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A case study of knowledge management adoption in an Australian professional organisation

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**A Case Study of Knowledge Management Adoption in an
Australian Professional Organisation**

A thesis submitted in fulfillment of the requirements for the award of the
degree

DOCTOR OF PHILOSOPHY

from

UNIVERSITY OF WOLLONGONG

by

MATTHEW JAMES BOWDEN

Bachelor of Information & Communication Technology (BIS)

(Honours Class II Division I)

**SCHOOL OF INFORMATION SYSTEMS AND
TECHNOLOGY**

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I'm just going to lie on the floor, now. Please don't let me swallow my tongue.

Abstract

This research investigates the adoption of knowledge management (KM) in knowledge-intensive professional organisations. This thesis defines what KM is and how it relates to knowledge-intensive organisations like professional organisations. It also defines the related concept of business intelligence (BI) and discusses the relationship between BI and KM and the impact that this relationship has on an organisation. Furthermore, the thesis examines different organisational structures and identifies the professional organisation as being the one particular type whose internal structure makes it a prime candidate for KM.

The literature presents both a wide variety of approaches to the acquisition or deployment of KM, and a vast amount of discussion on the theoretical foundations of KM. However, much of the literature ignores the significant variations that exist in organisational structures and cultures as outlined in research.

The current research investigates how three approaches: Centralised, Decentralised and Hybrid, work in an organisation with a professional structure, as defined by Mintzberg. It does this by identifying a single professional organisation in which, fortuitously, the three proposed approaches were being used in three separate attempts to build very similar KM tools. These three case studies were examined using grounded theory methods to record the experiences related to the three different approaches. Specific issues were documented using emerging issues analysis, which is the process of identifying issues that could re-occur in other cases.

Recommendations are made as to how KM projects can impact a professional organisation and the issues they can expect to encounter when undertaking such projects. The thesis concludes by proposing two approaches of its own; one describing how a professional organisation can choose an approach to conduct a KM project, the other to assist in determining a system acquisition method.

Thesis Certification

I, Matthew J. Bowden, declare that this thesis, submitted in fulfillment of the requirements for the award of Doctor of Philosophy, in the Department of Informatics, University of Wollongong, is wholly my own work unless otherwise referenced or acknowledged. The document has not been submitted for qualifications at any other academic institution.

Matthew J. Bowden

6th March 2012

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List Of Publications

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Glossary

EDUC – Education

SITACS – School of Information Technology and Computer Science

RIS – Research Information System

RSO – Research Services Office

KM – Knowledge Management

BI – Business Intelligence

IT – Information Technology

OLAP – On-line Analytical Processing

ICT – Information and Communication Technology

Emlab – Educational Media Lab

CRC – Curriculum Resources Centre

RILE – Research center for Interactive Learning Environments

DMC – Digital Media Centre

FMS – Faculty Management System

UOW – University of Wollongong

DEST – Department of Educational Science and Technology

FPO – Faculty Publications Officer

RFCD – Research Fields, Courses and Disciplines

RO – Research Online

RQF – Research Quality Framework

Chapter 1: Introduction

1.1 Introduction

“Knowledge is of two kinds. We know a subject ourselves, or we know where we can find information on it”. (Samuel Johnson, 1709-1784) (Boswell and Croker, 1848, pp 452)

Despite all the enormous changes that Information and Communication Technologies (ICT) like the personal computer, the Web and mobile computing have brought to our lives, Johnson’s description of knowledge has never been more true. The real value of a modern organisation is embedded in what its employees know, or know how to do, and how well they share that knowledge, thus making it easier for others within the organisation to find it.

Throughout the 1970s and 1980s many organisations began to realise the importance of knowledge but it was only in the early 1990s that the concept of Knowledge Management (KM) became popular and soon became a core part of many an organisation’s IT portfolio. KM was quickly adopted in the resources, manufacturing, retail and finance sectors. Most large corporations began employing specialised knowledge engineers and the role of Chief Knowledge Officer emerged. Somewhat surprisingly, apart from some very early “experimental” work in the university sector, the adoption of KM was relatively slow in knowledge rich organisations like universities, hospitals, legal firms and similar professional organisations. This may have been because the professionals in these organisations were regarded as “repositories of knowledge” or because these organisations were often too small to invest in the

emerging knowledge technologies. Whatever, the reason, the use of KM in professional, knowledge-rich organisations is still poorly understood and poorly represented in the literature.

This research is an investigation into the adoption of knowledge management (KM) in knowledge-rich professional organisations. This thesis defines what KM is and how it relates to knowledge intensive organisations. It also defines the related concept of business intelligence (BI) and discusses the relationship between BI and KM and the impact that this relationship has on an organisation. Furthermore, the thesis examines different organisational structures and identifies the professional organisation as being the one particular type whose internal structure makes it a prime candidate for KM. Finally, three approaches to KM adoption used in professional organisations are described and the research poses the question: when you compare and contrast 3 different approaches, which, if any, of these three approaches is the most appropriate for the development and deployment of KM in professional organisations.

1.2 Background To The Research

“If knowledge is understood as ‘information that is relevant for action’, then the greatest challenge in business today is to link the content (information) with the context (action)” (Kimpeler, 2001, pp3). There are many different definitions in the literature for Knowledge Management (KM). This is because there are so many different disciplines involved in this field of research, including education, management, information technology, psychology and philosophy. Hlupic et al. (2002) have identified three general reasons why the term “knowledge management” has been so

hard to define. The first reason is that the term 'knowledge' is a hard concept to define. Typical definitions of KM include:

"KM is a tool to facilitate the sustainable transfer of knowledge and its flow in explicit, implicit and tacit forms. The understanding of the knowledge, the capacity to manage the flow and leverage the capacity of the organisation to create and innovate and the place of technology in this schema is an essential focus in the exploding information age" (Burstein et al., 2003, pp1)

"Managing the process of creation, development and diffusion of knowledge in order to achieve organisational capability" (Jewels et al., 2003, pp2)

"KM can be viewed as a process or practice of creating, acquiring, capturing, sharing and using knowledge (explicit and tacit) for the purpose of improving the learning and performance of the organisation" (Wilson et al., 2003, pp2)

The fact is that KM allows organisations to do a wide variety of things that will, if done successfully, create a more efficient and productive knowledge culture and allow the organisation to focus on creating new products and services to improve customer satisfaction and improve organisational practices. This is why KM can be a valuable tool to professional organisations like universities, hospitals legal firms and the like. However, some organisations refer to this organisational process as Business Intelligence (BI).

KM and BI are both about helping an organisation achieve success through better use of the knowledge and information available to it. The literature initially presented KM and BI as two entirely independent concepts. Renowned business intelligence expert Ralph Kimball describes the term Business Intelligence (BI) as “a generic term to describe leveraging the organization's information assets for making better business decisions” (Kimball et al., 2002, pp5). Cody et al (2002, pp697) define the term BI as having “coalesced in the last decade around the use of data warehousing and on-line analytical processing (OLAP)”.

It was later realised that the KM and BI concepts, while different, overlapped, and there were claims that KM was a subset of BI. More recently, that trend has reversed, and BI is now being considered as a subset or an adjunct of KM. As chapter 2 explains, it is the latter view which is taken in this thesis.

Many approaches to the acquisition or deployment of KM have been proposed in the literature, however, these studies often assume that the proposed approach is universally or widely applicable. This assumption ignores the significant variations that exist in organisations structures and cultures.

Organisations come in different shapes and sizes, across a wide variety of different disciplines and industries, employing from one to hundreds of thousands of employees and managers. The literature produced by Mintzberg on the structure of organizations spans several decades and shows that all organizations are not the same, differing in many aspects internally and externally. In ‘The Structuring of Organizations’ Mintzberg (1979) describes how the literature on organisational structure evolved. As a result of

the work done by Burns and Stalker, Lawrence and Lorsch, to mention but a few, Mintzberg concludes there is no “one best way” to structure an organization (Mintzberg, 1979). If there is no “one best way” to structure an organisation, then why would there be “one best way” to acquire or deploy KM?

Indeed, many of the KM approaches recommended in the literature were derived for large corporations in the resources, retail, manufacturing and financial sectors. There appears to be a gap in the literature in relation to the adoption of KM by smaller organisations like universities, legal firms and hospitals. These knowledge-rich organisations are described by Mintzberg as “professional “ organisations and have a unique structure that is quite different to those found in most large corporations. This raises the question: is there a preferred approach to KM adoption in professional organisations. While this research acknowledges that there are many other dynamics that can affect KM in an organisation, such as organisational complexity, size, industry and culture, the current research has chosen to focus on organisational structure to narrow the scope of the research.

Rusanow (2003) outlines three approaches in which KM can be implemented into a law firm, a classic example of a professional organisation. These three approaches are described as:

- Centralised
- Decentralised
- Hybrid

This research aims to investigate how each of these approaches works in a professional organisation. It determines whether one of these approaches better suits a professional

organisation or whether different circumstances demand different approaches. Qualitative research techniques and methods, including case studies, grounded theory and issues analysis, are used in this investigation of these 3 approaches.

1.3 Methodology

To investigate the three proposed approaches to KM adoption in a professional organisation, the research identified a single professional organisation in which, fortuitously, the three proposed approaches were being used in three separate attempts to build very similar KM tools. These three case studies were examined using grounded theory methods to record the experiences related to the three different approaches. Specific issues were documented using emerging issues analysis, which is the process of identifying issues that could re-occur in other cases. The analysis of the three case studies was conducted using similar data collection techniques such as interviews and observation. From the data that was gathered, issues were identified and discussed in regard to their relevance to the case studies and professional organisations in general. Recommendations are made as to how KM projects can impact a professional organisation and the issues they can expect to encounter when undertaking such projects. The three case studies and subsequent issues are discussed in the Chapters 4-6. The analysis of these issues and the suggested recommendations are expounded in Chapter 7.

1.4 Significance Of The Research

This research is significant for several reasons. Firstly, the three approaches described above have not been well-documented in the literature and have certainly not been applied simultaneously in a single organisation. Secondly, it allows a unique

comparison of these three approaches, something of value to KM researchers in general. Thirdly, this is only the second application of these three approaches to an organisation with a Mintzbergian professional structure. Fourthly, given that the case studies in this research were undertaken at a university, it allows a comparison to be made with the previous study conducted for a law firm (Rusanow, 2003).

Lastly, KM practitioners, especially those working in professional organisations, will also benefit from the identification and classification of issues identified in the three case studies. An awareness of these issues and their flow on effects could significantly improve the adoption of KM in professional organisations in the future. The outcomes of the research include two decisions trees which would guide a KM professional in a) the selection of an appropriate approach for KM adoption and b) in deciding whether to buy or build a KM tool. These factors are of greater value not only to a KM practitioner in a professional organisation but to those working in other KM projects.

1.5 Conclusion

As well as introducing the concepts of knowledge management and organisational structures this chapter has highlighted how important the concept of KM is to organisations and how it can benefit them. This chapter has also intimated that although knowledge intensive organisations can benefit greatly from the incorporation of KM, research on how this can be most effectively executed in a professional organisation is required. Consequently, the aim of the current research is:

to analyse three different approaches to develop and implement knowledge management and the ways that it can benefit professional organisations.

Chapter 2 investigates the literature surrounding KM. It considers what KM is, and what it means to an organisation. Following that there is a discussion on how the two concepts of KM and BI relate to each other and the significance that this relationship can have on an organisation. The chapter then examines knowledge intensive organisations and how KM is important to them. Finally, there is a discussion of the work done by Mintzberg in the area of organisational structures of organisations. The chapter concludes by considering an approach to incorporating KM into a knowledge intensive organisation.

Chapter 3 describes the methodology used to conduct the research, to investigate the research question proposed in chapter 2. Chapters 4, 5 and 6 are case studies of KM adoption in a professional organisation which was conducted over a five year period to fulfil the research objectives. Chapter 7 discusses the findings of these three case studies and summarises the issues encountered. The thesis concludes by proposing two approaches of its own; one describing how a professional organisation can choose an approach to conduct a KM project, the other to assist in determining a system acquisition method.

Chapter 2: Literature Review

2.1 Introduction

The following conceptual framework (Figure 2-1) represents the four way relationship that exists between Knowledge Management (KM), Knowledge Intensive Organisations, Approaches to Knowledge Management and Professional Organisations. An understanding of these four concepts is crucial to the current research.

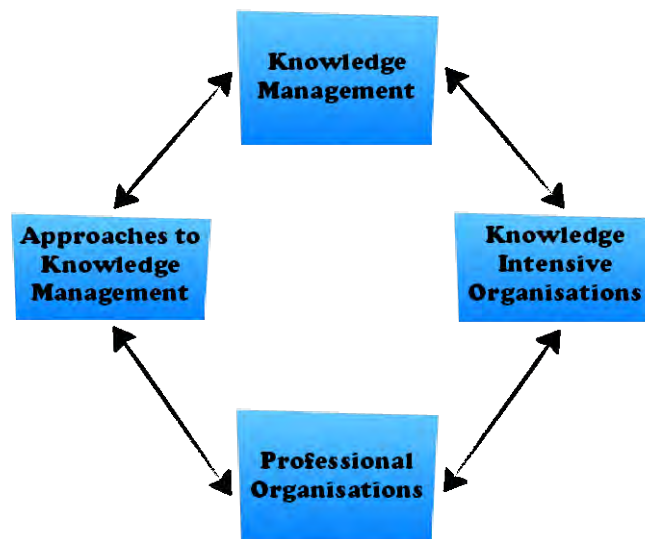


Figure 2-1 Conceptual Framework

This chapter will examine the field of “Knowledge Management” and other complementary fields to determine what they mean. It will also look at the structure of organisations and how they differ. Finally, it will look at different approaches that incorporate these practices in a specific organisational style, the professional organisation.

2.2 Knowledge in the Modern World

The latter part of the 20th century was dominated by information. Drucker (1999, pp47) states “The truly revolutionary impact of the Information Revolution is just being felt”. Drucker (1999, pp47) goes on to say that the information revolution “is profoundly changing economies, markets, and industry structures; products and services and their flow; consumer behaviour; jobs and labor markets. But the impact may be even greater on societies and politics and, above all, on the way we see the world and ourselves in it”. Businesses and governments alike focussed on information technology, information systems, the information economy and information workers. And, so organisations around the world computerised most of their business processes, the amount of data and information became so large that the world seemed to suffer from “information overload”. At the turn of the century, most organisations began to realise there was a need for knowledge rather than information, and there was a need to gather intelligence from the vast stores of available data. Without doubt, the 21st century has begun with a focus on knowledge and intelligence.

2.2.1 The Knowledge Economy

As stated in Halloran (2003) due to the impact of information technology, e-commerce and the rapidly changing world of telecommunications, the new “knowledge economy” has left many organisations with the need to overhaul their existing strategies for the acquisition and development of their human capital strengths, especially when developing the skills required by their future knowledge workers. The new “knowledge economy” replaced the “industrial economy”. Kimpeler (2001) describes how the term “knowledge based economy” was coined to describe this shift in advanced economies, with a focus towards greater dependence and reliance on knowledge, information,

highly specialised employee skill levels and an increasing need for reliable access to these in day-to-day business.

“Today, knowledge in all its forms plays a crucial role in economic processes. Nations, which develop and effectively manage their knowledge assets, perform better. Firms with more knowledge systematically outperform those with less. Individuals with more knowledge get better paid jobs. This strategic role of knowledge underlies increasing investments in research and development, education and training, and other intangible investments, which have grown more rapidly than physical investments in most countries and for the most of the last decade.” (Kimpeler, 2001, pp1). With the focus on knowledge in today's society, we have moved into a knowledge economy which affects everyone from businesses to governments to education institutions. Neef (1999) discusses in detail the issue of KM and the knowledge economy. Neef (1999) states that a knowledge-based economic revolution is taking place and that it involves two distinct factors: KM for individual organisations and knowledge-based economies for nations. It discusses how these two factors are part of a major evolutionary economic movement which is reforming the economic structure of the world. Neef (1999) concludes that this is why KM should be seen by all as one of the most important sets of practices and policies that an organisation has to adopt in order to move towards becoming a global, learning organisation that can survive in the new knowledge economy (Neef, 1999).

