeable, especially the head of the finance working committee. The vendor however had a contradictory opinion of the users. According to the vendor, the users failed to provide strong and stable system requirements that they could work with. They had a lack of knowledge of their own business processes and the users failed to come to a consensus on their business processes. As a result, the systems developed by the vendor were patchy and incomplete. All of the cases show that user involvement was important to ensure a positive development outcome, however, this required users who were knowledgeable of their own business processes.

9.4.2.2   Vendors/vendor developers

In this study the vendor was the bridge between all the cases. This started with their involvement in the Case 1 project. The vendor came into the project with a base system that was developed based on accumulation of skills, expertise and experience of their developers. In Case 1, the vendor together with the university signed a joint development agreement (JDA). This JDA was signed to support the Case 1 head of ICT's planning to ensure rapid development and continuous enhancement and modification. The vendor took this opportunity to fill in the gaps of the existing base system. This initial development created great interest in the industry, where the system won multiple awards locally and internationally. This generated interest from other universities in employing the same system. One of them was Case 2. By this time, it was the vendor's intention to become the market leader in education management system software and to make the system the best practice for educational institutions. Each of the projects was considered as a test bed for the system. Their confidence was boosted when they managed to complete the development of core modules of the system on time. With the system now fully embedded with updated system modules and functionalities – a more updated version – they further marketed the system to other

universities and they managed to secure a project with Case 3. Their confidence in their existing base system and their assumption that all universities were similar in their functionalities, instigated the "plug and play" development approach. With this approach in mind, and without knowing the complexities of the organization, the planning for the project timeline was insufficient. They had planned to complete the overall system within the 24 month period. Their plan to "plug and play" their based system was crushed when the users rejected the prototype that was based on the Case 2 system. According to one of the vendor's developers, in this project it was like developing a system from scratch rather than the planned prototype approach. The un-streamlined business processes among the different merged institutes had made matters worse. Combined with other emerging project issues, the vendor left the project after the 24-month project period lapsed. If they had better understood the overall organizational context of their client and limited their assumptions towards the project, it would have probably resulted in a more successful outcome.

Another issue that related to the vendor was the vendor developers' turnover. In Case 3, the vendor developed a strategy where knowledge was transferred from the senior to junior developers through a mentor-mentee approach. However, it was a challenge for the vendor to maintain their structure. The vendor's plan to ensure knowledge transfer from senior to junior developer did not materialize. The vendor's high turnover had a negative impact on development. The most common reason for the developers leaving projects were better job prospects and work pressure. This work pressure was mainly due to the communication restrictions during the requirement sessions where they (the vendor) were confronted with more senior users. The developers' departure from the project, although replaced, had implications. The senior developer who left the project was replaced with a new developer. Limited knowledge and understanding of the product and its requirements created frustrations for the users and even themselves, due to being pressured by the users and the team leader. Users' confidence towards the project became vulnerable due to this. According to the senior developer, the most important task was to build users' confidence towards them; they had to show their full understanding of the system and the users' requirements. Due to the turnover, users had to reiterate their requirements to the new developers and since their requirements were not stable, they kept changing from their initial request and with the new developers

still in a learning process, development was slow and inconsistent. This caused the project to be delayed and remain incomplete. Staff turnover was inevitable. People moved from one place to another for betterment. One way to counter this problem is to ensure a strong layer of support within the project organization.

9.4.2.3   Project managers

Within all three case studies, we only obtained access to Case 3's project managers. We interviewed two of the four project managers that were involved in Case 3. From their responses, certain aspects are worth pointing out. As mentioned previously, the first project manager initiated a traditional approach to system development with embedded project risk management, which sadly was only completed half way when the project manager was fired. When the second project manager took office, she did not revisit the plans that had already been laid out by her predecessor but abruptly changed to her own plan – the e-management concept. According to the second project manager, from her own experience the e-management concept was the secret of project success; thus by adopting a similar concept in Case 3 she expected to provide a positive result. Similarly to the vendor, the second project manager assumed that all projects were identical in nature. She failed to understand that different projects have different organizational contexts and environments and especially different organizational cultures. Although the second project manager acknowledged the need to satisfy the pre-requisites of e-management, which include knowledgeable, skilful and committed vendors, ICT developers, top management and users, she assumed the pre-requisites had been met and continued implementing her e-management concept. It was only when she felt that the project was not healthy that she blamed the vendor for not being committed and knowledgeable and accused the top management of not being committed to the project. Therefore, from this study, it was evident that project managers should take into consideration a client's organizational context and environment before implementing strategies.

9.5   Limitations of research and future research

We acknowledge that this study has its limitations and could be improved through further research. First, in "following the actor", due to limited access and time constraints, we failed to follow all human actors involved in this project. In our opinion, more interesting "critical events" could be found if these actors were interviewed.

Among the human actors were project managers for Case 1, Case 2 and other project managers for Case 3, the VC for Case 2, heads of ICTs from Case 1 and Case 2, more lower level users from Case 2 and users from other campuses from Case 3. Apart from identifying more interesting critical events, interviews with these respondents would provide a more in-depth understanding of the identified critical events. This limitation had a ripple effect on the second limitation which was using indirect responses or third party reports. For example in Case 3, the information on the first project manager's plan on his development approach was gathered from the vendor team leader and vendor project manager, since we did not have access to interview the first project manager. The third limitation of the study is in respect of the critical incident technique adopted, which suggests a retrospective approach to interviews. During interview sessions, we asked the respondent to go back into the history of the project and recall any interesting incidents that had occurred. This may have affected the correctness of their responses. According to Chell (2004), this retrospective approach was the only disadvantage in this technique. However, since the incidents were usually critical or important, the interviewees would have a vivid memory of these incidents. The fourth limitation relates to the process of translation of the interview transcripts. Some of the interviews – especially with the lower level staff – were conducted in Malay. This approach was to ensure that they were able to express their opinion on the issues fully rather than being limited by English skills. The translation was conducted by the researcher himself based on his experience interviewing the respondent since different intonation to a similar word would require different translations.

Whilst the introduction of the GT coding technique proved effective, especially in identifying events, it had certain limitations. The process of data interpretation was conducted by the researcher based on his limited knowledge of the issues under study and this was our fifth limitation. However, guidance through continual meetings with the supervisor improved the researcher's skills. Lastly, there was limited literature or reports on information system development in Malaysia generally and universities specifically. However this study would provide an opportunity for us to improve the pool of literature and studies on this area. Although this research only focused on enterprise systems implementation in specific industry which is higher education in Malaysia, it seemed similar to implementation of enterprise systems anywhere or in any

industry (see Bob-Jones et al., 2008; Newman and Zhu, 2009; Newman and Zhao, 2008). As long as it involves social and technical interactions, critical events would emerge and gaps would be created.