The emergence of the knowledge economy began sometime in the mid 1980s (Neef, 1999) following an extended period of relative economic stability. Neef (1999) claims that automobiles were not much different from the way they were in the late 60s, grocery stores in 1980 still did not have electronic inventory or point of sales systems

and in 1985 medical research had hardly made any fundamental leaps forward. The economy was dominated by one single trading block in which the USA was the major player, with an ascent of Japan, a rehabilitated Germany and the other European Economic Community countries. Although South Korea was beginning to develop, much of the Pacific rim remained with primitive economic infrastructure and countries such as China, India and the Soviet Union remained relatively untapped (Neef, 1999). According to Neef (1999), sometime in the mid 80s there were dramatic changes. These changes involved such events as the move from cumbersome mainframes to the personal computer and laptops, better computing power for a fraction of the cost, the development of the internet, electronic commerce and just-in-time inventory systems. There was a shift towards outsourcing non-essential aspects of business, small-to-medium sized organisations began to become successful and nations that had previously been overlooked like India now became “tiger economies”. These types of economies attracted large amounts of investment from established countries and their growth rates doubled those of advanced economies (Neef, 1999). The table below shows how the world economy was changing and how it was effecting organisations in the shift to the knowledge economy.

Physical Assets	→	Intangible Assets
Fragemented Tasks	→	Integrated/Co-ordinated Tasks
Mass Marketing	→	Just-in-Time Products
Operational Efficiency	→	Innovation
Management Control	→	Common Goals and Objectives
Training	→	Lifelong Learning/Training

Figure 2-2 Organisational changes in the knowledge economy (Kimpeler, 2001, pp2)

The resulting shift towards the knowledge economy had a profound effect on organisations, education and governments. Kimpeler (2001) describes how these changes made organisations change the way they operate, and lists three main changes that occurred: Changes in recruitment and employment, changes in the organisational framework for enterprises and changes in business processes due to IT. The first of these changes involves the employees of the organisation. In the knowledge economy, employees have a lot more knowledge that the organisation relies on and it was discovered that when employees left an organisation, the business found that not only did they lose the employees but also the business suffered due to the loss of all the knowledge they took with them. The second change was related to the framework of the organisation. Rapid changes in information technology led to changes in work processes which meant that many employees needed new skills. Many employees began multi tasking in several areas of the organisation instead of being focused on one particular business area. This, in turn, meant that new training methods were needed and that people entering the workforce required better skills in many different areas. They also required more knowledge than their predecessors. The last of the changes described by Kimpeler (2001) was the implementation and incorporation of IT into changed business processes. The rapid innovation of technology resulted in the incorporation of technologies, such as intranets, into businesses which led to changes in business and production processes, like just-in-time inventory. This shift also led to organisational expansion, easier communication between businesses and access to new markets.

Neef (1999) argues that the shift into a knowledge economy can be seen as a knowledge-based chain reaction. Neef (1999) adds that several technological breakthroughs assisted in the development of new and better organisational processes.

Later there was the development of the electronic marketplace due to the growth and popularity of the internet and the World Wide Web. This meant that unlike previous decades, where a business would run the same way year in year out, employees and organisations would now have to be flexible as well as highly skilled, as business processes and markets could shift from year to year due to the rapid innovation of new technologies. After that was the expansion into global technologies. Neef (1999) states that the birth of global technologies is where technology takes on a revolutionary edge. The development of global communication technologies opened up new markets to many businesses. It allowed many organisations to base different parts of their business in different locations around the world and still they could communicate as if they were in the same building on different floors. Neef (1999) discusses how technology has had an impact on today's society much in the way the printed word had on the Renaissance era. The new technologies have allowed ideas (techniques, research results, diagrams, formula, marketing patterns) to be distributed in an instant in any form or language to anyone, anywhere around the world. Neef (1999) concludes by stating that new sets of policies and practices have emerged due to the innovation and development of new information and communication technologies, employee upskilling, globalisation and the dominance of the new knowledge-based marketplace. The application of these policies and practices led the organisation to better business practices and these distinguished successful from the unsuccessful organisations in the knowledge economy.

2.2.2 Knowledge in the Modern Organisation

In today's society knowledge is an important commodity for a successful organisation. Kimpeler (2001, pp3) states “If knowledge is understood as ‘information that is relevant

for action', then the greatest challenge in business today is to link the content (information) with the context (action)". Kimpeler (2001) shows that information and knowledge are important in today's businesses and that identifying and using this knowledge is of great significance to an organisation's success. Kimpeler (2001) suggests that there are four types of knowledge that are important to an organisation. These are: know-what (facts or information); know-why (context); know-how (competence and skills); and know-who (network of knowledge). Each of these four types of knowledge can also be either codified (explicit) or tacit (implicit); the goal is to identify which is which, and how each can contribute to the success of an organisation. Earl (2001), Grant (1996), Nonaka (1994), as cited in Jerram et al. (2003) show that knowledge has become a key organisational resource in modern organisations. A critical question for today's organisations is how to use this knowledge. In modern businesses, the management of information is more than a general issue to organisations and their management. In fact, systematic and active practices like knowledge management are central to the general notions of competitiveness and effectiveness in today's organisations (Kimpeler, 2001). The vast amount of literature that has been written about the subject in journals, text books and online is testimony to its importance. Nevertheless, the terms 'Knowledge Management' (KM) and 'Business Intelligence' (BI) require further refinement and clarification.

2.2.3 Knowledge Management (KM)

There are many different definitions in the literature for KM. This is partly due to the fact that so many different disciplines are involved in this field of research, including educational, management, information technology, psychology and philosophy. Hlupic et al. (2002) have stated that there are three reasons why the term 'knowledge management' is so hard to define. The first reason is that the term 'knowledge' is in

itself a hard concept to define. The way it is used in the eclectic management field is the second reason. The third reason is that KM is an emerging discipline involving other fields of research, terms and concepts are still being defined and refined. The following definitions give a perspective of what researchers and practitioners think KM is.

Knowledge management is “a multi-disciplined approach to achieving organisational objectives by making best use of knowledge” (Standards Australia, 2003, pp7)

“Knowledge management is a business-focused approach to the processes that govern the creation, dissemination, and utilisation of knowledge to fulfil organisational objectives thereby adding value to and increasing the productivity of the organisation” (Murray, 1998, pp5)

“KM is a tool to facilitate the sustainable transfer of knowledge and its flow in explicit, implicit and tacit forms. The understanding of the knowledge, the capacity to manage the flow and leverage the capacity of the organisation to create and innovate and the place of technology in this schema is an essential focus in the exploding information age” (Burstein et al., 2003, pp1)

“Managing the process of creation, development and diffusion of knowledge in order to achieve organisational capability” (Jewels et al., 2003, pp2)

“KM can be viewed as a process or practice of creating, acquiring, capturing, sharing and using knowledge (explicit and tacit) for the purpose of improving the learning and performance of the organisation” (Wilson et al., 2003, pp2)

“Organisational knowledge supported by information technology is a resource offering significant, if not critical, competitive advantage.” (Alavi and Leidner, 2001, pp114)

“Knowledge management is concerned with the exploitation and development of the knowledge assets of an organisation with a view to furthering the organisation’s objectives. The knowledge to be managed includes both explicit, documented knowledge, and tacit, subjective knowledge. Management entails all of those processes associated with the identification, sharing and creation of knowledge. This requires systems for the creation and maintenance of knowledge repositories, and to cultivate and facilitate the sharing of knowledge and organisational learning. Organisations that succeed in knowledge management are likely to view knowledge as an asset and to develop organisational norms and values, which support the creation, and sharing of knowledge.” (Rowley, 2000, pp11)

Hlupic et al. (2002) provide a list of additional definitions. Defining KM is not just a problem in academic literature. The literature of non-academic organisations also reflects how hard it is to stipulate what KM is. In a KM survey performed by CAUL in 2002, forty universities were asked if they had a definition of KM at their university. Of the twenty six that responded, all stated that they did not have a formal definition of KM within their university structure (CAUL, 2002). Cody et al (2002, pp698) state that KM “definitions span organizational behavioral science, collaboration, content management, and other technologies”. While references may differ in their definitions of whether knowledge management is a processor a tool and whether it incorporates or excludes technology, all definitions agree that the purpose of KM is to help an organisation identify and use its knowledge in all forms to better itself. As the authors in Hlupic et al.

(2002, pp94) neatly put it: “Despite the differences in KM definitions, it it seems that there is one common parameter in different knowledge management definitions: knowledge management is seen as the vehicle for organisational effectiveness and competitiveness”.

Murray (2001) believes that KM can be broken up into five stages. He argues that data becomes information which in turn becomes knowledge. This knowledge then leads to informed actions and these produce business results. This is a simplistic but effective way of viewing the process of KM within an organisation. However, Piccoli et al. (2000) state that there are three stages to KM. The first of these stages is organisational learning which is the process of acquiring information. The next step is knowledge production which is the process of transforming and incorporating information into usable knowledge. The final stage is that of knowledge distribution which involves the process of distributing knowledge throughout the organisation (Piccoli et al., 2000). This three-stage process is similar to the five-stage process mentioned immediately above, with the acquisition of information, the production of knowledge and the delivery of the knowledge to others being the common concepts.

Richardson (2003) provides a more technical view of KM. This is reaffirmed in his work “The Role of Information Systems and Technology in Case Management: a case study in health and welfare insurance” (Richardson and Hope, 2003) where it is stated that there are two stages to KM. The first stage involves getting the core processes in control so that the employees have the correct information to serve the customers; The second stage involves the utilisation of more advanced software tools. Gold et al. (2001) provide a framework based on the more traditional components of organisational

culture. This framework presents KM from an infrastructure point of view: the technology infrastructure/artefacts. These include ordinary systems within the organisation as well as specialist KM systems which need to be fully integrated to allow the free transfer of information and collaboration so their knowledge creation can happen. Then there is the structural infrastructure, which includes the organisational 'norms' that bind together the employees in social cohesion, and that ICT must reach across these boundaries for KM practices to be effective. Finally there is cultural infrastructure, the most important aspect of knowledge management, which refers to the culture of the organisation and how it should encourage the free exchange of information. This organisational culture is a complicated issue and the cultural aspect will be discussed later in more detail. For now it is just noted that this is a different look at what KM is.

Highlighting the diverse views of KM, Hlupic et al. (2002) look at KM as three aspects that need to be incorporated into an organisation. They describe the three aspects as the hard, soft and abstract parts of the knowledge base. The 'hard' refers to the technology and tools that allow easy forms of data access, manipulation and so on. The 'soft' refers to organisational structures and processes and the 'abstract' refers to the innovation, problem solving and understanding of the essence and theory of KM (Albert (1997); Applehans et al. (1998); Laudauer (1995): cited in Hlupic et al. (2002)). These three aspects need to be integrated in order for KM to be successful. This example of what KM is provides a different perspective of how KM can be viewed within an organisation. KM can be identified with the focus on the knowledge as the Piccoli et al. (2000) and Richardson (2003) examples demonstrate or it can be from an organisational point of view as with the Gold et al. (2001) and Hlupic et al. (2002) views. Either way,

knowledge management can be seen as a task involving knowledge acquisition, knowledge codification and knowledge sharing, which takes place in every aspect of the organisation in the physical ICT systems and in the non-physical structures of an organisation such as culture.

According to Hlupic et al. (2002, pp92) KM allows organisations to:

1. Identify, appreciate and respond to strengths, weaknesses, opportunities and threats.
2. Act, assimilate feedback and react in these arenas simultaneously.
3. Develop the capacity to operate in real-time environments.
4. Understand and create 'real' value as determined and perceived by the end consumers.

These four points describe the potential for organisations to extend their productivity and provide better products and services for their customers. But delivering the best service and products to their customers is not the only benefit that can be derived from KM because: "knowledge management has been about breaking down barriers within the organisation, and e-business has been about breaking down the barriers between the organisation and its customers" (Kidwell et al., 2000, pp30). This has been shown by Gilhooly (2000) where it was shown that knowledge for the University of Utah Hospital and its Clinics, knowledge within their organisation meant the difference between life and death. This is an extreme example, however, for most organisations the need for knowledge means the difference between success and failure.

There are many reasons to adopt KM. Milam Jr (2001, pp2) describes what organisations see as the best uses of KM. He ranked these uses as follows:

1. Capture and share best practices
2. Provide training, corporate learning
3. Manage customer relationships
4. Deliver competitive intelligence
5. Provide project workspace
6. Manage legal, intellectual property
7. Enhance web publishing
8. Enhance supply chain management

All of these uses of KM would help an organisation become better. Milam Jr (2001, pp3) also stated reasons for organisations adopting KM, which include:

- Retain expertise of personnel
- Increase customer satisfaction
- Improve profits, grow revenues
- Support e-business initiatives
- Shorten product development cycles
- Provide project workspace

KM allows organisations to do a wide variety of things that will, if done successfully, create a more efficient and productive knowledge culture and allow the organisation to focus on creating new products and services that assist customer satisfaction and lead to

better organisational practices. This is why KM is a valuable tool to for professional organisations like universities, legal firms, medical practices etc.

There are many important issues to be assessed when introducing KM. The first of these is strategy. Frequently, the literature on KM discusses the need for a strategy when using or introducing KM. A strategy can help in the successful implementation of KM tools and practices. Murray (2001) states that, when looking to use KM, there is a need to identify and locate the knowledge in an organisation; validate and verify its value; acquire it in a useful form at a reasonable cost; determine where and with whom the knowledge would benefit the organisation and how it can be made available in an appropriate form with suitable technology. If this can be done it is the first step in having an excellent KM strategy for the organisation.

There are several challenges regarding the development of a KM strategy. A major one that comes prior focuses on people, knowledge and the organisational objectives before the technology to be used (Jewels et al., 2003). This is confirmed by Tan et al. (2003) who believe that an effective KM strategy requires an evaluation and analysis of what employees know, who knows it, which knowledge can be leveraged and what knowledge is missing or leaking. To do this the total knowledge environment within the organisation needs to be examined, taking into consideration the formal and informal aspects of the organisation's knowledge.

Wilson et al. (2003) discuss how an organisation can have two directions in which to focus their strategies. If the organisation has routine outputs, they should try and build knowledge repositories (knowledge stocks). On the other hand, if the organisation has

non-routine outputs, they should have a strategy that focuses on creating better culture and person-to-person contact (knowledge flows). However, they do state that a strategy that combines both these foci is better due to the complex nature of organisations in the knowledge economy. Wilson et al. (2003) also describe three socio-technical layers which can be seen in an organisation. These layers are helpful when defining and developing a strategy for an organisation. The three layers are: Infrastructure, which is the physical / communicational contact between employees using hardware and software; Infostructure, which are the formal rules that govern exchanges between employees and provide cognitive resources that employees use to make sense of events on the network; and Infoculture, the background knowledge which is embedded in the social interaction within the organisation. These three layers could simply be viewed as the infrastructure, policy and culture of the organisation, that is, three important aspects of an organisation when deploying KM within an organisation.

Kidwell et al. (2000) identify several steps that an organisation should take when launching KM initiatives. The first of these is to start with a strategy so that the organisation can identify what they want to accomplish with KM. Organisational infrastructure is another step which requires all aspects of the organisation - human resources, financial measurements of success and information technology - need to support KM to achieve the desired strategy goal. The third step is to select a high-level champion for the initiative. This means someone who will support the KM initiative and will inspire others to support the project as well. The next step involves selecting a pilot project with which KM can build credibility within the organisation for the idea and begin developing a suitable culture. The next step is to develop a detailed action plan for the pilot which documents the process, technology, roles and incentives used in the

project. The last step is to review the plan after its implementation and refine it so that it can be used again to help the implementation of other KM projects. This process outlines the need for a strategy and the analysis an organisation needs before it can proceed to implement KM tools and techniques. There are many risks that accompany the use and implementation of KM projects in any organisation.

Jaminson and Loeng (2003) describe many of the risks encountered when using and developing KM. To combat these risks Jaminson and Loeng (2003) identify several risk migration techniques, one of which is a knowledge-based strategy. It states how an organisation needs to direct its resources towards the development of a strategy to assist itself with successful KM and propel it to succeed in this new knowledge economy. The article also identifies several other necessary issues, including the need to map key processes and people in the organisation or knowledge-based process planning. This is a process that helps organisations identify where KM can be effective for them and help with the development of a successful knowledge strategy. Other issues identified are the need for a knowledge sharing culture and the need for a supporting technical infrastructure. All of the above, along with the need for a leader as described in Kidwell et al. (2000), are keys to the success of KM within any organisation.