This brings us to possible future research. The process model, especially the PSIC model, could still be considered to be in its infancy. This, together with the vast untapped empirical data, would provide an opportunity for us to adapt this model to other contexts of research either theoretically or empirically. While this research attempts to understand the process of black-boxing from a combination of the stakeholder and the actor-network perspective, other theoretical perspectives could also be used. For example the power and politics perspective was evident in our study but it was not developed further. With the novelty of CAQDAS, other perspectives like culture, knowledge, communication, leadership and relationship could be further explored and thus further deepen our understanding on organizational change. The notion of competitive advantage is another possible future research, with the vast empirical data, different intentions and expectations towards IS projects from different perspectives (mainly vendor, client and project managers) could be explored. Empirically, this study could be extended to incorporate other development projects for other universities in Malaysia and interesting patterns from it. During the final stage of the research, the researcher was being approached again by the user from Case 3 and the vendor to assist them in their project. This could provide an opportunity for the research to further develop the existing cases and other new projects for the vendor.

9.6 Research last word

Change is inevitable. In this research, we attempt to understand organizational change through the application of the PSIC model that provided us with clear trajectory of enterprise systems implementation in three unique case studies. We adopted both stakeholder and actor-network perspectives to establish project narratives and to provide an explanatory discussion of these complex phenomenon. As a researcher, this is a start for a new exciting beginning.

References

AGOURRAM, H. & INGHAM, J. (2007) The impact of national culture on the meaning of information system success at the user level. *Journal of Enterprise Information Management,* 20(6)**,** 641-656.

AHMAD, A. & NEWMAN, M. (2010) Computer-assisted qualitative data analysis software: an illustration of limitations and advantages. *16th Americas Conference on Information Systems.* 12-15 August, Lima, Peru.

AHN, J.-H. & SKUDLARK, A. E. (1997) Resolving conflict of interests in the process of an information system implementation for advanced telecommunication services. *Journal of Information Technology,* 12**,** 3-13.

AKKERMANS, H. & HELDEN, K. V. (2002) Vicious and Virtuous Cycles in ERP Implementation: A Case Study of Interrelations between Critical Success Factors. *European Journal of Information Systems,* 11**,** 35-46.

AL-AHMAD, W., AL-FAQIH, K., KHANFAR, K., ALSAMARA, K., ABULEIL, S. & ABU-SALEM, H. (2009) A Taxonomy of an IT Project Failure: Root Causes. *International Management Review,* 5(1), 93-104.

ALEXANDER, I. & STEVENS, R. (2002) *Writing Better Requirements,* London, Addison-Wesley.

ALEXANDER, I. F. (2006) A Taxonomy of Stakeholders: Human Roles in System Development. IN STAHL, B. C. (Ed.) *Isssues and Trends inTechnology and Human Interaction.* Idea Group Inc. .

ALTER, S. (2000) The Siamese twin problem: a central issue ignored by dimensions of information effectiveness. *Communications of the Association for Information Systems,* 2**,** 1-55.

ALTER, S. (2002) The Work System Method for Understanding Information Systems and Information System Research. *Communications of the Association for Information Systems,* 9**,** 90-104.

ATKINSON, C., ELDABI, T., PAUL, R. J. & POULOUDI, A. (2001) Investigating Integrated Socio-technical Approach to Health Informatics. *34th. Hawaii International Conference on System Sciences.* Hawaii.

BACCARINI, D. (1996) The concept of project complexity: a review. *International Journal of Project Management,* 14**,** 201-204.

BAILUR, S. (2006) Using Stakeholder Theory to Analyze Telecenter Projects. *Information Technologies and International Development,* 3(3)**,** 61-80.

BALLEJOS, L. C. & MONTAGNA, J. M. (2008) Method for Stakeholder Identification in Interorganizational Environments. *Requirement Engineering***,** 13, 281-297.

BAZELEY, P. (2007) *Qualitative Data Analysis with NVivo,* City Road, London, Sage Publications Ltd.

BEHAR, R. (1996) *The Vulnerable Observer: Anthropology That Breaks Your Heart,* Boston, Beacon Press.

BENBASAT, I., GOLDSTEIN, D. K. & MEAD, M. (1987) The Case Research Strategy in Information Systems. *MIS Quarterly***,** 11(3), 369-386.

BENBYA, H. & MCKELVEY, B. (2006) Toward a Complexity Theory of Information Systems Development. *Information Technology and People,* 19**,** 12-34.

BENDAHAN, S., CAMPONOVO, G., MONZANI, J.-S. & PIGNEUR, Y. (2005) Negotiation in technology landscapes: an actor-issue analysis. *Journal of Management Information Systems,* 21**,** 137-172.

BIJKER, W. E. (1993) Do not despair: there is a life after constructivism. *Science Technology Human Values,* 18(1)**,** 113-138.

BLOOMFIELD, B. P., COOMBS, R., COOPER, D. J. & REA, D. (1992) Machines and Manoeuvres: Responsibility Accounting and the Construction of Hospital Information Systems. *Accounting, Management and Information Technology,* 2(4)**,** 197-219.

BOB-JONES, B., NEWMAN, M. & LYYTINEN, K. (2008) Picking up the pieces after a "successful" implementation: Networks, coalitions and ERP systems. *14th Americas Conference on Information Systems.* 14-17 August, Toronto, Canada.

BOLAND, R., NEWMAN, M. & PENTLAND, B. (2010), Hermeneutical Exegesis in Information Systems Design and Use. *Information and Organization*, 20 (1), 1-20.

BRINKERHOFF, D. W. (1991) *Improving Development Program Performance,* Boulder, Colorado, Lynne Reinner Publishers.

BROOKS, L., FITZGERALD, G. & ATKINSON, C. (2008) Using Actor Network Theory to Interpret the Introduction of Information Systems within the London Ambulance Service. *14th Americas Conference on Information Systems.* 14-17 August, Toronto, Canada.

BRYANT, A. (2002) Re-grounding Grounded Theory. *Journal of Information Technology Theory and Application,* 4**,** 25-42.

BRYMAN, A. & BELL, E. (2003) *Business Research Method,* Oxford, Oxford University Press.

BRYNJOLFSSON, E. & MENDELSON, H. (1993) Information systems and the organization of modern enterprise. *Journal of Organizational Computing and Electronic Commerce,* 3**,** 245-255.

BUCHOLZ, R. A. (1993) *Principles of Environmental Management: The Greening of Business,* Englewood Cliffs, NJ, Prentice Hall.