2.2.3.1 Culture, Leadership and Technology's influence on KM

Culture, leadership and the use of technology are considered to be among the most important aspects in order to get KM to work. Culture describes a common ground of knowledge which is needed for the communication and elaboration of common goals (Kimpeler, 2001). Much of the literature concerned with KM refers to the need for the culture of the organisation to accept and embrace KM in order for it to be successful.

Boling et al. (2000), Piccoli et al. (2000), Jewels et al. (2003), Kidwell et al. (2000) and Herschel and Jones (2005) all confirm the importance of culture to KM. Hlupic et al. (2002) articulated it particularly well, when they declared that organisational culture is an important factor to consider in the context of KM because its boundaries may often restrict the flow of information among the organisation's employees resulting in a move to resist the sharing of information and knowledge. Furthermore, Hlupic et al. (2002) discuss how knowledge must be useful to employees and what everybody in the organisation gains by sharing knowledge. Only then can an adequate culture for KM be delivered and developed. It is not enough to simply install the tools for KM, the culture of the organisation must embrace the idea for it to work. One way to ensure this is to have good leadership driving the KM initiative.

Burstein et al. (2003) state that the need for KM leadership has been identified as one of the critical success factors for a KM program. Lloyd (2002) discusses the importance of leadership, describing how the leader sets the direction, tone and culture of the organisation. Lloyd (2002) also writes that leadership needs to bring the knowledge issues to the surface and then make sure they are acted upon and integrated into the development of a strategy. Leaders need to help create the conditions in which managers will encourage the use and development of KM practices and help develop trust within the organisation. The role of the leader would depend on how the strategy views KM. If the strategy is for an organisation-wide movement, then a high up position like the CEO or CIO would benefit the process as they would be in a good position to help with the development of a sharing culture between business units. However, if the strategy is a unit-based project, then someone like a unit head or middle manager would suffice. As Koch et al. (2002) describe in the analysis of a KM project, the deputy head

of the department is responsible for managerial influences which can include co-ordinating, controlling and leading the conduct of KM within the unit. Overall, it is important to have someone who will help rather than hinder the process, someone who will champion the strategy into practice and help develop a sharing culture. Leadership may be much more critical to creating an effective KM environment within the organisation than the technology used to support that KM environment.

The technology used to assist with KM within the organisation is important. However, as established previously, it is not the only factor that will contribute to a successful KM organisation. Reid (2000) notes that the development of technology-based methods for KM practices, such as the storage, creation and distribution of knowledge, correlated with the increasing emphasis on business strategy which drive the creation of new KM systems within the organisation. However, Davenport and Prusak (2000, pp142) note: “The installation of Notes or the Web or case-based reasoning software will not in itself bring about that change. Technology alone won’t make a person with the expertise share it with others. The mere presence of technology won’t create a learning environment, a meritocracy, or a knowledge creating company”. In order for KM to be successful, technology must accompany the culture of the organisation. The technology must not be allowed to drive the development of cultural shifts within the organisation.

Instead human needs must be at the centre of such transformation (Reid, 2000), that is, organisational culture should determine what technology is needed and used. While technology is important, culture and leadership are also necessary for the successful incorporation of KM. The next section will examine what some academic institutions have done to build such a culture and the strategies and technologies they used to do it.

2.2.3.2 *Business Intelligence (BI)*

Business Intelligence (BI) is a concept that encompasses many different business activities such as data warehousing, KM and enterprise resource planning. BI can be defined as “The process, technologies, and tools needed to turn data into information, information into knowledge, and knowledge into plans that drive profitable business actions.” (Loshin, 2003, pp6). Renowned business intelligence expert Ralph Kimball describes the term business intelligence as “a generic term to describe leveraging the organization's information assets for making better business decisions” (Kimball et al., 2002, pp5). Cody et al (2002, pp697) define the term BI as “coalesced in the last decade around the use of data warehousing and on-line analytical processing (OLAP)”. While BI is an asset to an organisation, it must be managed correctly in order for it to be effective in each individual organisation.

As Marren (2004, pp5) describes it, BI “is simply the collection, analysis and application of strategic information to business decisions”. In today’s knowledge intensive business world, BI techniques are of great value to organisations. Some of these benefits are outlined by Loshin (2003) who states that there are many ways in which BI can benefit organisations. He describes how BI programs achieve goals such as increased profitability, decreased business costs, decreased business risks and improved customer relationship management. So, with great benefits available to an organisation, how does one go about achieving these goals and does the type or style of organisation determine how to undertake these tasks? Okkonen et al. (2002, pp7) provides several different definitions of BI and finishes by concluding that BI “is separated into two categories of information needed for the formulation of a business strategy. *Business intelligence is the process of gathering and analysing internal and*

external business information”. Okkonen et al. (2002) also defines BI “as the process which supports operational and tactical business decision-making. The process consists of phases in which, for example, external and internal data is gathered and converted into intelligence” (Okkonen et al., 2002, pp7). Like KM, BI has many different definitions, each depending on the organisational view of how the information relates to business practices and the terminology the practices subscribe to.

2.2.3.3 The Relationship Between KM and BI

BI and KM are all about helping an organisation achieve success through better use of the knowledge and information available to them. The literature discusses several ways or stages as to how this is done. Whatever its role, the organisation should set their definition in relation to what KM and BI are meant to do for them. In doing this, organisations should take some things into consideration. Richardson (2003) states that a KM definition should include the customer. He claims that much of the literature today does not include the customer in the definition which is unusual as this is the reason that most companies start KM projects in the first place (Richardson, 2003). He also suggests that the concept of knowledge worker should be extended to include the supplier and customer of an organisation, not just its employees. KM does not just refer to the incorporation of information and communication technology (ICT) but instead covers a wider range of issues. Halloran (2003) observes that KM also encompasses the creation of processes and behaviours that allow the transformation of information into knowledge by people for use by the organisation. Halloran (2003) goes on to state that KM needs to encompass people, processes, technology and culture. With such a variety of definitions, a common feature appears, they all refer to the concept of creating knowledge from organisational data for the benefit of the organization.

The previous point can be seen in the article by Cody et al. (2002), which discusses the integration of business intelligence and knowledge management. As Cody et al. (2002) state “A critical component for the success of the modern enterprise is its ability to take advantage of all available information”. This is due to organisations becoming ‘knowledge-centric’, that is, the majority of the operating core, support staff, middle line and strategic apex need access to a vast variety of organisational information (Cody et al., 2002, pp697). The authors go on to state that BI and KM have proved their usefulness and provide a good return on the investment (Cody et al., 2002). They go on to discuss how the desire by IT managers to extend the capabilities of their BI and KM systems has existed for some time, overcoming such inhibitors as the separation of data across separate systems and so forth (Cody et al., 2002).

This view is confirmed by Herschel and Jones (2005) who point out that in a survey conducted by OTR consulting, 60% of respondents did not understand the difference between the two terms. For the purpose of their article Herschel and Jones (2005) describe KM to be about “collaboration, content management, organizational behavioral science, and technologies. KM technologies incorporate those employed to create, store, retrieve, distribute and analyze structured and unstructured information” (Herschel and Jones, 2005, pp45-46) while BI is “focused on the similar purpose, but from a different vantage point. BI concerns itself with decision making using data warehousing and online analytical processing techniques (OLAP)” (Herschel and Jones, 2005, pp46). However, Herschel and Jones (2005) argue that KM and BI should be considered mutually critical components and necessarily integrated for the management of organisational, intellectual capital.

Like this research, Herschel and Jones (2005) look at the views of other researchers. McKnight (2002) had KM falling under the BI banner and he argued that KM was internal-facing BI, where intelligence was shared among the employees. Haimila (2001) also saw KM as assisting BI within organisations, citing an example of law enforcement officers using BI as a way to better use the data collected to make faster and better informed decisions. Marco (2002) explained that an enterprise wide KM solution cannot exist without a BI-based meta data repository and that this repository was, in fact, the back bone of the KM system. Cook and Cook (2000) saw that there was a need for people to recognize that the concepts of KM and BI were both rooted in pre-software business management theories and practices and that in fact technology had clouded the definitions of KM and BI. Cook and Cook (2000) show that, when defining the role of technology in BI and KM, as opposed to defining technology as BI and KM, is a better way to clarify the distinction between KM and BI. Kadayam (2002) believes that, while the two fields of KM and BI have evolved over the last two decades, they have done so in parallel. Kadayam (2002) also feels that several technological developments have given rise to the emergence of 'new business intelligence' or NBI. This has been pushed by two factors: the growth of internet information, and new technologies that aggregate, analyse and report on data from a variety of sources that were previously thought incompatible.

KM encompasses both tacit and explicit knowledge while, traditional BI focuses on explicit information only (Herschel and Jones, 2005). On the other hand, Malhotra (2002) explains how BI could be constructed as KM and that it depends on how the organisation defines its world. Summarising all of these definitions, Herschel and Jones (2005) note that, whatever the point of view, there is an acceptance that KM and BI do

need to be considered as an integrated whole. In conclusion Herschel and Jones (2005) state that BI systems are becoming increasingly more critical to the day to day running of operations but only a fraction of the information that is needed is in computers, with the vast majority of the organisation's knowledge assets remain in the minds of its employees (Herschel and Jones, 2005). This fact is confirmed by Nemati et al. (2002) who argue that what is needed is a new generation of knowledge enabled systems that deliver a platform to capture, cleanse, store, organize, leverage and disseminate the data, information and the knowledge of the organisation. Based on these conclusions, this research considers BI to be a subset of KM and henceforth will use the term knowledge management (KM) to refer to both. The next section will focus on what KM means to a professional organisation, what KM needs to be successful and how KM can be used in the organisations such as academic environments.

2.2.3.4 What makes a project KM

This research considers a project to be KM if the project aims to accomplish any of the 3 aims described by Davenport and Prusak (1997) and outlined in Alavi and Leidner (2001). If the project seeks to make knowledge visible and show the roll of knowledge in the organisation, if it's purpose is to develop a knowledge-intensive culture by encouraging and aggregating behaviours such as knowledge sharing and proactively seeking and offering knowledge or it's purpose is to build an infrastructure, not only a technical system, but a web of connections among people given space, time, tools, and encouragement to collaborate.

2.2.4 KM in Knowledge Intensive Organisations

While it is generally argued that all organisations can benefit from KM, it appears that some organisations are more “knowledge intensive” than others. Such knowledge intensive organisations have, as their core business function, the application of knowledge, which is provided to clients as professional services. Typical examples would include accountants, law firms, medical practitioners and hospitals, and universities, among others.

An accounting firm often has specialists in cost accounting, financial, accounting, forensic, accounting, fund management, and taxation. Each of these specialists is highly knowledgeable about the regulations and practices associated with his or her specialisation, as well as being knowledgeable about the field of accountancy in general. Similarly, solicitors and lawyers must have a broad knowledge of statutory law, which are the statutes and codes enacted by legislative bodies; regulatory law which are regulations established by governmental agencies based on statutes; and case law, which is the set of reported judicial decisions which may be used as precedents. In addition, legal practitioners may specialise in Family law, Criminal law, Contract law, International law or Property law, with each of these specialisations requiring another extensive body of knowledge. In addition to this theoretical knowledge, the legal practitioner must know the practicalities of various court systems, court procedures, police procedures etc.

Medical practitioners in general practice need to have a thorough knowledge of medical conditions, diseases and their symptoms, appropriate diagnostic tests to use and medications and other ancillary treatments that may cure or alleviate the disease or

condition. Regardless of a practitioner's own knowledge, specialist treatment may be required, in which case the general practitioner must also know about the various specialist areas like cardiology, endocrinology, neurology, oncology and so on. In addition, the general practitioner must know about the health care system, the hospital system, pharmaceutical practices and so on. Hospitals are even more knowledge intensive than general practices, employing large numbers of specialists and ancillary medical practitioners including nurses, emergency medical technicians and paramedics, laboratory scientists, pharmacists, physiotherapists, respiratory therapists, speech therapists, occupational therapists, radiographers and dieticians. Hospitals are often equipped with an amazing array of medical devices including ECG, EEG, ultrasound and MRI machines, PET and CT scanners, and x-ray machines, medical lasers and LASIK surgical machines and life support machines including medical ventilators, anaesthetic machines, heart-lung machines, ECMO, and dialysis machines, all of which require hospital staff with special knowledge. In addition, many hospitals are training institutions, providing practical experience and mentoring young doctors during their internship.

The broadest spectrum of knowledge in knowledge intensive organisations is found in universities, which, typically, provide education and conduct research in the specialist fields described above, and in many more including engineering, economics, mathematics, the sciences, geography, education, management, computing etc. Because of their dual roles of creating new knowledge through research and disseminating that knowledge through teaching, universities are the quintessential knowledge intensive organisation. Not surprisingly, many novel KM initiatives and experiments have been conducted in universities. The remainder of this section gives an overview of the

breadth of KM initiatives in universities and an indication of the types of technologies that have been used for KM

2.2.4.1 Technologies and KM in Universities

According to Oosterlinck & Leuven (2002) KM is what universities have been involved in ever since they were established. Oosterlinck & Leuven (2002) observe that in the evolving knowledge economy, universities have an important role to play. They explain that the knowledge economy is growing because capital and labour production factors have been surpassed by knowledge, and so KM has become a key issue in today's society. This is confirmed by Reid (2000), who states that universities have always managed knowledge. Reid (2000) describes how universities have used researchers to create and circulate knowledge, used publications and libraries to store knowledge and shared knowledge with students to help them increase their knowledge base. This follows closely the processes of BI and KM discussed earlier, with the acquisition and creation of knowledge, the storage and then the distribution and sharing of knowledge and the mining of data to create intelligence.

Achava-Amrung (2001) notes that KM involves creating an environment that allows college and university constituencies to create, share, capture and leverage knowledge to improve their performance in fulfilling institutional missions. This is why KM can be a valuable asset to a university, it can be a benchmark on progress, a continuous quality improvement process and can be used to measure performance as milestones (Stevenson, 2000).

However there are many more factors that have meant that universities must change. Reid (2000) articulates that universities find themselves in a cultural dissonance between historical assumptions and practices and those of the emerging information society. The article states that universities are undergoing transformations because of a range of external forces, which include: market competition, virtualisation and globalisation. The result of the influence of these factors is that it has given rise to new ways in which the role and function of today's universities can be viewed in the knowledge economy. Another factor contributing to the changes being undertaken by universities is the reduction in funding. Internal and external changes resulting from a reduction in government financial support is consequently resulting in a need for universities to have a more enterprising approach to revenue generation (Reid, 2000); this is especially true in Australia.

The profound changes in competition in the education marketplace have made universities and other higher education facilities think like business (Ubon and Kimble, 2002). The educational market is like many of the other business markets because they are becoming global as universities attempt to internationalise their curricula and offer high-quality programs to students regardless of their location (Ubon and Kimble, 2002). Today's education is subject to the same pressures of the marketplace as regular business, and educational institutions need to perform just as well as any other organisation in the knowledge economy (Ubon and Kimble, 2002). Ubon and Kimble (2002) outline that organisations use KM to improve their efficiency and effectiveness and so too could educational facilities such as universities to enhance the learning of students. KM principles share many common elements with education including: a knowledge sharing community, collaboration on tasks to help with efficiency and

effectiveness of the organisation, trust and knowledge sharing between the organisation and the employees and a shared understanding in order for the environment to succeed. With the incorporation of KM into educational facilities there is the potential for it to have the same benefits as it is having in other organisations.

With all these changes taking place, universities have had to evolve with them in order to stay competitive in this age of the knowledge economy. Oosterlinck and Leuven (2002) observe that a modern university can be described by the co-existence of several fundamental components. The first, as Oosterlinck and Leuven (2002) describe it, is the world of research, or knowledge creation. The second component is that of knowledge dissemination, which involves spreading the knowledge created by research to the attending students, both codified (explicit) knowledge through classes and also tacit knowledge such as skills and the ability to continue to learn after leaving the learning institution. The third component is the academic service to society. This refers to transferring the knowledge from the university into society at large, including the economic world. As we are in a knowledge economy this could not only create value for the university but also the nation, as discussed earlier. Shearmur (2000) describes how universities have vast amounts of explicit and tacit knowledge, which are of relevance to fields other than the ones in which it was developed. These three components follow closely what KM is about: knowledge creation, codification and dissemination. Therefore, by adding KM techniques to a university could help it become more competitive and a better learning environment.

Piccoli et al. (2000) provide a framework that allow the application of KM to a university faculty. The paper introduces a model of knowledge creation and delivery

that can be implemented by both the student and the faculty bodies. Piccoli et al. (2000) discuss how the model can be implemented and then provides an example of the model being used, and how it can be successfully implemented in the case of introducing a virtual learning environment. For the purpose of this review, however, only the model will be examined to see what is available for universities to do. The model is based around the concept of a hypertext organisation. This is an organisation that is managed through the dynamic cycle of knowledge and information sharing in which the organisation's members co-operate in knowledge creating activities driven by top management vision (Piccoli et al., 2000). Piccoli et al. (2000) discuss how this would require a structured approach, stretching across the various stakeholders within the organisation. The purpose is to create an environment and culture within the faculty that promotes both individual and organisational learning and also increasing organisational memory. The three-staged model, shown below corresponds to the three core fundamentals of KM discussed earlier: the acquisition and generation of knowledge; the codification and storage of knowledge; and the sharing or distribution of knowledge.

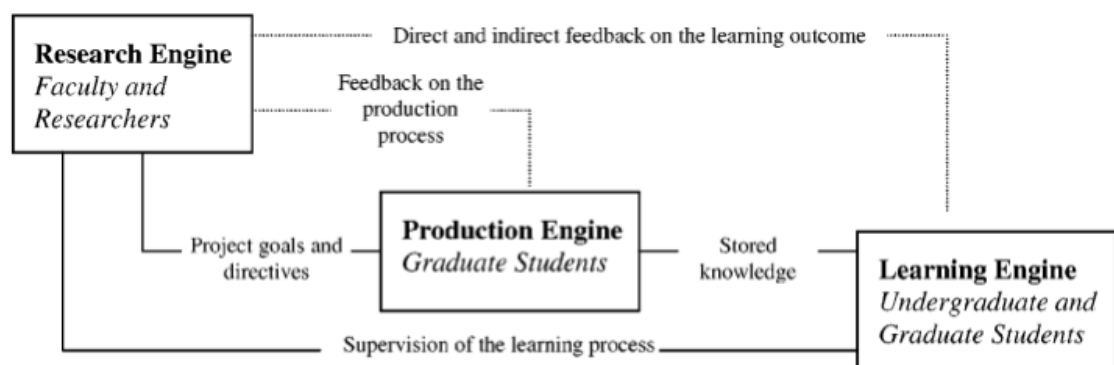


Figure 1. The proposed knowledge management model. (Dotted lines represent feedback loops.)

Figure 2-3 Proposed Model from Piccoli et al. (2000, pp232)

The paper uses the term ‘creation’ to describe the stage in which new knowledge is produced or gathered, and the term ‘delivery’ to describe the process of sharing it with users (Piccoli et al., 2000). The three entities in the above diagram drive the proposed knowledge creation and delivery process. The first stage, the research engine, contains faculty and researchers whose role is to provide guidance to and set the goals of the organisation, which could be described as developing a strategy, and also to monitor the progress and evaluate the results. These tasks are described in the paper as knowledge acquisition and generation. The next stage, the production engine, contains graduate students, who are responsible for producing and codifying knowledge as part of their own training (Piccoli et al., 2000). This is done under the supervision of those in the research engine. The paper describes this process as knowledge generation and knowledge storage. The final section, the learning section, is comprised of undergraduate and graduate students, and their role is to absorb and apply the stored knowledge under the faculty direction. The paper states that the model positions individuals into each stage where they can best contribute and benefit the process, however membership of each stage is flexible. It states how, with this model, the learning process within the organisation becomes a continuous process that provides all participants at different levels in the organisation access to information they need, or a means to get to it.

Piccoli et al. (2000) discuss how the model has the potential to assist in a wide range of projects, from developing computer applications to web-based knowledge repositories describing tools, frameworks and methodologies, to case study archives (Piccoli et al., 2000). One of the examples provided is how the model would work in the development of a web-based group support system. They suggest that, over the course of one or more

semesters, students in an internet development course could create the structure of the application and build upon it by adding several more features. Throughout the production phase of the application, several software development theories could be analysed and evaluated. In the learning phase the application could be used by executive MBA students to work remotely on assignments. While this is taking place interested researchers could test theories and hypothesise about them, such as dynamics of virtual teamwork. The paper also provides another example of developing a remote teaching application and repository, which describes many of the previous principles. The example shows how this could be an effective way for use of KM principles in a university. For a better understanding the paper should be read in its entirety as it concludes by demonstrating how the model performs with a real world implementation.

These are a few of the points the article discusses showing that there is a lot that needs to be done in order for KM to succeed. However with the vast number of techniques and tools available, research is needed in evaluating methods and frameworks used by organisations in analysing and evaluating the knowledge needs of the organisation and also in the selection of tools and techniques used. When these have been identified they should be applied to a case study of a professional organisation to see how effective the approaches are in producing KM projects.

Ubon and Kimble (2002) point out that there are many ways of supporting the development of knowledge sharing, including intranets, video conferencing, portals, collaborative groupware programs, and course management systems such as Lotus Learning Space. In fact there are over 1800 different products in the marketplace that carry the KM label (Chauvel and Despres, 2002). The article by Businessline (2001)

describes several different types of solution currently being used. It describes how France uses a knowledge portal and the Harvard Business School has a powerful web site providing a range of educational resources, some free and some priced. The authors go on to describe several other scenarios like that of Professor Raj Reddy of Carnegie Mellon University, an expert in artificial intelligence, who attempted to collect virtually all information available in the world and store it for free. He is aiming to store information dating back around 1000 years. Another project described in the article involves the storage of foreign exchange rates for almost all currencies dating back several years, for all who need this resource for research.

Another tool available is the portal. Levinson (2002) describes how a university used this process to solve several problems they were having in regards to knowledge access and distribution. The school lacked the proper infrastructure to support the entire student body as well as the faculty. This situation was compounded by the fact that everyone was not located in the one campus but were rather found in several satellite campuses spread around the area. Students and faculty members at these external campuses could not get the same level or quality of access to applications and information as their peers at the main campus. People at the main campus, on the other hand, could only access applications from a networked PC, there was no remote access. Completing the list of problems was the fact that email had to be used as the only way of sharing files electronically and students needed to remember an extraordinary amount of passwords, sometimes topping sixteen, clearly there was a need for KM to be applied. To introduce a KM system, a portal was created where students, faculty, staff, alumni and other institution and business partners could access all the services, research and applications they needed. The portal was established and facilities included

registering for classes, post / read syllabi, online classes, instant messaging and online course management. It also meant that students only needed the one password, reducing frustration and increasing knowledge transfer.

Several other tools can be used as effectively like this including Livelink which is an internet-based collaborative knowledge management application which provides both local and remote students with constant access to an up-to-date knowledge repository (M2 Presswire, 1999). It helps deliver online course work and assists course coordinators by having students submit assignments electronically. Which are then distributed electronically to tutors using the administrative tools. Anderson (2000) describes how the New York University Stern School of Business, the London School of Economics and the Hec Graduate Business School in Paris have created a degree in which each school provides modules for the learning and teaching process. The three schools have combined to give students a truly global degree in which they receive knowledge relevant to their industry from several different cultural points of view. Each institution provides an expertise in its specialised field, thus giving students the best possible educational experience.

Oosterlinck and Leuven (2002) provide a set of recommendations for the adoption of KM. The first thing to be done is the drafting of a mission statement encompassing what the organisation expects to achieve from KM. It states that awareness about the responsibility of staff towards the stakeholders should be raised. It states the need to establish the understanding that there is a difference between KM and information technology. Another point it expresses is that the organisation should also encourage an open culture internally and externally with regard to sharing information among staff.

A trend that has been developing in the knowledge economy is that of the corporate university. Coulson-Thomas (2000) and Garnett (2001) discuss how companies are aligning themselves with universities in order to leverage the knowledge that universities have available to them. In a partnership with a university, an organisation is clearly drawing upon the client capital of the university to enhance and boost its own human and structural capital (Garnett, 2001). Garnett (2001) states that in research carried out in the United Kingdom, a training manager of a company showed that employees who participated in the postgraduate scheme of the aligned university had a better understanding of the organisation's core competencies and were better able to relate them to their work within the organisation better than any other group. This is a big benefit to the organisation, especially in this knowledge society where many employees require constant training to keep up to date with new technologies and processes. This is also a benefit to universities as it allows them access to a vast amount of information and knowledge of the company which can assist and be used by members of the university to further their own research, which can, in turn, be reapplied to the organisation to make it better.

Another application of KM in a university is given by Boling et al. (2000) and Tan et al. (2003), which is the use of knowledge repositories or a knowledge base. Tan et al. (2003) also describe the issues of a help desk for a business school at an Australian university. A help desk's role is to support staff and students who need help with technology. Boling et al. (2000) discuss the use of a knowledge base at Indiana University which contains 6000 answers to commonly asked questions all in a web accessible database. The use of such technologies are of great benefit to a university.

They assist in refining help processes and reduce the workload of technology support personnel. Having a knowledge base reduces the number of help requests for technical support, and at the same time, keeps all information vital to the support personnel in the one place. Such a service reduces administrative time. When staff find new solutions to new problems, other members of the support unit can have instant access to the solution, reducing bottle necks in accessing information and knowledge. This type of use of KM is, of course, of great benefit to universities whether it be a local support group within the faculty or an organisation-wide repository, with one support group managing the whole institution, or a combination of faculty support groups.

This section has made the argument that some organisations are more knowledge intensive than others. The examples given are predominantly organisations which employ professionals e.g. accountants, medical practitioners, lawyers and academics. This raises two questions: are there differences in the way these knowledge intensive organisations operate, and, if so, do these differences affect the way that KM should be adopted in knowledge intensive organisations. The following section seeks to address the first of these two questions.

2.3 The Structure of Organisations

Organisations come in different shapes and sizes. They cross a wide variety of different disciplines and industries, and can employ from one to hundreds of thousands of employees and managers. They could be only a few days in existence or have been a leader in their industry for decades; they can be standalone organizations or a collection of smaller organizations, they can exist entirely in one country or span the globe.

Clearly, not all organisations are the same, as confirmed by the work of Henry Mintzberg (1979).

2.3.1 Mintzberg's Organisational Structure Theory

The literature produced by Mintzberg on the structure of organizations spans several decades and shows that all organizations are not the same, that, in fact, they differ in many aspects both internally and externally. In his book 'The structure of organizations' Mintzberg (1979), describes how the literature on organisational structure evolved, due to the work of Burns and Stalker and also Lawrence and Lorsch to mention a few, to show that there was no "one best way" (Mintzberg, 1979) to structure an organization. In fact, there were many factors that contributed to the success of an organization including how these factors interrelate with each other. Later in his work he sums all this up by describing how the "one best way" had dictated the way people viewed organisational structure into thinking there was a right and a wrong way to devise and structure an organization (Mintzberg, 1995).

Mintzberg's (1979) research has identified six basic elements that constitute an organisation: the Strategic Apex, the Middle Line, the Operating Core, the Technostructure, the Support Staff and the Ideology (Mintzberg, 1995). Figure 2-4 shows how the basic organisation is structured and how each of the six elements are related. The Strategic Apex is the top of the organisation and refers to executives and the managers who oversee the organisation and are responsible for strategic direction (Mintzberg, 1995). Below the Strategic Apex is the Middle Line - the members of the organisation who are responsible for the management of the relationship between the Strategic Apex and Operating Core. The Operating Core refers to the members of the

organisation who perform the basic work of the organisation, either delivering the service or manufacturing the product of the organisation (Mintzberg, 1995). The Technostructure refers to a group outside the Main Line of authority whose main role is to formally control the work of others. Also outside the Main Line of authority is the Support Staff who provide internal services to the organisation to assist others such as the Operating Core. These roles often include such tasks as the mailroom or legal council (Mintzberg, 1995). Lastly there is the Ideology, which refers to the “culture” of the organisation and incorporates the traditions, beliefs and organisational norms that differentiate on organisation from another (Mintzberg, 1995).

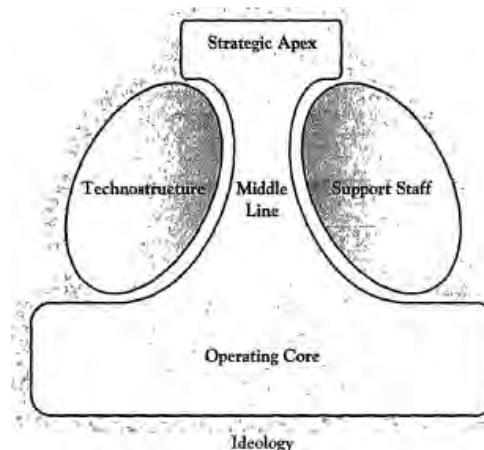


Figure 2-4 The 6 basic parts of an organisation (Mintzberg, 1995, pp332).

The combination of these six elements makes up most organisations. It is the interaction of these elements that creates differences in organisations. Although Mintzberg (1995) believed each organisation was unique, he also observed that many organisations shared similar “configurations” which he classified as Entrepreneurial, Machine and Professional, Diversified, Missionary and Political.

Mintzberg (1995) outlines several different configurations that can arise in the make up of an organisation. Each of the different configurations is derived from the way the different organisational elements (discussed previously) of the organisation interact with each other. Shown in Figure 2-5 through to Figure 2-10 (Mintzberg, 1995, pp344-349) graphically represent different arrangements of the organisational elements in different configurations.

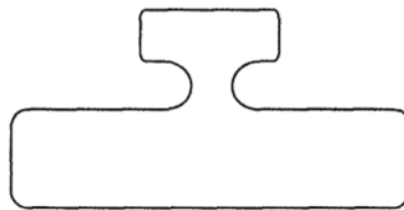


Figure 2-5 Entrepreneurial Configuration

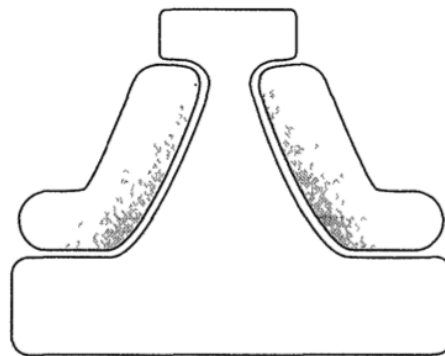


Figure 2-6 Machine Configuration

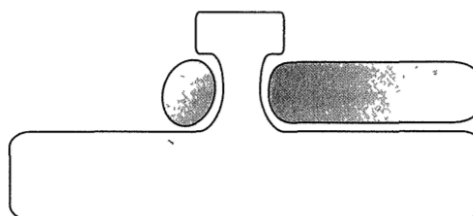


Figure 2-7 Professional Configuration

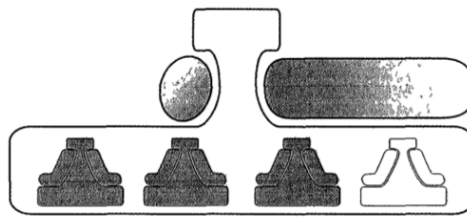


Figure 2-8 Diversified Configuration

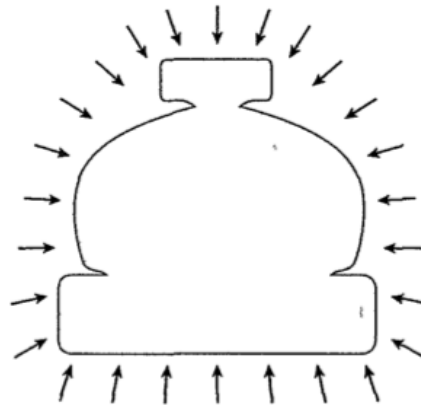


Figure 2-9 Missionary Configuration

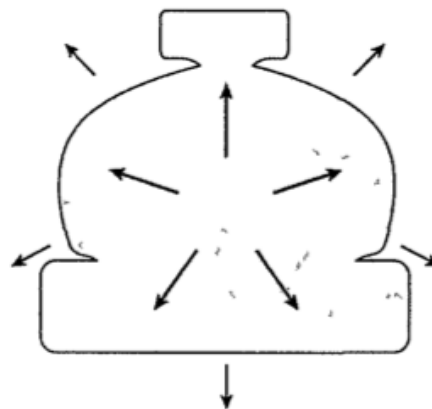


Figure 2-10 Political Configuration

Mintzberg (1995) describes the Entrepreneurial organisation as being like the start up dot com companies of today; they are simple in structure, have a few top managers and little of the organisational behaviour is formalised. This differs from the Machine organisation, which according to Mintzberg (1995) is the offspring of the Industrial Revolution. It contains a large technostructure and many middle managers and is

derived from organisations that have highly standardised work. This combined with the Diversified organisation make up many of today's organisations. Mintzberg (1995) describes the Diversified organisation as being made up of 'Divisions' in the middle line, and each division has its own structure. Unlike the others, the Professional organisation is more concerned with the standardisation of skills rather than work, thereby distinguishing itself from the Machine organisation (Mintzberg, 1995). The Professional organisation relies on highly-trained highly-specialised professionals who have considerable control over their own work. So, unlike the other configurations of organisations, the power over many of the decisions in regards to operating and strategic decisions flows all the way down to the bottom of the organisational hierarchy into the operating core (Mintzberg, 1995). Above the operating core there is a very unique structure to the Professional Organisation. Due to the fact that the professionals work so independently there is little need for a technostructure, but the support staff is typically very large, needed to assist the professionals with their work (Mintzberg, 1995). Also the Professional organisational units can be quite large due to the independence of the professionals, and there are usually few middle line managers in the organisation (Mintzberg, 1995). As Mintzberg states "The Professional organization is called for whenever an organization finds itself in an environment that is stable yet complex. Complexity requires decentralization to highly trained individuals, and stability enables them to apply standardized skills and so to work with a good deal of autonomy" (Mintzberg, 1995, pp346). Examples of professional organisations are universities, hospitals or law firms. A summary of these configurations, highlighting their major differences, can be found below in Figure 2-11.