BURGOYNE, J. G. (1994) Stakeholder Analysis. IN CASSEL, C. & SYMONS, G. (Eds.) *Qualitative Methods in Organizational Research: A Practical Guide.* London, SAGE Publication.

CALLON, M. (1986) Some elements of a sociology of translation: domestication of the scallops and the fishermen of St Brieuc Bay. IN LAW, J. (Ed.) *Power, action and belief: a new sociology of knowledge?* London, Routledge.

CALLON, M. (1999) Actor-network theory: the market test. IN LAW, J. & HASSARD, J. (Eds.) *Actor Network Theory and After.* Oxford, Blackwell Publishers.

CALLON, M. & LAW, J. (1982) On interests and their transformation: enrolment and counter enrolment. *Social Studies of Science,* 12**,** 615-625.

CARROLL, A. B. (1989) *Business and Society: Ethics and Stakeholder Management,* Cincinnati, OH, South-Western Publishing Co. .

CHELL, E. (2004) Critical incident technique. IN CASSELL, C. & SYMON, G. (Eds.) *Essential Guide to Qualitative Methods in Organizational Research.* London, Sage Publication Ltd.

CILLIERS, P. (1998) *Complexity and Postmodernism: Understanding Complex Systems,* London, UK, Routledge.

CLARKSON, M. B. E. (1995) A stakeholder framework for analyzing and evaluating corporate social performance. *Academy of Management Review,* 20**,** 92-117.

CLELAND, D. I. (1998) *Field Guide to Project Management,* London, Van Nostrand Reinhold.

COAKES, E. & ELLIMAN, T. (1999) Focus Issue on Legacy Information Systems and Business Process Change: The Role of Stakeholders in Managing Change. *Communications of the Association for Information Systems,* 2(1)**,** Article 4.

COOPER, R. B. & ZMUD, R. W. (1990) Information technology implementation research: A technology diffusion approach. *Management Science,* 36(2), 123-139.

COOREN, F., MATTE, F., TAYLOR, J. R. & VASQUEZ, C. (2007) A humanitarian organization in action: organizational discource as an immutable mobile. *Discourse and Communication,* 1**,** 153-190.

CORDELLA, A. & SHAIKH, M. (2006) From Epistemology to Ontology: Challenging the Constructed "truth" of ANT. Department of Information Systems, London School of Economics and Political Science.

CROSBY, B. L. (1991) Stakeholder Analysis: A Vital Tool for Strategic Managers. *Implementing Policy Change Project***,** 2, 1-6.

CULE, P., SCHMIDT, R., LYYTINEN, K. & KEIL, M. (2000) Strategies for Heading Off IS Project Failure. *Information Systems Management,* 17, Spring, 65-73.

DAVENPORT, T. H. (1998) Putting the Enterprise into the Enterprise System. *Harvard Business Review***,** 76(4), 121-131.

DAVISON, J., DEEKS, D. & BRUCE, L. (2003) Stakeholder Analysis as a Medium to Aid Change in Information System Reengineering Projects. *Systematics, Cybernatics and Informatics,* 2(2)**,** 36-41.

DAVISON, J., THOMPSON, J. B., DEEKS, D. A. & LEJK, M. (2006) PisoSIA a Stakeholder Approach to Assist Change in Information Systems Development Projects and Aid Process Improvement. *Software Qualitative Journal***,** 14, 25-36.

DESAI, A. (2005) Adaptive Complex Enterprises. *Communication of the ACM,* 48**,** 32-35.

DE VREEDE, G.-J., JONES, N. & MGAYA, R. J. (1998-1999) Exploring the application and acceptance of group support systems in Africa. *Journal of Management Information Systems,* 15**,** 197-234.

DICK, P. (2004) Discourse analysis. IN CASSELL, C. & SYMON, G. (Eds.) *Essential Guide to Qualitative Methods in Organizational Research.* London, Sage Publication, Inc.

DOHERTY, N. F. & KING, M. (2001) An investigation of the factors affecting the successful treatment of organizational issues in systems development projects. *European Journal of Information Systems,* 10**,** 147-160.

DONALDSON, T. & PRESTON, L. E. (1995) The Stakeholder Theory of the Corporation: Concepts, Evidence and Implications. *Academy of Management Review,* 20(1)**,** 65-91.

DOOLIN, B. & LOWE, A. (2002) To reveal is to critique: actor-network theory and critical information system research. *Journal of Information Technology,* 17**,** 69-78.

EHIE, I. C. & MADSEN, M. (2005) Identifying critical issues in enterprise resource planning (ERP) implementation. *Computers in Industry,* 56**,** 545-557.

ELHARIDY, A. M., NICHOLSON, B. & SCAPENS, R. W. (2008) Using Grounded Theory in Interpretive Management Accounting Research. *Qualitative Research in Accounting & Management,* 5**,** 139-155.

ESTEVES, J., RAMOS, I. & CARVALHO, J. (2002) Use of Grounded Theory in Information Systems Area: An Exploratory Analysis. *European Conference on Research Methodology for Business and Management.*

FIELDING, N. & LEE, R. M. (1991) *Using Computers in Qualitative Research,* London, Sage Publications Ltd.

FINNEY, S. & CORBETT, M. (2007) ERP implementation: a compilation and analysis of critical success factors. *Business Process Management Journal,* 13(3)**,** 329-347.

FLOWERS, S. (1996) *Software Failure: Management Failure,* Chichester, UK, John Wiley & sons Ltd.

FREEMAN, R. E. (1984) *Strategic Management: A Stakeholder Approach,* Boston, Pitman.

GANDECHA, R., ATKINSON, C., PAPAZAFEIROPOULOU, A. & POULOUDI, A. (2004) Analyzing the UK NHS Care Records Service (NCRS): a Stakeholder / Actor Network Theory Perspective. *Americas Conference on Information Systems.* August, New York.

GARGEYA, V. B. & BRADY, C. (2005) Success and failure factors of adopting SAP in ERP system implementation. *Business Process Management Journal,* 11(5)**,** 501-516.

GERALDI, J. G. (2009) What Complexity Assessments Can Tell Us About Projects: Dialogue Between Conception and Perception. *Technology Analysis and Strategic Management,* 21**,** 665-678.

GERALDI, J. G. & ADLBRECHT, G. (2007) On Faith, Fact, and Interaction in Projects. *Project Management Journal,* 38**,** 32-43.

GERSICK, C. J. G. (1991) Revolutionary Change Theories: A Multilevel Exploration of the Punctuated Equilibrium Paradigm. *Academy of Management Review,* 16(1)**,** 10-36.