CONFIGURATION	PRIME COORDINATING MECHANISM	KEY PART OF ORGANIZATION	TYPE OF DECENTRALIZATION
Entrepreneurial organization	Direct Supervision	Strategic apex	Vertical and horizontal centralization
Machine organization	Standardization of work processes	Technostructure	Limited horizontal decentralization
Professional organization	Standardization of skills	Operating core	Horizontal decentralization
Diversified organization	Standardization of outputs	Middle line	Limited vertical decentralization
Innovative organization	Mutual adjustment	Support staff	Selected decentralization
Missionary organization	Standardization of norms	Ideology	Decentralization
Political organization	None	None	Varies

Figure 2-11 Outline of Different Organisational Styles (Mintzberg, 1995, pp343)

2.3.2 Conclusion

Now, if there is no “one best way” (Mintzberg, 1995) to structure an organisation, the conclusion could be reached that there is no “one best way” to conduct KM in an organisation. The fact that organisations are internally different would affect the way in which KM would be deployed within an organisation. With much of the KM literature referring to more traditional organisational structure types like Mintzberg’s Machine organisation, there is little research into KM in a Professional organisation, where the Operating Core of the organisation are more empowered due to the nature of the organisation.

2.4 Selecting an Approach to KM in Professional Organisations

The KM literature contains an abundance of models and theoretical bases for using, deploying, developing and implementing KM systems in an organisation. Baskerville and Dulipovici (2006) discuss how the field of knowledge management is building on theoretical foundations from many different disciplines, including information economics, strategic management, organizational culture, organizational behavior,

organizational structure, artificial intelligence, quality management, and organizational performance measurement. Theories from all these disciplines are being used as foundations for new perceptions that provide a rationale for managing knowledge in an organisation (Baskerville and Dulipovici, 2006). Baskerville and Dulipovici (2006) state that, based “on articles published between 1995 and 2005, new concepts are emerging, including knowledge economy, knowledge alliance, knowledge culture, knowledge organization, knowledge infrastructure, and knowledge equity. An analysis of the theoretical foundations of knowledge management reveals a healthy arena with a strong foundation and clear directions for future work” (Baskerville and Dulipovici, 2006). These can include theories such as “emergent” KM versus “planned” KM, as mentioned in Gao et al. (2002), Maguire et al. (2007), and Sunassee and Sewry (2002), among others.

For the purpose of this study an approach needed to be identified and observed in a real world situation within a professional organisation to see its effectiveness. After a review of many of the previously mentioned theories, the approach chosen was a KM approach recommended for use in a law firm. It was chosen as it was an approach recommended for a professional organisation, which is the focus of the current research.

Rusanow (2003) describes three approaches in which KM can be implemented into a law firm and, by extension, a professional organisation. These three approaches are:

- Centralised
- Decentralised
- Hybrid

The centralised approach involves “establishing a centralized knowledge management function that directs all knowledge management initiatives” (Rusanow, 2003, p147). This approach is designed to allow for a cost effective and consistent development of systems helping to eliminate duplication of tools within the organisation (Rusanow, 2003). However, this approach does not take into account that different business units or specialist functions within the organisation may have different knowledge needs. A centralised approach will, therefore, force them to fit into a general system which can cause frustration and problems (Rusanow, 2003).

In the second approach, the decentralised approach, individual or separate groups are “able to pursue knowledge management initiatives without an overarching firm-wide strategy” (Rusanow, 2003, p148). However, Rusanow states that this approach can lead to duplication with regards to the development of systems and result in lost opportunity for best practices across the organisation (Rusanow, 2003). The third approach, the hybrid approach, is referred to by Rusanow as the ‘best practice approach’. It is a combination of the previous two approaches where the organisation “sets the direction for knowledge management and provides an infrastructure to facilitate knowledge management among practice groups” (Rusanow, 2003, p148). Rusanow (2003) describes how one of these approaches should be adopted.

This research aims to investigate how each of these approaches works and whether an organisation should use one of these approaches or whether an organisation can use different approaches in different circumstances. This the research will investigate this through qualitative research using techniques and methods such as case studies, grounded theory and issues analysis.

2.5 Conclusion

This chapter has reviewed the literature on KM and BI and has found that the process of deploying KM within an organisation, or within a single unit in an organisation is a complex task. While KM technologies have developed to a state of sophistication, the problems associated with KM initiatives are largely social and organisational, depending on the culture and structure of the organisation. The work of Mintzberg has shown that organisations typically adopt one of six common configurations: Entrepreneurial, Machine, Diversified, Professional, Missionary and Political. This raises the question: does KM operate in the same way in all six of these structures? Certainly, the KM literature does not appear to address this question. In fact, most of the KM literature focuses on the Machine or Diversified organisations, predominantly in the IT, mining and manufacturing sectors. One organisational configuration which, surprisingly is not well represented in the KM literature, is the Professional Organisation, such as a university. This is strange because Professional organisations are typically knowledge intensive. The final section of the literature review presents 3 approaches to KM that might be appropriate in Professional organisations. This leaves us with the research question, which of those 3 approaches would be most appropriate for a Professional organisation?

To answer this question, the following objectives must be met:

- Identify an appropriate Professional organisation where KM is being developed using a variety of approaches
- Compare and contrast the effectiveness of these approaches
- Provide guidelines for the selection of appropriate approaches to KM development and deployment in professional organisations

The next chapter presents the methodology that was used to achieve these objectives and thereby answer the research question.

Chapter 3: Methodology

3.1 Introduction

The analysis of the literature in the previous chapter shows that there is a gap in regards to research into KM in professional organisations and how it is conducted. To date, the majority of the literature has focused on the traditional style of organisations or emerging or entrepreneurial organisations. This could be due to the style of the organisation being about making money and increasing profits. However, with professional organisations, many are found to be not-for-profit or government-funded such as public hospitals and universities (while this is not always true, as private medical practices and law firms are also professional organisations). KM can benefit these knowledge rich organisations by helping reduce costs and improve business practices. So, to assist this type of organisation, research was conducted to analyse different approaches to developing and implementing KM and the ways that it can benefit professional organisations.

The aim of this chapter is to describe the research methodology that was used to conduct this research. It discusses the methods used to record the experiences of the case studies in developing their KM projects, identify the issues that were faced by three organisation during the time the projects were in operation, critically evaluate the approaches used by the organisation and the projects themselves, asses the viability of these approaches in KM development within professional organisations, and establish guidelines for the use of KM within professional organisations based on the issues identified.

This chapter will start by discussing the research goals which will be followed by a discussion of the research methods chosen for the purpose of this study. It will discuss why these specific methods were chosen as a methodology from the diverse methods available in Information Systems research. It will then discuss the best qualitative research methods identified for this study for gathering the required data for issues analysis.

3.2 Research Goals

As stated in section 1.2 (Background To The Research), this research explores the issues associated with Knowledge Management adoption in professional organisations.

The three goals of this research are to:

- Identify an appropriate professional organisation where KM is being developed using a variety of approaches
- Compare and contrast the effectiveness of these approaches
- Provide guidelines for the selection of appropriate approaches to KM development and deployment in professional organisations

The following section describes how these research goals were addressed.

3.3 Consideration of Broad Approaches

When looking at the many research frameworks that exist for Information Systems research, careful choice was taken when formalising the methodology for this particular study. While several structured research frameworks were considered, such as March and Smith (1995), it was deemed that these focused more on the technology being

created and less on the issues being faced by the organisation during the development and deployment processes. This is why the current research combined some of the Information Systems methods with grounded theory to ensure that both the technological and the organisational aspects of the research are covered. The resulting methodology was qualitative in nature.

3.4 Qualitative Research

Qualitative research can be described as being conducted “through an intense and/or prolonged contact with a “field” or life situation. These situations are typically “banal” or normal ones, reflective of the everyday life of individuals, groups, societies, and organizations” (Miles and Huberman, 1994, pp6).

Over the last several decades (Creswell, 2003), qualitative research has developed as a research approach used to capture a holistic view of the context or social phenomena being studied, including its rules and structures. Instead of focusing on minuscule details or measurable elements of a situation, its purpose is to present a broader overview that describes the ‘full picture’(Miles and Huberman, 1994). To allow all necessary information to be collected in adequate detail, qualitative research is typically conducted over an prolonged period of time (Miles and Huberman, 1994). The current research involved the evaluation of three KM projects over a five-year period.

Across most qualitative research projects, there are many features that are similar. Preserving the original form of all materials collected throughout the research is essential. Concepts or themes can be identified from the collected data, and these can then be reviewed with participants (Miles and Huberman, 1994). The interpretations of

the research data and the identified themes and concepts, are all determined by the researchers. The most appropriate of these interpretations, themes and concepts may be identified by considering theoretical background and/or internal consistency. It is essential however, when interpreting qualitative research data, to recognise the role of the researcher's 'personal lens', and to acknowledge relevant biases that may arise from this (Miles and Huberman, 1994, Creswell, 2003). Qualitative data is organised, compared, contrasted, and analysed using recurring words and themes identified by the researcher, which requires complex reasoning. There is a necessity in qualitative research for the data collection and analysis processes to be iterative, which can lead to reformulation of the problem analysed (Miles and Huberman, 1994, Creswell, 2003). In the early stages of any qualitative research study, there is little standardised instrumentation used. The researcher is solely responsible for responding to data gathered, and modifying the data collection approaches as a result (Miles and Huberman, 1994, Creswell, 2003).

Using a pragmatic theoretical perspective, the social, political and historical contexts (Creswell, 2003) of the 3 KM projects could be understood and considered when generating theories about the projects. Pragmatic theoretical research is concerned with finding 'what works', and identifying solutions to realistic problems (Chow, 1987). By focusing on the problem, the researcher is able to select any suitable method to understand and analyse the problem (Creswell, 2003). The array of data analysis techniques used, with detailed description of the process undertaken to analyse the range of data collected in this research are described later in this chapter.

3.4.1 Multi-methodological Research

A multi-methodological approach is one which utilises a variety of research methods in a single study (Chow, 1987). It is also described as the “third methodological movement” (Tashakkori and Teddlie, 2003), deriving from a need to bridge the gap between qualitative and quantitative approaches. One of the benefits of using a multi-methodological approach to research is the opportunity to diminish the limitations of either the qualitative or quantitative method. This is confirmed by Creswell (2003, pp15) who states “biases inherent in any single method could neutralize or cancel the biases of other methods”. Often, the multiple methods approach is used to address the numerous or diverse goals of the research. These methods are interactive, allowing the participants to give their views directly to the researcher (Tashakkori and Teddlie, 2003, Miles and Huberman, 1994, Creswell, 2003). The approach of obtaining data from multiple sources using multiple methods, which allows the data to be combined, compared and verified, was determined to be the most effective method for evaluating the 3 KM projects, in the current study (Tashakkori and Teddlie, 2003, Eisenhardt, 1989).

This research uses a multi-methodological approach so that data can be captured from a mixture of sources, supported by “the triangulation made possible by multiple data collection methods provides stronger substantiation of constructs and hypotheses” (Eisenhardt, 1989, pp538). Creswell’s (2003) research has also found that results from one method can be used to inform the function or results of another. Through the use of several data collection methods, this research collected material from a variety of sources across the three case studies, which is essential when studying a rich field of data. (For example, it was necessary to evaluate documentary data using a different

method than the methods that were used to evaluate the opinions of people gained through face to face interviews.)

3.4.2 Qualitative Research Methods

Qualitative methods were “developed in the social sciences to enable researchers to study social and cultural phenomena” (Myers, 2008, pp8), and allow the researcher to use many different data sources. The goal of qualitative research is “understanding issues or particular situations by investigating the perspective and behavior of the people in these situations and the context within which they act” (Kaplan and Maxwell, 2005, pp30). The advantage of qualitative research methods over quantitative methods is that they allow the researcher to understand the individuals and situations within their social and institutional contexts (Kaplan and Maxwell, 1994).

It is recommended that a variety of methods and techniques are used to capture the richness of these KM projects (Morse et al., 2009). Qualitative methods include observation, open-ended questioning, interviews, surveys, focus groups, participant observation, electronic discussions, case studies, site visits, stakeholder analysis, pre/post testing, content analysis and documentary analysis (Morse et al., 2009, Creswell, 2003, Kaplan and Maxwell, 2005, Eisenhardt, 1989). Documents to be used in documentary analysis can include published and unpublished documents, archival data, audiovisual data, images, company reports, private communications such as email and instant messaging, and newspaper articles (Creswell, 2003, Eisenhardt, 1989). Many of these methods are used in the researcher developing an understanding of the ‘inside’ perceptions of the individuals included, and these perceptions can only be captured through the consideration of the individuals’ speech and behavior and an

ability by the researcher to shelve their preconceptions while interacting with the individuals taking part in the research (Miles and Huberman, 1994).

It is customary in qualitative research distinguish between the primary and secondary data sources. Primary sources are those gathered by the researcher directly from the organisation or individual, and these are characteristically unpublished (Creswell, 2003). Secondary data sources are previously published materials (Creswell, 2003). This research depends greatly on primary sources to collect ‘real life’ data about the experiences of the KM projects, with only a limited number of secondary data sources gathered and used.

Section 3.5 describes the selection of a suitable research approach, with techniques that were considered to be complementary with the research goals specified in section 3.2, and the conduct of qualitative research.

3.5 Case Study Approach

As stated by Walsham (1995), many authors have shown that interpretive case studies, if performed and written up properly can make a valuable contribution to IS research. For the purpose of this research the term case study will be used to describe any one of three KM projects. Eisenhardt (1989, pp534) states that “The case study is a research strategy which focuses on understanding the dynamics present within single settings” and that “Moreover, case studies can employ an embedded design, that is, multiple levels of analysis within a single study”. Eisenhardt (1989, pp534) goes on to state that “Case studies can involve either single or multiple cases, and numerous levels of analysis”. Multiple cases can be chosen either randomly or, as Sofaer (1999) states,

purposively to meet some predetermined requirements. Sofaer (1999) also states that case studies not only have the purpose of examining the site, but also the purpose of examining the informants and their experiences. This is why this approach was chosen to achieve the intended research goals.

3.6 Grounded Theory Approach

A grounded theory approach was applied throughout the collection and analysis of the data in this research. As stated in Morse et al (2009, p19), “Grounded theory is a way of thinking about data – processes of conceptualization – of theorizing from data, so that the end result is a theory that a scientist produces from data collected by interviewing and observing everyday life”. The use of grounded theory allowed the researcher to organise and model the data from the three case studies “in particular ways as demanded by the research question, situation, and participants for whom the research is being conducted” (Morse et al., 2009, p14). This meant that by using grounded theory all representations of the experiences, and the theories derived from them, are based on information provided by the individuals participating in the case studies (Creswell, 2003). The value of using a grounded theory approach can be seen through its development over the last four decades from initial use in health research into many other social science disciplines, to the point where it may now be the most commonly used qualitative research approach (Morse et al., 2009).

Grounded theory researchers focus on the need for ‘real’ data and evaluation through observation and anecdotal evidence of user behaviour (Morse et al., 2009); the application of grounded theory to case study research allows this ‘real’ data collection and analysis to be achieved.

Strauss and Corbin (1998) suggest that Charmaz's list of criteria for evaluating grounded theory is comprehensive. Charmaz classifies four categories of criteria which are used to evaluate the scientific and the creative aspects of conducting grounded theory, these are: credibility, originality, resonance and usefulness. Strauss and Corbin (1998) believe that the ability of the researcher to capture a broad range of observations in the categories listed above, the ability to present new insights, and the interpretation of the collected data in a way that can be used in 'everyday worlds' are the key indications of high quality grounded theory research. This research will aim to do just that, producing lessons that can be applied to real KM projects in professional organisations.

3.6.1 Grounded Theory Use in Information Systems Research

Grounded theory is grounded in the social sciences (Morse et al., 2009), but has been used in various fields of research including Information Systems and Nursing. A noticeable application of grounded theory methods in Information Systems research is that of Urquhart and Fernandez (2006). This research was substantial because it successfully implemented a recently developed research approach (referred to as grounded theory building research), demonstrating a relevance and rigor, which satisfied the expectations of other Information Systems researchers.

Prior to the work of Urquhart and Fernandez in the development and acceptance of grounded theory building research, Robey and Markus's (1998) three research models for achieving rigor and relevance in Information Systems research were used. These research models were developed in response to problems experienced by Information Systems researchers when endeavoring to conduct research that is relevant to real world practice but still satisfies the academic rigor expected by IS researchers (Robey and Markus, 1998). Also noted by Robey and Markus (1998) when developing the three models, was the

connection between Information Systems research practices and social science research practices. The first of the three models, applied theory, takes real world problems that are relevant to current organisations, and considers them in relation to established theory of the time. The second model, evaluation research aims to achieve a balance between the theory and the real world practice, by evaluating an intervention (in this research's case three similar projects) based on specific objectives (the three approaches). The final model, policy research, concentrates on a problem in need of a solution with the aim of understanding the policymaking process.

Additional development by Fernandez and Lehmann (2005) on research models for achieving rigor and relevance in Information Systems research led to the proposal of grounded theory building research. While Robey and Markus' (1998) three models are widely accepted in Information Systems research, they do involve some preconceptions about the cases under assessment by the researcher. These preconceptions have the capacity to reduce the relevance of the academic research to practitioners. Therefore the selection of grounded theory for this research minimises these preconceptions when evaluating the data collected, and therefore, aids in generating results that are both applicable to practitioners and academics.

3.6.2 Case Study Research and Grounded Theory

Appropriate implementations of grounded theory, were first published in 1967 by Glaser and Strauss, and have been broadly discussed in academic literature (Morse et al., 2009). While its common throughout the literature that the grounded theory approach studies "actors in their context" (Leahman and Fernandez, 2007), the process for this research is not highly standardised (Morse et al., 2009). Morse et al (2009) consider grounded theory to be a adaptable and that it can not be used in a 'cookbook'

or formulaic way. As it is widely used by different people in different disciplines, people will be collecting different data sources in different ways, with data types including traditional observation and interview data, images, non-verbal material, and technical detail. Collectively, all these data elements will form a body of text. This body forms the basis for conceptualisation and theory building. A grounded theory approach implies both an inductive and deductive logic within the research (Morse et al., 2009). Inductive reasoning is employed to create theories within the research, as the theories arise after the data collection begins. Once the collected data has been coded, the researcher can then apply deductive logic to conceptually establish the data collection necessary to generate further theory from the research.

In traditional grounded theory, theory building entails theorising about interactions between individual people. Lehmann and Fernandez's (2007) research considers the application of grounded theory to the discipline of Information Systems and maintains that it is "essential to extend this focus to the interaction between groups of people and organisations, typically in the form of case studies" (Leahman and Fernandez, 2007). This research by Lehmann and Fernandez's (2007) is formative work in addressing the application of grounded theory to case study research.

As explained in Section 3.5 of this chapter, this research used a case study approach. A comparison (Leahman and Fernandez, 2007) of Glaser and Strauss' guidelines for grounded theory research (requiring elements such as 'add data until theoretical saturation', 'establishing relationships between categories', and 'theoretical sampling determines multiple cases') and Yin's conventional case study method (needing elements such as 'multiple sources of evidence', and 'replication logic in multiple

cases’) observed that most of the differences between the two approaches related to the terminology used. It was determined by Lehmann and Fernandez’s (2007) that the use of grounded theory in a case study approach was therefore capable of generating “good theory”. This is also confirmed by the work of Morse et al (2009).

When applied to the current research, with three distinct case studies (see Chapters 4-6), the application of grounded theory to case study research involved:

- Intra-case sampling – continuing analysis of data in each single case study until new data no longer adds to the understanding of that individual case
- Inter-case sampling – the theoretical frameworks developed from the intra-case sampling (outlined above) are evaluated for ‘saturation’, this is to certify that all theories related to the developed theoretical frameworks are complete as possible, based on all the data collected from all the case studies (Leahman and Fernandez, 2007).

Lehmann and Fernandez (2007) established a set of detailed steps for the application of grounded theory to case study research, and the deliverable each of these steps produced. This process is presented in Table 3.1.

Table 3.1 Grounded Theory Method for Case Studies: Detailed steps (Leahman and Fernandez, 2007)

<i>Analysis Steps</i>	<i>Results and Deliverables</i>
1. 'Open' Coding of 'incidents' in the interview transcripts and supporting documents, the 'texts'	Basic, 'raw' categories and properties
2. Assembling the network of individual texts, i.e. writing the 'story' of the case	Case history/story
3. Using the 'story' for reviewing, refining and collapsing the basic categories, based on uniform and/or overlapping properties; merging raw categories into families of 'substantive' categories and further reducing these to 'core' categories	Hierarchy of 'core' categories embracing 'substantive' categories, formed from 'raw' categories
4. 'Theoretical' Coding of the case 'story' for 'relations' between core categories; this is for the case in hand, although the categories and relations from previous cases are used in constant comparison	Identifying main interactive categories; distinction between primary and secondary interaction; identifying direction of linkages; defining the specific nature of each interaction
5. Establishing and refining categories and their linkages	Models of the interaction of all categories, in groups and <i>in toto</i> , and preliminary theory write-up of descriptions and propositions
6. Comparing between cases, 'stories' as well as individual 'texts'	Establishing the differences between the cases, by contrasting the case in hand with each of the previous cases in turn
7. Establishing and refining the theoretically relevant differences between the cases	Distilling and new, 'derived' categories and relationship 'constructs' from the comparative analysis
8. Distilling theory elements from both the case in hand and from the comparative analysis	Theorems and propositions, forming the 'nth-generation' of the (provisional) Theoretical Framework
9. 'Densifying' the (provisional) Theoretical Framework by comparison with its previous 'generation'	Revised 'nth-generation' (provisional) Theoretical Framework
10. Delimiting and 'axiomatising' the last generation (provisional) Theoretical Framework	Final Substantive Theory

While this presents the idea as a simple linear procedure, Lehmann and Fernandez (2007) stress that the spiral nature of the grounded theory method is one of 'research in action'. One of the key philosophies expressed by Lehmann and Fernandez (2007) is the hierarchical relationship between texts (as the basic building blocks), case stories, viewing all of the case stories as a whole, and theory building as the ultimate goal.

3.7 Emerging Issues Analysis

Using a grounded theory approach this research aimed to identify problems encountered during each of the case studies. To do this, it based the analysis on the concepts used in emerging issues analysis outlined in the work of Molitor (1977). Inayatullah (1998) describes emerging issues analysis as “a method which identifies issues before they reach the trend or problem phase. It makes the assumption that issues follow an s-pattern growth curve from emerging to trend to problem” (Inayatullah, 1998, pp827). Based on this definition, problems encountered in each of the case studies will be called issues.

Unlike trend analysis, which involves looking at issues which are, or are about to become ‘mainstream’ (shown in Figure 3-1), emerging issues analysis involves identifying possible trends. These possible trends are located in the ‘Innovators’ stage of the s-pattern (shown in Figure 3-1) or the beginning of the s-curve. Emerging trend analysis is useful when the researcher does not have enough data to conduct a traditional trend analysis. Figure 3-1 shows a graphical representation of the s-pattern being discussed, and where emerging issues fall on this s-pattern. The figure is taken from work by Futures (2011), but is based on the work by Molitor (1977), who established the concept of emerging issues analysis.

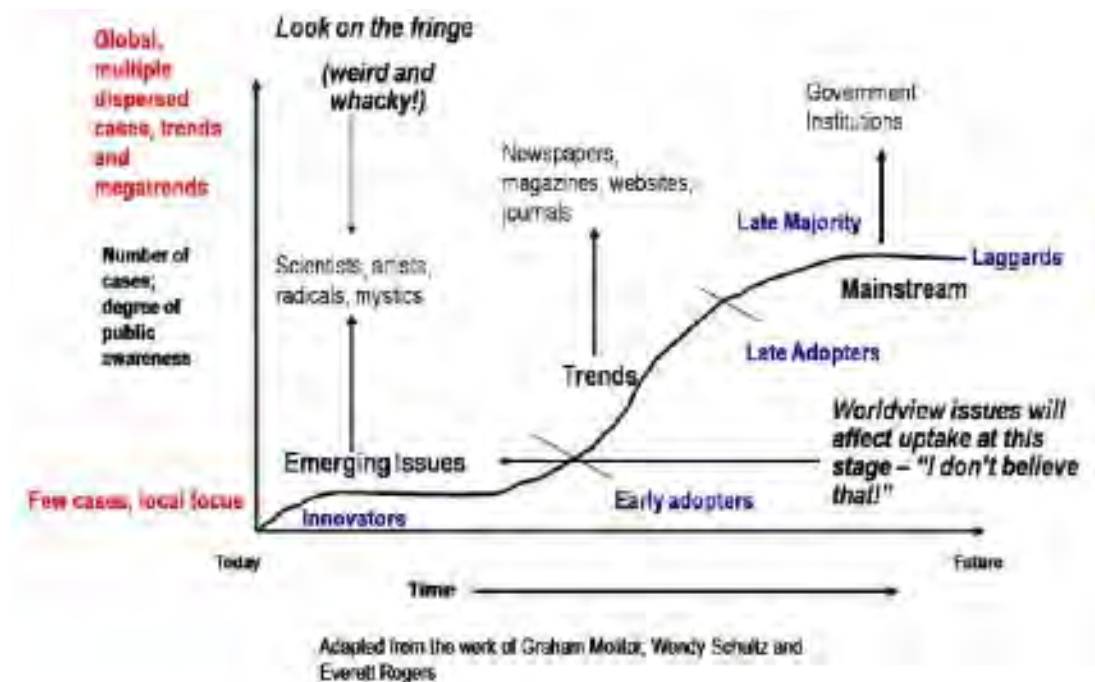


Figure 3-1 Life cycle of a trend (Thinking Futures, 2011)

Issue identification in emerging issues analysis is based on experience and observation. When a particular issue is observed, it is noted and future instances of this issue are investigated by the researcher (Thinking Futures, 2011). This process, (initial issue identification) was applied in this research. As portrayed in grounded theory, all ‘issues’ were documented. Then as each individual case study continued, when a repetition of identical or significantly similar incidents was identified, these issues were further investigated. These issues are highlighted throughout Chapters 4-6 and discussed in more detail in Chapter 7.

3.8 Data Collection and Sources

Due to the nature of case study research, as described in section 3.5, several different data collection methods were used over a 5 year period to provide the most comprehensive picture in each of the three case studies. The benefit of the qualitative multi-method style that this research has adopted is that it is not focused on the quantity

of the data needed to draw conclusions, but the data's diversity and the opportunity for comparison this diversity presents (Brewer and Hunter, 2006). When discussing data collection in multi-method research Brewer and Hunter (2006, pp64) state that it is "a selective process to be controlled primarily by the researcher's theoretical formulation of the problem and only secondarily by methodology". They claim that just because there are many different ways to collect data in a multi-method approach to research, there is not a need to employ all methods every time research is conducted (Brewer and Hunter, 2006). Instead they state that the choice of methods and how many of them are used, depends instead entirely on what information and data is needed to "shed light" on the problem being investigated (Brewer and Hunter, 2006). Based on this, the researcher has selected the four following methods to collect data in all three of the case studies as they are the best methods in gaining the type of data needed to answer the research goals. These methods are Interview, Observation, Informal Communication and Documentation.

3.8.1 Interviews

Interviews were chosen as they are a common method used in data collection in qualitative research. This is shown in the article by Sofaer (1999), who discusses the importance of qualitative methods in health services research (health services being another form of professional organisation). Sofaer (1999) highlights that one of the commonly used methods in case study research are "key informant interviews". It is stated that these interviews can vary from unstructured to highly structured, however, generally the questions in the interview remain open-ended (Sofaer, 1999). By this the author means that, while there is typically a list of questions to be asked, these are used

as “probes” but the interviewee is allowed to guide the path of the interview based on their answers (Sofaer, 1999).

In following this method, “key informants” were identified in each of the case studies and semi-structured interviews were conducted to gain a richer picture of the case studies. Notes were taken in each of the interviews to assist in identifying the important information and where possible digital recordings were taken so they could support the notes taken. In the decentralised case study (chapter 4) the person in charge of the project and the lead programmer were interviewed together to give an account of the entire project. In the hybrid case study (chapter 5), interviews were conducted with the programming teams, the head of the unit and the University’s technology support unit. In the centralised case study (chapter 6), interviews were conducted with both project managers, and several members of the operating core.

3.8.2 Observation

The article by Sofaer (1999) highlights how observation is also important in case study research. Sofaer (1999) explains how one of the “purest” forms of qualitative research, naturalistic inquiry, involves a long term exposure to someone or something in which the investigator makes notes on unstructured observations and conversations they have had with those being observed. The author also discusses a subset of this method known as “participant observation” where the researcher becomes part of the process or setting being studied (Sofaer, 1999). The article concedes that for “those steeped in the Cartesian duality between observer and observed, this approach is indeed hard to fathom” (Sofaer, 1999, pp1109). However, as Sofaer (1999) explains, in many instances it can be nearly impossible to get sufficient access to the needed data without becoming

a participant. Therefore in order to gain the richest experience and the best data possible for this research, “participant observation” was used in all 3 case studies.

3.8.3 Informal Communication

The researcher used analysis of emails, informal meetings, training documentation and informal discussions with project team members to help enhance understanding of the processes and problems faced by each of the project teams during their development of their respective projects. This included interactions from project managers, administrative staff, training staff, programmers and respective project team members.

3.8.4 Document Analysis

Sometimes referred to as content analysis, document analysis can also vary in its use and application (Sofaer, 1999), depending on the purpose of the information needed. Documents can be analysed in order to identify the “facts” of a series of events or a certain situation or, alternatively the focus can be more on the meaning embedded within the context of the document (Sofaer, 1999). The latter often involves the identification of assumptions, values and priorities and helps to identify differences in perceptions of similar events (Sofaer, 1999).

In the context of this research document analysis was used for both of the purposes described in the previous paragraph. Analysis of reports for planning of systems and usability were examined to establish issues faced by the project groups, as well as gauge the difference in opinion of different factions of the project group and the organisation in regards to many similar issues that occurred during the course of the case study.

3.9 Selecting An Appropriate Professional Organisation

The first of the research goals to be addressed was the selection of an appropriate professional organisation in which to conduct the research (research goal i). To do this, a variety of professional organisations were considered with the aim of finding one that would allow observation of the development of KM projects through several different approaches. There were several issues to be taken into account when selecting the organisation. First was access to the projects. The organisation would have to be willing to allow the researcher to observe and document the processes and things undertaken through the course of the project. The organisation would have to be big enough that different areas of the organisation would be using different approaches to implement KM into their practices. The organisation would have to be actively pursuing KM initiatives of their own accord and the initiatives would have to be significant enough that they would impact on the operating core. Lastly the KM projects would have to be conducted at similar times in order to allow for a suitable time frame for the research to be conducted.