GHAURI, P. (2004) Designing and conducting case studies in international business research. IN MARSCHAN-PIEKKARI, R. & WELCH, C. (Eds.) *Handbook of Qualitative Research Methods for International Business.* Cheltenham, UK, Edward Elgar.

GOTTERBARN, D. & ROGERSON, S. (2005) Responsible risk analysis for software development: creating the software development impact statement. *Communications of the Association for Information Systems,* 15**,** 730-750.

HANSETH, O., AANESTAD, M. & BERG, M. (2004) Actor-network theory and information systems. What's so special? *Information Technology and People,* 17(2)**,** 116-123.

HANSETH, O. & BRAA, K. (1998) Technology as traitor: emergent sap infrastructure in a global organization. *International Conference on Information Systems.* Helsinki, Finland, Association for Information Systems, 188-196.

HANSETH, O. & LYYTINEN, K. (2010) Design Theory for Dynamic Complexity in Information Infrastructures: The Case of Building Internet. *Journal of Information Technology,* 25**,** 1-19.

HEEKS, R. (2002) Information systems and developing countries: failure, success and local improvisations. *The Information Society,* 18**,** 101-112.

HEEKS, R. & STANFORTH, C. (2007) Understanding e-Government Project Trajectories from an Actor-Network Perspective. *European Journal of Information Systems,* 16**,** 165-177.

HEISKANEN, A., NEWMAN, M. & EKLIN, M. (2008) Control, trust, power and the dynamics of information systems outsourcing relationship: a process study of contractual software development. *Journal of Strategic Information Systems,* 17(4), 268-286.

HEISKANEN, A., NEWMAN, M. & SIMILA, J. (2000) The social dynamics of software development. *Accounting , Management & Information Technology,* 10(1)**,** 1-32.

HENRY, J. (2004) *Software Project Management: A Real-World Guide to Success,* Boston, MA, Addison-Wesley.

HIRT, S. G. & SWANSON, E. B. (2001) Emergent Maintenance of ERP: New Roles and Relationship. *Journal of Software Maintenance and Evolution: Research and Practice***,** 13, 373-397.

HOLMBERG, L., NILSSON, A., OLSSON, H. H. & SANDBERG, A. B. (2008) Appreciative inquiry in software process improvement. *Software Process Improvement and Practice,* 13**,** 107-125.

HOLMSTROM, H. & HENFRIDSSON, O. (2006) Improving packaged software through online community knowledge. *Scandinavian Journal of Information Systems,* 18**,** 3-36.

HONADLE, G. & COOPER, L. (1989) Beyond coordination and control: an interorganizational approach to structural adjustment, service delivery and natural resource management. *World Development,* 17**,** 1531-1541.

HORTON, J., MACVE, R. & STRUYVEN, G. (2004) Qualitative research: experiences in using semi-structured interviews. IN HUMPREY, C. & LEE, B. (Eds.) *The Real Life Guide to Accounting Research: A Behind-the-Scenes View of Using Qualitative Research Methods.* Oxford, UK, Elsevier Ltd.

HUGHES, J. & JONES, S. (2003) Reflections on the use of Grounded Theory in Interpretive Information Systems Research. *European Conference on Information Systems.* Naples, Italy.

INTEGRATED KNOWLEDGE & CAMPUS MANAGEMENT SDN BHD (2011) Retrieved 16 June, 2011 from http://www.ikcm.com.my/ims-education.htm

KAGHAN, W. N. & BOWKER, G. C. (2001) Out of machine age?: Complexity, sociotechnical systems and actor network theory. *Journal of Engineering Technology Management,* 18**,** 253-269.

KALLINIKOS, J. (2006) Information Out of Information: On the Self-referential Dynamics of Information Growth. *Information Technology and People,* 19**,** 98-115.

KANELLIS, P., LYCETT, M. & PAUL, R. J. (1999) Evaluating business information systems fit: from concept to practical application. *European Journal of Information Systems,* 8**,** 65-76.

KAPLAN, B. & DUCHON, D. (1988) Combining Qualitative and Quantitative Methods in Information Systems Research: A Case Study. *MIS Quarterly,* 12(4)**,** 571-586.

KAPLAN, B. & MAXWELL, J. A. (1994) Qualitative Research Methods for Evaluating Computer Information Systems. IN ANDERSON, J. G., AYDIN, C. E. & JAY, S. J. (Eds.) *Evaluating Health Care Information Systems: Methods and Applications.* Thousand Oaks, CA, Sage Publications.

KEEN, P. G. W. (1981) Information systems and organizational change. *Communication of the ACM,* 24(1)**,** 24-33.

KEIL, M., CULE, P. E., LYYTINEN, K. & SCHMIDT, R. C. (1998) A framework for identifying software project risks. *Communication of the ACM,* 41(11)**,** 76-83.

KELLE, U. & LAURIE, H. (1995) Computer Use in Qualitative Research and Issue of Validity. IN KELLE, U. (Ed.) *Computer-Aided Qualitative Data Analysis: Theory, Methods and Practice.* London, Sage Publications Ltd.

KIM, R. M. & KAPLAN, S. M. (2006) Interpreting Socio-technical Co-evolution. *Information Technology and People,* 19**,** 35-54.

KING, N. (2004) Using templates in the thematic analysis of text. IN CASSELL, C. & SYMON, G. (Eds.) *Essential Guide to Qualitative Methods in Organizational Research.* London, Sage Publishing, Inc.

KING, P., KVAVIK, R. B. & VOLOUDAKIS, J. (2002) Enterprise resource planning systems in higher education. *Educause Centre for Applied Research - Research Bulletin,* 2002(22).

KIRSCH, L. J. (1996) The Management of Complex Tasks in Organizations: Controlling the Systems Development Process. *Organization Science,* 7**,** 1-21.

KLEIN, H. K. & MYERS, M. D. (1999) A set of principles for conducting and evaluating interpretive field studies in information systems. *MIS Quarterly,* 23(1)**,** 67-93.

KLING, R. (1980) Social analyses of computing: theoretical perspectives in recent empirical research. *Computing Surveys,* 12**,** 61-110.

KLING, R. (1987) Defining the bounderies of computing across complex organizations. IN BOLAND, R. J. & HIRSCHHEIM, R. A. (Eds.) *Critical Issues in Information System Research.* Chichester, John Wiley & Sons.

KLING, R. & SCACCHI, W. (1982) The web of computing: computer technology as social organization. *Advances in Computers,* 21**,** 1-90.

KOCH, C. (2002) The ABC's of ERP. *CIO ERP Research Center.*

KWON, T. H. & ZMUD, R. W. (1987) Unifying the fragmented models of information system implementation. IN BOLAND, R. J. & HIRSCHEIM, R. A. (Eds.) *Critical issues in information system research.* Chichester, John Wiley & Sons.

LACITY, M. C. & HIRSCHHEIM, R. (1995) Benchmarking as a strategy for managing conflicting stakeholder perceptions of information systems. *Journal of Strategic Information Systems,* 4**,** 165-185.

LANSISALMI, H., PEIRO, J.-M. & KIVIMAKI, M. (2004) Grounded Theory in Organizational Research. IN CASSELL, C. & SYMON, G. (Eds.) *Essential Guide to Qualitative Methods in Organizational Research.* Sage Publications, Ltd. .

LANZARA, G. F. (1999) Between transient constructs and persistent structures: designing systems in action. *Journal of Strategic Information Systems,* 8**,** 331-349.

LATOUR, B. (1986) Visualization and cognition: thinking with eyes and hands. *Knowledge and Society: Studies in the Sociology of Culture*, 6, 1-40.

LATOUR, B. (1987) *Science in Action: How to Follow Scientist and Engineers Through Society,* Cambridge, MA, Harvard University Press.

LATOUR, B. (1991) Technology is society made durable. IN LAW, J. (Ed.) *A Sociology of Monsters? Essays on Power, Technology and Domination.* London, UK, Routledge.

LAUDON, K. C. & LAUDON, J. P. (1998) *Management Information Systems: New Approaches to Organization and Technology,* Englewood Cliffs, NJ, Prentice Hall.

LAVE, C. A. & MARCH, J. G. (1975) *An introduction to Models in the Social Sciences,* New York, Harper and Row.

LAW, J. (1992) Notes on the theory of the actor-network: ordering, strategy and heterogeneity. *Systems Practice,* 5(4)**,** 379-393.

LAW, J. (1999) Complexity, naming and topology. IN LAW, J. & HASSARD, J. (Eds.) *Actor Network Theory and After.* Oxford, Blackwell Publishers.

LAW, J. & BIJKER, W. E. (1992) Postscript: technology, stability and social theory. IN BIJKER, W. E. & LAW, J. (Eds.) *Shaping Technology / Building Society.* Cambridge, MA, MIT Press.

LEAVITT, H. J. (1965) Applied Organizational Change in Industry: Structural, Technological and Humanistic Approaches. IN MARCH, J. G. (Ed.) *Handbook of Organizations.* Chicago Rand McNally & Company.

LEE, H. & OH, S. (2006) A Standards War Waged by a Developing Country: Understanding International Standard Setting from the Actor-Network Perspective. *Journal of Strategic Information Systems,* 15**,** 177-195.

LESCA, N. & CARON-FASAN, M.-L. (2008) Strategic Scanning Project Failure and Abandonment Factors: Lesson Learned. *European Journal of Information Systems,* 17, 371-386.

LOCKE, K. (1996) Rewriting the discovery of grounded theory after 25 years? *Journal of Management Inquiry,* 5**,** 239-245.

LYNCH, T. & GREGOR, S. (2004) User Participation in Decision Support Systems Development: Influencing System Outcomes. *European Journal of Information Systems,* 13, 286-301.

LYYTINEN, K. (1987) Different Perspectives on Information Systems: Problems and Solutions. *ACM Computing Surveys,* 19(1), 5-46.

LYYTINEN, K. (1988a) Expectation Failure Concept and Systems Analysts' View on Information System Failures: Result of an Exploratory Study. *Information & Management,* 14, 45-56.

LYYTINEN, K. (1988b) Stakeholders, Information System Failures and Soft Systems Methodology: An Assessment. *Journal of Applied Systems Analysis,* 15**,** 61-81.

LYYTINEN, K. & HIRSCHHEIM, R. (1987) Information Systems Failures: A survey and Classification of the Empirical Literature. *Oxford Surveys in Information Technology,* 4, 257-309.

LYYTINEN, K., MATHIASSEN, L. & ROPPONEN, J. (1996) A Framework for Software Risk Management. *Scandinavian Journal of Information Systems,* 8(1)**,** 53-68.

LYYTINEN, K. & NEWMAN, M. (2006) Punctuated Equilibrium, Process Models and Information System Development and Change: Towards a Socio-Technical Process Analysis. *Sprouts: Working papers on information environments, systems and organizations,* 6(1)**,** 1-48.

LYYTINEN, K. & NEWMAN, M. (2008) Explaining information systems change: a punctuated socio-technical change model. *European Journal of Information Systems***,** 17, 589-613.

VAN MAANEN, J. (1988) *Tales of the Field: On Writing Ethnography,* Chicago, University of Chicago Press.

MAHRING, M., HOLMSTROM, J., KEIL, M. & MONTEALEGRE, R. (2004) Trojan actor-networks and swift translation. *Information Technology and People,* 17**,** 210-238.

MARKUS, M. L. & ROBEY, D. (1988) Information Technology and Organizational Change: Causal Structure in Theory and Research. *Management Science,* 34(5)**,** 583-598.

MCKEEN, J. D., GUIMARAES, T. & WETHERBE, J. C. (1994) The relationship between user participation and user satisfaction: an investigation of four contingency factors. *MIS Quarterly,* 18**,** 427-451.

MCKELVEY, B. (1997) Quasi-natural organization science. *Organization Science,* 8**,** 351-380.

MCLOUGHLIN, I. (1999) *Creative Technological change,* London, Routledge.

MCMASTER, T., VIDGEN, R. & WASTELL, D. (1999) Networks of Association and Due Process in IS Development. IN LARSEN, T. J., LEVINE, L. & DE GROSS, J. (Eds.) *Information Systems: Current Issues and Future Changes.* Laxenburg, Austria, IFIP.

MENDELOW, A. L. (1984) Information systems for organisational effectiveness: use of stakeholder approach. IN BEMELMANS, T. M. A. (Ed.) *Beyond productivity: information systems development for organizational effectiveness.* Amsterdam, North Holland.

MERALI, Y. (2006) complexity and Information Systems: the Emergent Domain. *Journal of Information Technology,* 21**,** 216-228.

MEYER, M. H. & CURLEY, K. F. (1991) An applied framework for classifying the complexity of knowledge-based systems. *MIS Quarterly,* 15**,** 455-472.

MINISTRY OF HIGHER EDUCATION OF MALAYSIA (2011) Retrieved 15 June, 2011 from http://www.jpt.mohe.gov.my

MITCHELL, R. K., AGLE, B. R. & WOOD, D. J. (1997) Toward a Theory of Stakeholder Identification and Salience: Defining the Principle of Who and What Really Counts. *Academy of Management Review,* 22(4)**,** 853-886.