When selecting the organisation, a short list of the types of organisations was drawn up that would suit both the style and size required. These included:

- A medium sized medical practice
- A medium sized law firm
- A regional sized University
- A small hospital
- A medium sized age care facility

It was determined for the purpose of the research that a large university, medical practice or law firm would be too difficult to track projects through all facets of the organisation. Of the five choices on the short list, one of them stood out for a significant reason. The university was unlike the other four choices as it was the only one that did not contain large amounts of highly confidential data. While universities do have confidential data, it is not as central to the core business processes as it is with medical practices and patient records or law firms and their clients' cases. With the ethical issues associated with confidential data, there was the possibility that problems in regards to the observation of projects and reporting of issues within the research, therefore it was deemed the university would be the best choice as it was more likely that these issues would not present themselves as often.

Given the stereotypical view of a university as “an ivory tower”, a university might appear atypical of professional organisations. This is far from the truth, as the following description of the selected organisations complex set of stakeholders and trading partners. For example, the selected university has a campus in Dubai, and teaches programs for partner institutions in China, Singapore, Malaysia and Indonesia. The integration and reporting required to the government each year demonstrates a need for KM related data capture and systems in the organisation and the knowledge that can be gained through these systems allows them to compete on the global marketplace that higher education has become.

This organisation also has many stakeholders such as research partners like BHP, the Australian Research Council (ARC) and the Excellence in Research Australia (ERA) which is the body that has taken over from the now defunct RQF discussed in chapter 6.

The new medical school has relationships with many health care providers in which its students perform clinical placements, and even has trading partners like the Port of Singapore for which the EmLab team developed software. Each of these partners or stakeholders require different levels of reporting and in return supplies the organisation with valuable information which can be captured and turned into organisational knowledge to increase competitive advantage.

3.10 Evaluating the Different Organisational Approaches

Now a suitable sized university had to be chosen. Several universities of similar size were investigated to find possible candidates and one was chosen in which the research would be conducted. An investigation was conducted to determine if KM projects were being undertaken in the organisation. Two projects were identified in separate business units that were constructing similar KM systems and were being done so in a similar fashion to two of the approaches described by Rusanow (2003) in the literature, i.e. a decentralised and a hybrid approach. These case studies were deemed to be KM as they satisfy the working definition of KM used in this research (see section 2.2.3). The case study projects satisfy Davenport and Prusak's (1997) third aim of having the purpose to build an infrastructure, not only a technical system, but a web of connections among people given space, time, tools, and encouragement to collaborate.

These two case studies were undertaken and at the same time a third case study was sought to complete the analysis of the three approaches. One presented itself when the university announced it was also building a system similar to the other two case studies using a centralised approach, which was used as the third and final case study. Data for the research would be collected between 2005 and 2010.

One of the issues that will arise when undertaking 3 case studies at different levels within the same organisation is that the case studies will have different ground issues e.g. different management styles, different reporting structures etc. Some members of one case study could be involved in another case study at a higher organisational level. It might be argued that these different ground issues make it difficult to compare and contrast the three case studies. While this is true, the selection of three case studies within a single organisation removes far more confounding ground issues. For example, our case studies all lie within the one industry sector and within the same organisation, and the KM project all focused on similar tasks. This has removed a host of possible extraneous factors and so makes comparison of the 3 case studies more valid.

Moreover, the goal of this research was to evaluate 3 different approaches to KM, and one of these is a centralised approach, which would typically be organisation-wide. So, any comparison of these three approaches would inevitably involve cases at different organisational levels and so it is difficult to imagine how ground issues associated with organisational level could possibly be avoided. Alternatively, case studies employing each of the 3 approaches might have been sought in 3 different universities. However, this would not have removed the issue that the projects would have been at different organisational levels and would instead have introduced a host of additional differences between the contexts of the projects.

Given the unavoidable differences in organisational level, care must be taken in comparing and aggregating data across the three case studies.

3.11 Conclusion

This chapter has discussed the methodology that was used to undertake this research. It has shown how using a case study approach combined with grounded theory methods was used to record the experiences related to the three different approaches analysed in this research. Specific issues were documented using emerging issues analysis, which is the process of identifying issues that would possibly re-occur in other cases. The analysis of the three case studies was conducted using similar data collection techniques such as interviews and observation. From the data that was gathered, issues were identified and discussed in regard to their relevance to the case studies and professional organisations in general. From this discussion, recommendations were made as to how KM projects can impact on a professional organisation and the issues they can expect to encounter when undertaking such projects. The three case studies and the issues that arise from them are discussed in the next three chapters (Chapters 4-6), and the analysis of these issues and the recommendations drawn from this analysis can be found in Chapter 7.

Chapter 4: EDUCATION (EDUC) - Case Study One

4.1 Introduction

The aim of the study is to examine different methods of implementing knowledge management (KM) successfully into a professional organisation such as an Australian university. As previously explained, the investigation would be done by comparing and contrasting more than one approach to KM adoption used within the organisation. It was determined that there would be three case studies to analyse whether the different approaches observed (decentralised, hybrid and centralised) actually work and whether one approach has advantages over the other within the specific structure of a professional organisation.

This chapter presents the first of these case studies which used the “Decentralised” approach discussed previously in chapter 2.

4.2 Background

The first of the three case studies involves the Education (EDUC) Faculty at the University of Wollongong. This is one of the ten faculties within the university. As stated on their website:

“The Faculty of Education was formed in 1984 from the amalgamation of the former Department of Education of the Faculty of Arts of the University of Wollongong, and the nearby School of Education (Institute of Education).”
(Faculty Of Education, 2007)

It is one of only two faculties within the university that are not subdivided into smaller schools or units. See section 5.1 for the structure of a more typical faculty. The structure of the Faculty is shown in Figure 4-1 below

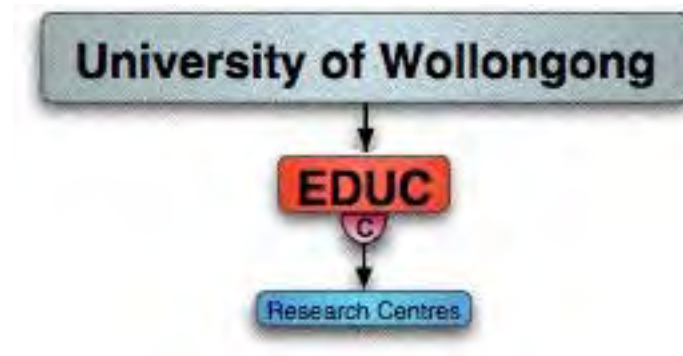


Figure 4-1 How the Education Faculty fits into the University

This means that all management comes from the top of the Faculty, the Dean (because there are no heads of school, see section 5.1), and when processes or technologies are adopted at a local level they can affect all staff involved within the Faculty much more easily than in more complexly structured faculties.

The Education Faculty is a medium-sized faculty in the context of this University and is made up of 45 academic staff (Operating Core and Middle Line) and 27 professional staff (Support Staff and Technostructure). The academic staff are required to teach both undergraduate and postgraduate courses as well as actively participate in research in their respective fields. The Education Faculty has a number of different degrees that are offered to both local (Australian Citizens) and international students. This is demonstrated by their website which states they have “approximately 1400 students, spread over both undergraduate and postgraduate programs in teacher education and training, and higher degree programs up to Doctoral level.” (Faculty Of Education, 2007). The areas within the education field which are covered by the degrees on offer

include: Early Childhood, Primary, Secondary and Physical and Health Education. They also engage in distance education by offering subjects at off-campus locations for both domestic and international students (Faculty Of Education, 2007).

Although the Education Faculty has a centralised organisational structure, it is not physically centralised within the university campus. The Faculty is “housed in four buildings on the Wollongong campus with specific study space for postgraduate students, seminar rooms and access to the University computer network system.” (Faculty Of Education, 2007), as shown in Figure 4-2. This distributed location suggests a need for a well developed IT infrastructure to assist in better communication for students and staff and to allow for easy and simplified access to commonly used data for both learning and administrative purposes.

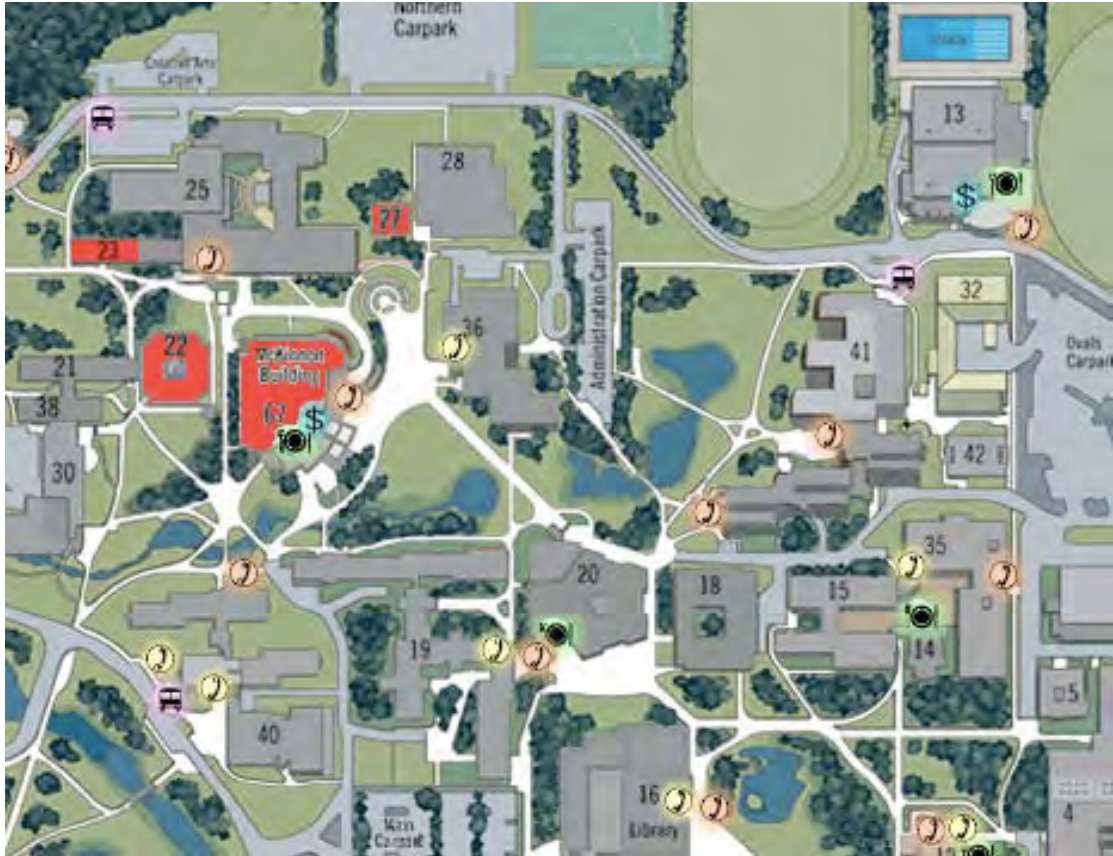


Figure 4-2 The Physical location of the Faculty of Education (shown in red) (Faculty Of Education, 2007)

There is also a small separate resource facility, comparable to a small subject specific library, called the Curriculum Resources Centre (CRC), which “houses material related to teacher training programs, and policy material related to the operation of the NSW school system.” (Faculty Of Education, 2007). The main University library also houses a significant collection of material used by education students, however the CRC caters exclusively to the students studying education by housing subject-specific information to assist the learning process.

There are two other groups within the Education Faculty that are of importance to this case study. The first of these is known as the Educational Media Lab (Emlab) which provides the Faculty of Education with local technology support. However, Emlab also

produce new and innovative educational multimedia resources through the creation of CDs and interactive web environments.

Their website states that their aim is to:

“...provide modern approaches to traditional learning methodologies and implement original teaching concepts that not only look good but are intuitive, user friendly and fun.

Our team of programmers, web developers, graphic designers and interface designers has grown in number and reputation through the years to be one of the forerunners in the field of educational media both within Australia and internationally.” (Emlab, 2007).

Emlab works closely with several of the research centres within the Education Faculty, including the Research centre for Interactive Learning Environments (RILE) and the Digital Media Centre (DMC). Emlab supports many of these centres in its research and is actively involved in the publication of research from these centres.

However, Emlab not only caters to the Education Faculty, it is also a commercial entity in its own right. Emlab is actively involved with the commercial production of software for clients ranging from the University itself to external government and corporate bodies. Products are created and polished to award winning standards, and are developed in the different areas of multimedia design and development, scientific simulation in both adult professional development and student learning environments (Emlab, 2007). The work produced by Emlab is also delivered in both print and digital media. Examples of their work include:

“Road Risks - Your Choice (2004)

Client - Roads and Traffic Authority (RTA)

A suite of resources to assist high school students in thinking more about safer behaviour on the road, particularly using skateboards, travelling in cars and as pedestrians.

Winner of the Ascilite president's award for excellence.” (Emlab, 2007)

“Pilotage Courseware (2002)

Client - IMPART Corporation, Royal Australian Navy

A flexible, simulated training environment for RSN and RAN officers to develop their pilotage skills.

Winner of an AIMIA award. plus 2 other awards.” (Emlab, 2007)

“StageStruck (1998)

Client - National Institute of Dramatic Art (NIDA)

An interactive opportunity for students in remote or urban situations to experience the world of the performing arts both on stage and behind the scenes.

Winner of a BAFTA award. plus 6 other awards.” (Emlab, 2007)

The final group that is of importance in this case study is the Research Centre for Interactive Learning Environments (RILE); a group of researchers based in the Education Faculty whose research explores the use of technology in the education field, that's where it is used. It also looks at technology delivery (how it is used) and practices (what is can be used for). As stated on their website the goals of RILE are:

- “To research new technologies to harness their potential for use in education and their capability to transform the way people learn
- To review, refine and describe the affordances of learning technologies, learning designs, learning environments and research approaches
- To design and develop innovative learning environments and tools
- To disseminate research findings and the latest trends and practice in ICTs to inform classroom practice and policy
- To support members to incubate new ideas for development and research in new technologies, and to encourage and critique new research proposals”

(RILE, 2007)

To achieve these goals, RILE collaborates with Emlab and other bodies in the Education Faculty. This close collaboration allows for some top quality products to be produced, assisting with the development of both the knowledge of the academic members of staff and the quality of the Faculty's outputs in research and teaching. This type of collaboration is exactly what leads to the project that constitutes the first case study - the development of the Faculty Management System (FMS) by Emlab.

4.3 Initial Phase

The initiation of the project was an ad hoc process at best. The idea for the project arose when RILE wanted to have a publicly available website to create an online presence for the research centre. The purpose of this website was to allow people to locate information, such as the membership of RILE, complete with pictures and contact information. The website was also to contain information about what grants the research centre and individual members had successfully achieved, their current and past projects, a list of publications by the research centre and a list of any individuals, external to the organisation, who had published under the auspices of RILE research centre. RILE approached the internal technology support team Emlab (Technostructure) asking for help to set up or develop this website. After discussions with members of the technology support staff (Technostructure), the idea was both refined and expanded to become a dynamic, web-based system that would allow RILE to achieve all of the desired features. This would be done through the creation of a web-enabled database, allowing the addition of data through a simple web interface and the posting of that data directly onto web pages through automated processes built into the system.

This was an informal creation process. This problem did not arise from analysis. Instead, the process was initiated by a simple request from a research group. In developing this system there was little or no attempt to integrate the proposed system into the organisation's IT infrastructure or processes.

ISSUE 1# – Depending on who instigates the project, some approaches may be better suited to the task than others. (Approaches: centralised, decentralised and hybrid).

4.4 Task Selection

The construction of a dynamic web-enabled database meant that members of RILE would be able to adjust their own staff details, add new members to the group with ease (including members external to the University), add both new and old publications that had not yet been recorded and add and update project information as it became available. However, due to the nature of the discipline, the members of RILE had a variety of levels of technological skills, which meant that the new system had to be simple enough for people to use no matter what level of experience they had with technology. It was decided that the system would be built in a way so that it did not require any experienced knowledge of web-based construction methods (such as HTML or java programming).

Due to the fact that this was a small project and the IT staff were familiar with building software, the 'original dynamic web system' was built rather than bought. This meant that all further enhancements to the original dynamic web-based system would need to be done by the IT staff.

ISSUE 2# - The competence of the Technostructure will affect the decision to build or buy the system.

ISSUE 3# - The build/buy decision will affect ongoing maintenance and the role of the Technostructure.

4.5 Development Issues

This section will discuss the process of the development of the Faculty Management System (FMS) and the issues that arose throughout the process.