MITEV, N. (2009) In and Out of Actor-Network Theory: A Necessary but Insufficient Journey. *Information Technology and People,* 22(1)**,** 9-25.

MITROFF, I. I. (1983) *Stakeholders of the Organizational Mind,* London, Jossey-Bass.

MOHR, L. (1982) *Explaining Organizational Behaviour,* San Francisco, CA, Jossey-Bass Publisher.

MONTEIRO, E. & HANSETH, O. (1996) Social Shaping of Information Infrastructure: On Being Specific About the Technology. IN ORLIKOWSKI, W. J., WALSHAM, G., JONES, M. R. & DE GROSS, J. (Eds.) *Information Technology and Changes in Organizational Work.* London, Chapman & Hall.

MORISON, M. & MOIR, J. (1998) The Role of Computer Software in the Analysis of Qualitative Data: Efficient Clerk, Research Assistance or Trojan Horse? *Journal of Advanced Nursing,* 28**,** 106-116.

MOSELEY, L. G., MEAD, D. & MURPHY, F. (1997) Applying Lexical and Semantic Analysis to the Exploration of Free-Text Data. *Nurse Researcher,* 4**,** 46-68.

MOTWANI, J., SUBRAMANIAN, R. & GOPALAKRISHNA, P. (2005) Critical factors for successful ERP implementation: Exploratory findings from four case studies. *Computers in Industry,* 56**,** 529-544.

MUKHERJEE, I. (2008) Understanding Information System Failures from the Complexity Perspective. *Journal of Social Sciences,* 4(4), 308-319.

MYERS, M. D. (1994) Dialectical hermeneutics: a theoretical framework for the implementation of information systems. *Information Systems Journal,* 5(1)**,** 51-70.

MYERS, M. D. (1997) Qualitative research in information systems. *MIS Quarterly,* 21(2).

MYERS, M. D. & NEWMAN, M. (2007) The qualitative interview in IS research: examining the craft. *Information and Organization,* 17**,** 2-26.

NAH, F. F.-H., LAU, J. L.-S. & KUANG, J. (2001) Critical factors for successful implementation of enterprise systems. *Business Process Management Journal,* 7(3)**,** 285-296.

NEWMAN, M. & ROBEY, D. (1992) A Social Process Model of User-Analyst Relationship. *MIS Quarterly*, June, 249-265.

NEWMAN, M. & SABHERWAL, R. (1996) Determinants of Commitment to Information Systems Development: A Longitudinal Investigation. *MIS Quarterly,* 20**,** 23-54.

NEWMAN, M. & ZHAO, Y. (2008) The process of enterprise resource planning implementation and business process reengineering: Tales from two Chinese small and medium-sized enterprises. *Information Systems Journal***,** 18(4), 405-426.

NEWMAN, M. & ZHU, S. (2007) Process modeling information systems development: The Sellco Case. IN T., M., WASTELL, D., FEMELEY, E. & DEGROSS, J. (Eds.) *Organizational Dynamics of Technology-Based Innovation: Diversifying the Research Agenda.* Boston, Springer.

NEWMAN, M. & ZHU, S. (2009) Punctuated Process Modelling of Information Systems Development: An Illustration from a Mid-sized Enterprise. *Communications of the Association for Information Systems,* 24(39)**,** 673-700.

ODEN, H. W., LANGENWALTER, G. A. & LUCIER, R. A. (1993) *Handbook of Material and Capacity Requirement Planning,* New York, MCGraw Hill.

OLIVER, D. & ROMM, C. (2002) Justifying enterprise resource planning adoption. *Journal of Information Technology,* 17(4)**,** 199-213.

ORLIKOWSKI, W. J. (1993) CASE Tools as Organizational Change: Investigating Incremental and Radical Changes in System Development. *MIS Quarterly,* 17**,** 309-340.

ORLIKOWSKI, W. J. & BAROUDI, J. J. (1991) Studying Information Technology in Organizations: Research Approaches and Assumptions. *Information Systems Research,* 2**,** 1-28.

OWEN, J. & LINGER, H. (2009) Resolution of Complexity in ISD Projects. IN PAPADOPOULOS, G. A., WOJTKOWSKI, W., WOJTKOWSKI, G., WRYCZA, S., ZUPANCIC, J. E., OWEN, J. & LINGER, H. (Eds.) *Information Systems Development.* Springer US.

PAN, G. S. C. (2005) Information Systems Project Abandonment: A Stakeholder Analysis. *International Journal of Information Management,* 25**,** 173-184.

PENTLAND, B. T. (1999) Building process theory with narrative: from description to explanation. *Academy of Management Review,* 24(4)**,** 711-724.

PERROW, C. (1984) *Normal Accidents: Living with High-Risk Technologies,* Princeton, NJ, Princeton University Press.

PETTIGREW, A. M. (1990) Longitudinal field research on change: theory and practice. *Organization Science,* 1**,** 267-292.

PLANT, R. & WILLCOCKS, L. (2007) Critical Success Factors In International Erp Implementations: A Case Research Approach. *Journal of Computer Information Systems,* 47(3)**,** 60-70.

POLLOCK, N. & CORNFORD, J. (2004) ERP Systems and the University as a Unique Organisation. *Information Technology and People,* 17(1), 31-52.

POOLE, M. S., VAN DE VEN, A. H., DOOLEY, K. & HOLMES, M. E. (2000) *Organizational Change and Innovation Processes,* New York, Oxford University Press.

POULOUDI, A. (1999) Aspect of the Stakeholder Concept and their Implications for Information Systems Development. *32nd Hawaii International Conference on System Sciences.* Hawaii.

POULOUDI, A., GANDECHA, R., ATKINSON, C. & PAPAZAFEIROPOULOU, A. (2004) How Stakeholder Analysis can be Mobilized with Actor-Network Theory to Identify Actors. IN KAPLAN, B., TRUEX, D., WASTELL, D., WOOD-

HARPER, A. & DEGROSS, J. (Eds.) *Information Systems Research.* Boston, Springer.

POULOUDI, A. & WHITLEY, E. (1997) Stakeholder Identification in Inter-Organizational Systems: Gaining Insights for Drug Use Management Systems. *European Journal of Information Systems*, 6, 1-14.

POULOUDI, A. & WHITLEY, E. (2000) Representing Human and Non-Human Stakeholders: On Speaking with Authority. IN BASKERVILLE, R., STAGE, J. & DE GROSS, J. (Eds.) *Organizational and Social Perspectives on Information Technology.* Boston, Kluwer.

PTAK, C. A. & SCHRAGENHEIM, E. (2004) *ERP : Tools, Techniques, and Applications for Integrating the Supply Chain,* Boca Raton, FL, St. Lucie Press.

RADDER, H. (1992) Normative reflexions on constructivist approaches to science and technology. *Social Studies of Science,* 22, 141-173.

RANDS, T. (1992) The key role of applications software make-or-buy decisions. *Journal of Strategic Information Systems,* 1(4), 215-223.

REED, D. (1999) Stakeholder management theory: a critical theory perspective. *Business Ethics Quarterly,* 9, 453-483.

RIBBERS, P. M. A. & SCHOO, K.-C. (2002) Program Management and Complexity of ERP Implementations. *Engineering Management Journal,* 14, 45-52.

ROBERTSON, S. & WILLIAMS, T. (2006) Understnading project failure: using cognitive mapping in an insurance project. *Project Management Journal,* 37, 55-71.

ROBEY, D. & NEWMAN, M. (1996) Sequential Patterns in Information Systems Development: An Application of a Social Process Model. *ACM Transactions of Information Systems,* 14(1), 30-63.

ROBEY, D., SMITH, L. A. & VIJAYASARATHY, L. R. (1993) Perceptions of Conflict and Success in Information Systems Development Projects. *Journal of Management Information Systems,* 10(1), 123-139.

ROSS, J. W. & VITALE, M. (2000) The ERP revolution: Surviving versus thriving. *Information Systems Frontier*, 2(2), 233-241.

RUOHONEN, M. (1991) Stakeholders of Strategic Information Systems Planning: Theoretical Concepts and Empirical Examples. *Journal of Strategic Systems,* 1(1), 15-28.

RYAN, G. W. & BERNARD, H. R. (2000) Data management and analysis methods. IN DENZIN, N. K. & LINCOLN, Y. S. (Eds.) *Handbook of Qualitative Research.* 2nd. ed. California, Sage Publication, Inc.

SABHERWAL, R., HIRSCHHEIM, R. & GOLES, T. (2001) The dynamics of alignment: insights from a punctuated equilibrium model. *Organization Science,* 12, 179-197.

SABHERWAL, R. & ROBEY, D. (1995) Reconciling Variance and Process Strategies for Studying Information System Development. *Information Systems Research,* 6(4), 303-327.

SARKER, S., SARKER, S. & SIDOROVA, A. (2006) Understanding Business Process Change Failure: An Actor-Network Perspective. *Journal of Management Information Systems,* 23(1), 51-86.

SAUER, C. (1993) *Why Information Systems Fail: A Case Study Approach,* Henley-on-Thames, UK, Alfred Waller Limited.

SAUER, C., SOUTHON, G. & DAMPNEY, C. N. G. (1997) Fit, failure, and the house of horrors: toward a configurational theory of IS project failure. *Proceedings of*

the 18th international conference on Information systems. Atlanta, Georgia, United States, Association for Information Systems.

SCAPENS, R. W. & JAZAYERI, M. (2003) ERP systems and management accounting change: opportunities or impacts? A research note. *European Accounting Review,* 12(1)**,** 201-233.

SCHOENHERR, T., HILPERT, D., SONI, A. K., VENKATARAMAN, M. A. & MABERT, V. A. (2010) Enterprise Systems Complexity and Its Antecedents: A Grounded-Theory Approach. *International Journal of Operations and Production Management,* 30**,** 639-668.

SCHULTZE, U. (2000) A Confessional Account of An Ethnography About Knowledge Work. *MIS Quarterly,* 24(1), 3-41.

SCOTT, S. V. & WAGNER, E. L. (2003) Networks, negotiations, and new times: the implementation of enterprise resource planning into an academic administration. *Information and Organization,* 13(4)**,** 285-313.

SHAW, T. & JARVENPAA, S. (1997) Process models in information systems. *Proceedings of the IFIP TC8 WG 8.2 international conference on Information systems and qualitative research.* Philadelphia, Pennsylvania, United States, Chapman & Hall, Ltd.

SMITH, L. W. (2000) Project Clarity through Stakeholder Analysis. *Journal of Defense Software Engineering***,** 13(12), 4-9.

SNOWDEN, D. (2002) Complex act of knowing: paradox and descriptive self awareness. *Journal of Knowledge Management,* 6**,** 100-111.

SOMERS, T. M. & NELSON, K. (2001) The impact of critical success factors across the stages of enterprise resource planning system. *34th Hawaii International Conference on System Sciences.* Hawaii.

SOMERS, T. M. & NELSON, K. G. (2004) A taxonomy of players and activities across the ERP project life cycle. *Information & Management,* 41**,** 257-278.

SPRADLEY, J. (1979) *The Ethnograhic Interview,* New York, Holt, Rinehart and Winston.

STACEY, R. D. (1992) *Managing the Unknowable: Strategic Boundaries Between Order and Chaos in Organization,* San Francisco, CA, Jossey-Bass.

STAKE, R. E. (1995) *The art of case study research,* California, Sage Publications Inc.

STAKE, R. E. (2000) Case studies. IN DENZIN, N. K. & LINCOLN, Y. S. (Eds.) *Handbook of Qualitative Research.* California, Sage Publication.

STARIK, M. (1994) Essay by Mark Starik: The Toronto Conference: Reflections on Stakeholder Theory. *Business and Society,* 33**,** 89-95.

STEAD, W. E. & STEAD, J. G. (1992) *Management for a Small Planet: Strategic Decision Making and the Environment,* Newbury Park, CA, Sage Publications.

STRAUSS, A. & CORBIN, J. (1990) *Basics of Qualitative Research,* California, Sage Publication Inc.

STRAUSS, A. & CORBIN, J. (1994) Grounded Theory Methodology An Overview. IN DENZIN, N. & LINCOLN, Y. S. (Eds.) *Handbook of Qualitative Research.* Thousand Oaks, CA, US, Sage Publications, Inc.

SUCHMAN, L. A. (1987) *Plans and Situated Actions: The Problem of Human-Machine Communication,* Cambridge, MA, Cambridge University Press.

SUMNER, M. (1999) Critical success factors in enterprise wide information management systems projects. *Proceedings of the 1999 ACM SIGCPR conference on Computer personnel research.* New Orleans, Louisiana, United States, ACM.

TAIT, P. & VESSEY, I. (1988) The effect of user involvement on system success: a contingency approach. *MIS Quarterly,* 12**,** 91-108.

TAN, C.-W., PAN, S. L. & LIM, E. T. K. (2005) Managing Stakeholder Interests in e-Government Implementation: Lesson Learned from a Singapore e-Government Project. *Journal of Global Information Management,* 13(1)**,** 31-53.

TATNALL, A. (2003) Actor-Network Theory as a Socio-Technical Approach to Information Systems Research. IN CLARKE, S., COAKES, E., HUNTER, M. G. & WENN, A. (Eds.) *Socio-Technical and Human Cognition Elements of Information Systems.* Hershey, PA, Idea Group Inc.

TATNALL, A. & GILDING, A. (1999) Actor-Network Theory and Information Systems Research. *Australasian Conference on Information Systems.* Australia.

TELLIS, W. (1997) Information technology in a university: a case study. *Campus Wide Information Systems,* 14(3), 78-91.

TURNER, J. R. & COCHRANE, R. A. (1993) Goals-and-methods matrix: coping with projects with ill defined goals and/or methods of achieving them. *International Journal of Project Management,* 11**,** 90-102.

UMBLE, E. J., HAFT, R. R. & UMBLE, M. M. (2003) Enterprise resource planning: Implementation procedures and critical success factors. *European Journal of Operational Research,* 146**,** 241-257.

URQUHART, C. (1999) Reflections on early requirements gathering. IN LARSEN, T. J., LEVINE, L. & DEGROSS, J. (Eds.) *Information Systems: Current Issues and Future Changes.* Laxenburg, Austria, IFIP.

VAN DE VEN, A. H. & HUBER, G. P. (1990) Longitudinal Field Research Methods for Studying Processes of Organizational Change. *Organization Science,* 1(3)**,** 213-219.

VAN DE VEN, A. H. & POOLE, M. S. (2005) alternative Approaches for Studying Organizational Change. *Organization Studies,* 26(9)**,** 1377-1404.

VIDGEN, R. (1997) Stakeholders, Soft Systems and Technology: Separation and Mediation in the Analysis of Information System Requirements. *Information Systems Journal***,** 7, 21-46.

VIDGEN, R. & MCMASTER, T. (1996) Black Boxes, Non-Human Stakeholders and the Translation of IT Through Mediation. IN ORLIKOWSKI, W. J., WALSHAM, G., JONES, M. R. & DE GROSS, J. (Eds.) *Information Technology and Changes in Organizational Work.* London, Chapman and Hall.

WALSHAM, G. (1993) *Interpreting information systems in organizations,* Chichester, John Wiley & Sons Ltd.

WALSHAM, G. (1995) Interpretive Case Studies in IS Research: Nature and Method. *European Journal of Information Systems,* 4, 74-81.

WALSHAM, G. (1997) Actor-network theory and IS research: current status and future prospects. *Proceedings of the IFIP TC8 WG 8.2 international conference on Information systems and qualitative research.* Philadelphia, Pennsylvania, United States, Chapman & Hall, Ltd.

WALSHAM, G., SYMONS, V. & WAEMA, T. (1988) Information systems as social systems. *Information Technology for Development,* 3(3), 189-204.

WEICK, K. E. (1998) Improvisation as a mindset for organizational analysis. *Organization Science,* 9**,** 543-555.

WELTI, N. (1999) *Successful SAP R/3 Implementation: Practical Management of ERP Projects,* Harlow, Addison-Wesley.

WHEATLEY, M. J. (1992) *Leadership and the New Science: Discovering Order in a Chaotic World,* San Francisco, CA, Berret-Koehler.

WHITLEY, E. & POULOUDI, A. (2001) Studying the Translations of NHSnet. *Journal of End User Computing,* 13(3)**,** 30-40.

WILSON, M. & HOWCROFT, D. (2002) Re-Conceptualising Failure: social Shaping Meets IS Research. *European Journal of Information Systems,* 11, 236-250.

WOLFE, R. A. & PUTLER, D. S. (2002) How Tight are the Ties that Bind Stakeholder Groups. *Organization Science,* 13(1)**,** 64-80.

XIA, W. & LEE, G. (2005) complexity of Information Systems Development Projects: Conceptualization and Measurement Development. *Journal of Management Information Systems,* 22**,** 45-83.

YEO, K. T. (2002) Critical Failure Factors in Information System Projects. *International Journal of Project Management,* 20, 241-246.

YIN, R. K. (1994) Discovering the future of the case study method in evaluation research. *Evaluation Practice,* 15(3)**,** 283-290.

YIN, R. K. (2002) *Case Study Research: Design and Methods*, Sage Publications, Inc.

Appendixes

Appendix 1: Interview Guide

Research topic: A process study of enterprise systems implementation in higher education institutions in Malaysia

Interview guide

1. Can you please state your name and position in this department? How long have you been with this organization?

2. Do you have any prior experience in system implementation?

3. What role are you playing in this enterprise systems implementation? Are you a member of any committee relating to the system project?

4. In your opinion, what is the reason for the implementation of the enterprise system?

5. In your opinion, what do you think are the most important characteristic / features of the enterprise system that helps to improve your department operations? What do you perceived are the benefits / advantages of implementing an ERP system especially the financial system?

6. What do you think are the most critical / challenging parts of this ERP system implementation? What strategies have you established / developed in meeting these challenges?

7. In your opinion, do you feel that the implementation of the ERP system is a success? How have you measured this success to date?

End of questions

	Case 1					Case 2					Case 3			
	Pilot	2nd. Round	3rd. Round	4th. Round		Pilot	2nd. Round	3rd. Round	4th. Round		Pilot	2nd. Round	3rd. Round	4th. Round
User 1	23/7		30/9	21/4	User 1	14/7	13/2			User 1	17/7	12/3	07/10	29/4
User 2	23/7		02/10	21/4	User 2	08/7	13/2			User 2	17/7			
User 3	23/7				User 3	14/7	13/2			User 3	29/7	23/2	09/10	15/4
User 4	24/7									User 4		12/3		
User 5		17/2								User 5		12/3	07/10	15/4
User 6		17/2								User 6		12/3		
User 7			30/9											
User 8			01/10	21/4										
User 9			01/10	20/4										
User 10				24/4										
ITD 1	24/7				ITD 1	14/7								
ITD 2		17/2												
ITD 3		17/2												
										PM1		19/2		
										PM2		12/2		15/4
Vendor 1		11/2		20/4	Vendor 1		25/2			Vendor 1	01/8	23/2	05/10	26/4
Vendor 2		23/2		21/4						Vendor 2		19/2		
Vendor 3		13/2								Vendor 3		27/2		
Vendor 4		25/2								Vendor 4		25/2		
Vendor 5		05/3								Vendor 5		24/2		
										Vendor 6			01/10	

Appendix 2: Detailed interview respondents by dates