4.5.1 Development Phase

Once the specifications had been finalised and agreed upon by both RILE and the technology support staff building it, the system was built using the software Filemaker Pro to function in multiple environments (Mac and Windows). FMS was introduced with great success. The system was able to do the job and RILE could add publications to the system and these would then be updated live to the web site for the research group to give it the most current public profile possible. It also allowed members to keep their details up to date by logging in and changing their own information in the database, which kept the information current, correct and up to date. This made the job for the web site manager easier as not only was the information kept current without their interaction, the system made all the pages on the site the same through the use of a template.

While this was a decentralised approach to the project, the web pages still had to meet the standard set by the University for public display. This is why templates were used.

ISSUE 4# - The approach taken may affect compliance with organisational standards or policies e.g. standard look and feel of web pages.

4.5.2 Run Out Phase

Once the system was up and running, it caught the attention of the Dean of the Faculty (Strategic Apex). Upon reviewing the application and the success it was achieving in allowing RILE to manage its information, the Dean called for the redevelopment of the system to incorporate every member of the entire Faculty. The use of a user-driven approach, that had been the catalyst for the project, was considered by the Faculty to have been an important factor in the success of this project and therefore would be maintained throughout the entire redevelopment process. A “user-driven approach” is where the operating core are the main drivers of the project and have control of the development of the system and can steer the direction the system development can take. The “user-driven approach” showed real potential in this instance and could be seen as a great approach within professional organisations. This is due to the fact that the operating core is the most important part within the professional organisation. By allowing the operating core to have control over software development projects it means that those with the most knowledge are impacting and driving organisational change. This is a benefit as it can help bring about positive change in the organisational culture and practices and since it was driven by the operating core, they are less likely to be resistant to change in work practices. However, there can be downsides to the user-driven approach including requirement creep and projects going off course. Consequently, a very good project manager is required to keep the project focused and running successfully.

In this case the user-driven approach demonstrated that a minimal push from the strategic apex was required to drive the project.

ISSUE 5# - The more that the operating core supports a KM system the less “push” will be required from the strategic apex.

The redevelopment required a complete re-write of the code to include new functions that the original system did not have as they were not included in the scope of the original project.

ISSUE 6# - Correct definition of scope/requirements will affect the amount of redevelopment/maintenance.

4.5.3 Faculty Management System (FMS) Features

After a complete rebuild of the program, the first iteration of the Faculty Management System (FMS) came into existence. This version included the following features:

Research Group Management

- Create and store multiple research group details
- Assign coordinators to each research group and manage membership of each group
- Manage research group and member positions
- Send emails automatically to all members of specific research groups
- Assist members to generate CVs for grant and promotion applications
- Support Open and Closed research groups: Open being available for anyone in the system to join, and Closed requiring members to be invited to join the

research group.

- Request members to join Closed research groups
- Inform group coordinators when a member leaves an Open group
- Request by members to leave a Closed research group
- Provide design templates for web pages

People Management

- Support three different types of member: Staff, Research Students, External Members
- Store common attributes for all three types of members
- Store specific attributes for staff, post graduate students and external members
- Manage personal information
- Upload a personal photograph
- Indicate if a person has a separate personal webpage and provide a link to it
- Provide two levels of Access: Administration and Normal
- Handle changes in a member's name for example marriage, divorce

Publication Types and Styles

- Support dynamic publication types and rules
- Define and modify publication types for example articles, books, and so on, through the system
- Switch publications between types without losing data
- Support multiple referencing styles per publication type (see 4.5.5)
- Apply styles anywhere (website or document export)

Publications

- Enter a new publication into the system
- Support unlimited number of Authors for a publication
- Support unlimited number of Editors for a publication
- Assign Author/Editor to any of the three user types
- Manage Author/Editor details quickly and easily
- Check if a publication is already in the system
- Store Workload percentages (see 4.5.4)
- Assign publications to a particular research group
- Manage and display publications using a parent/child hierarchy where a parent would be a research group and a child would be a sub-group or member of a group
- Define search criteria for the publication list under publication management
- Sort the publications list by either by date or by title

CV/Report Helper

- Export lists of publications to Microsoft Word
- Define what publications to export
- Define the sort order by publication type
- Choose the referencing style when exporting (see 4.5.5)
- Have personal details included if desired

Public Portal

- Provide a portal for each research group including:
 - Portal's Introduction Page
 - Publications list page
- Search and sort on the publications page
- Display Members' names to appear as hyperlinks
- Display Members' list page, sorted by position
- Allow groups to define what information to display on personal pages and what not to
- Support the Workloads process – publication percentage points assigned to each publication with more to be done in the future (this included incorporating an existing Filemaker Pro workloads model that had been operating for some years).
- Provide a staff directory – publicly display individual staff profiles and profiles in the context of Faculty research groups, which were dynamically generated from within the Faculty Management System. This includes the possibility of incorporating other web pages that describe Faculty positions, which were once static pages and did not go to any length to encapsulate skills or extended role descriptions.
- Store information about research students - these were previously entered into the Faculty Management System only in the context of research centre information.

These functions described above were accomplished with the use of the Faculty Management System, which is described in detail in section 4.5.5.

4.5.4 Workload Process

The “Workloads” process discussed in section 4.5.3 requires further clarification to understand its importance to the Faculty. The “Workloads” process refers to a negotiation between the Faculty and each academic member of staff on their performance for the coming year. It differentiates between teaching, administration and research and how much of each the academic will have to do in order to perform a full workload. The workload process is discussed in more detail in chapter 5 of this thesis, where a system is developed to cater specifically for this task.

Each faculty has its own model for assessing workloads and so requires a system to support that model specifically. The use of the decentralised approach meant that FMS could be built to cater specifically for the Education Faculty workload model.

ISSUE 7# - Different approaches (Centralised, Decentralised, Hybrid) will enable different levels of customization.

4.5.5 Faculty Management System (FMS) Functionality

The following is an analysis of the functionality of the Faculty Management System (FMS), which is necessary to allow a comparison of the solutions developed in each of the three case studies. The benefits and faults of each system are highlighted to show the successes and failures of using the three different approaches (decentralised, centralised and hybrid).

Figure 4-3 shows a screen shot of the group management screen. This is used by each research group to organise its members, its website and its public profile. To do this a coordinator for a research group is nominated and then given administrative access to the system to define the group and keep the information about the group up to date. The coordinator can enter a description of the research group which will appear on the group's own web site to show visitors what the group does. From this section they can also select the referencing style they want the publications to be displayed in on the web site. Different referencing styles are needed because different research disciplines within the broad field of education use different citation and referencing styles. This would be analogous to different reporting styles used in other professional organisations.

The group manager can select other members from this area and nominate them to be coordinators too. This section of the system also allows them to set up "position sets". These sets will be displayed on the website and will show the structure of the group and the positions that members hold within the group. This will allow for the formal structuring of the research group and will assist in distinguishing academics from research students and internal members from external members.

Children :

Research Centre for Interactive Learning Environments
Child Obesity Research Centre
Australian Centre for Educational Leadership
Centre for Interdisciplinary Youth Research
Centre for Research in Language and Literacy

Name :

Faculty of Education

Description :

The Faculty of Education was formed in 1984 from the amalgamation of the former Department of Education of the Faculty of Arts of the University of Wollongong, and the nearby School of Education (Institute of Education). Since then it has grown rapidly and now has 45 academic staff, 27 professional staff and a total enrolment of approximately 1400 students, spread over both undergraduate and postgraduate programs in teacher education and training, and higher degree programs up to Doctoral level. Staff undertake teaching across both undergraduate and postgraduate areas, and in most cases are also active researchers in their areas of expertise.

Referencing Style :

☒ APA Style
☐ Sample Styles

Co-ordinators :

Barry Harper

Pauline Lysaght

Jan Brown

Brian Ferry

Janice Wright

Carolina Fasano

Stephen Driham

Noraham Brind

Self Joining :

☐

Self Leaving :

☐

Positions :

Add new Positions
Sign Up a Member
Sign Up External Member
Adjust Position Order

<div>1) Dean (100 Deans)</div> <div>Barry Harper (Remove)</div> <div>Dean</div>	<div>2) Sub Deans (100 Deans)</div> <div>Pauline Lysaght (Remove)</div> <div>Sub Deans</div>	<div>3) Associate Deans (100 Deans)</div> <div>Janice Wright (Remove)</div> <div>Associate Deans</div> <div>Jan Brown (Remove)</div> <div>Associate Deans</div> <div>Brian Ferry (Remove)</div> <div>Associate Deans</div>
<div>4) Emeritus Professor (100 Deans)</div> <div>Carolina Fasano (Remove)</div> <div>Emeritus Professor</div>	<div>5) Professors (100 Deans)</div> <div>Stephen Driham (Remove)</div> <div>Professors</div> <div>Janice Wright (Remove)</div> <div>Professors</div> <div>Barry Harper (Remove)</div> <div>Professors</div>	<div>6) Associate Professors (100 Deans)</div> <div>Janice Harrington (Remove)</div> <div>Associate Professors</div> <div>Peter Kell (Remove)</div> <div>Associate Professors</div> <div>Beverly Derewianska (Remove)</div> <div>Associate Professors</div> <div>Brian Cambourne (Remove)</div>

Figure 4-3 The Group Management Screen

The next section of the software is the member management section which allows each individual member to keep their own profile up to date. This section allows the members to control several things about themselves (see Figure 4-4). Firstly, if a member is employed by the University, and specifically by the Education Faculty, then their name is automatically added to the system. The member can then upload a personal photograph of themselves which will be publicly displayed on the web through

their personal page. They can add details such as their contact email address, their phone number and their room and building number on campus. FMS then provides several text fields that allow the members to enter information about themselves for public display. These fields include their qualifications, current positions held, research areas and other related topics. This information is used to create a biography for the public web site. This information can also be used to generate a curriculum vitae (CV), another ability of the tool which will be discussed later.

University of Wollongong
Faculty of Education

Site Search
All of UOW

UOW Home > Faculty > Faculty of Education > Staff Home > Staff Members Management > Anthony Herrington

Full Name : Anthony Herrington
NOTE : Do not change this if the person is updated from Payroll.

Updated From Payroll : ☐

Title : ASPRO

Staff Number : 3392823

Photo : Upload Photo

Email : tonyh@uow.edu.au

Username : tonyh

Access Level : Normal

Personal Page : ☐

Website :

Building : 67

Room : 309

Phone : 0242214643

Fax : 0242214657

Staff Type : Academic

Employment Type : Permanent

Brand new Member : No

Current Positions :

Tony lectures in the areas of Adult Education and information Technology Education.

Qualifications :

BSc; DipEd; BEd; MEd; (Hon); PhD (UWA)

Figure 4-4 The member profile management page

All the information stored within the FMS is available for public display on the web page and is automatically generated by the system. Examples of these pages are shown in Figure 4-5 and Figure 4-6. These pages have a slightly different appearance and structure depending on how the page is accessed. If the page is accessed via a link on a research group's web page, it will appear differently to the equivalent page accessed via a link on the Faculty's web page. Figure 4-5 shows how the individual's page is displayed when they are accessed through the Faculty's web site. This view shows the academic as a member of the Education Faculty and uses the education template set up within the system. Figure 4-6 shows the exact same academic with the exact same information only this time the member has been accessed through the RILE research group. This means that the same information is retrieved from the FMS but this time the RILE template is used to display his information and not the Education faculty template. This allows academics and research groups to keep this information up to date and only have to maintain one set of data to keep several web sites current. These pages also display the academic's publications in the referencing style set by the group's coordinator. Similarly, the Faculty page will show all of the academic's publications while the research group page will omit any publication that is not relevant to the research themes of the research group.



Figure 4-5 An example of public profile or a web page: via Faculty

Figure 4-5 shows the header of the web page to be the Faculty of Education. It also has the University's tag words down the left side and a navigation bar. These are all part of the University template, designed to give a uniform corporate "look and feel". There are breadcrumbs and a search function which searches the whole of the University's website. It also uses the colour scheme set by the University.



Figure 4-6 An example of public profile or a web page: via research group

Figure 4-6 shows uses the RILE header and has a different navigation bar positioned in a different location. It uses additional tabs to locate further information about this specific academic and / or about RILE. It uses its own colour scheme and has no search function.

The next section involves entering new publications into FMS. The first thing the user does is select the type of publication including: journal publications, conference publications, book chapters, books, and so forth. Depending on what publication type is chosen, the user then enters the information needed to record the publication. The example in Figure 4-7 shows the user entering a journal article. The user then fills in the fields that are displayed. So, in the example below, the user adds the title of the

publication, the year and the journal title. He/she also adds details such as ISBN number, page details and if possible, a URL to the actual publication or at least the journal in which the article was published. Once this information is added the user then assigns authors to the publication. This allows the addition of multiple authors including authors external to the university or post-graduate students. Once the authors have been added, the user assigns the publication to a research group. Ideally, this should be the lowest group level in the hierarchy of research groups as publications recorded at low levels (children) are inherited by their parents in the hierarchy but not vice versa. The category of the publication is then selected, depending on whether or not it is to be DEST verified (i.e. meets the standards to be included in the funding calculations carried out by the Federal Department of Educational Science and Technology [DEST]). Then it is also decided by the user whether it will be submitted for workloads verification. Once all the data is entered, the user hits the submit button and the publication details are sent to the Faculty Publications Officer (FPO) for verification and approval. The FPO checks that DEST publications are properly recorded and verifies all details about the publication.

Naturalistic Inquiry in e-learning research

Owner: Shirley Agostino (Owner)

Type:

Title : Naturalistic inquiry in e-learning research

Year of Publication : 2005

Journal Title : International Journal of Qualitative M

Retweeted by [pat Ravine](#) · 

1800/1850 1609-4049

Volume Number: 4

Issue Number : 1

Page Numbers	Article 1
--------------	-----------

URL : <http://ulrichweb.com.proxy.uow.edu.au:2048/ulrichweb>

Availability 3

NOTE : Please enter Authors in the same order as they appear on the Publication.

Start typing the Authors name for list of Matching Authors.

2) As there is only one Author they must be a Faculty Member.

[illegible]

Apostrophe Story

Percentage = 100

More Authors 7

[Attach another Author to this Publication](#)

Author not available ?

[Add a new Author to the external list](#)

Groups 1

Please select the Group which the Publication is associated with.

Research Centre for Interactive Learning Environments

UOW Category C1: Article in scholarly refereed journal

Pre Systems :

DEST Verified:  (04/04/2006)

Entered into OEST 7 + 0

Workloads Verified :  (04/04/2006)

Entered Into Workloads Database: 7 / 0

[View Publications History](#)

Save and Submit for Verification

Delete Publication

Preview

Group and Style : Research Centre for Interactive Learning Environments - APA Style
Agostinho, S. (2005). Naturalistic inquiry in e-learning research. *International Journal of Qualitative Methods*, 4 (1), Article 2. Available at : <http://ulrichsweb.com.apcproxy.uow.edu.au/2048/ulrichsweb>

Figure 4-7 The publication entry screen

Figure 4-8 through to Figure 4-12 show more functionality of the system. Figure 4-8 shows how users can view all their publications and the options they have to manage them. It allows them a link to enter new publications with preferences covering referencing styles which can be used to determine how the public views the publication reference.



Figure 4-8 The publication management screen layout

Figure 4-9 and Figure 4-10 demonstrate how a user can generate a word document in the form of a CV. Figure 4-9 shows the initial options that the user has in creating a CV; they incorporate options as to what personal details and which publications to include. Figure 4-10 shows more detailed options with publications when creating a CV.



University of Wollongong
Faculty of Education



Site Search

All of UOW

[UOW Home](#) · [People](#) · [Faculty of Education](#) · [New News](#) · [Contact Us](#)

CV and Report Helper

Please define the information you wish to appear in your report/cv. Once the "Create" button has been clicked a Microsoft Word document called "CV.doc" will be downloaded to your computer.

Person :
Start typing for auto completion.
Anthony Harrington

Include Personal Details : ☒

Include Publications : ☒

For Group :

This box is for defining the criteria for the Publications you wish to include :

Publication Type : <input type="text" value="See All"/>	Keyword : <input type="text"/>	Between Years : <input type="text" value="and"/>
DEST : <input type="text" value="Either"/>	Workloads : <input type="text" value="Either"/>	Quotation Style : <input type="text" value="APA Style"/>

Advanced Sort Options :

— None Selected —

University of Wollongong
Wollongong NSW 2522 Australia
Telephone +61 2 4221 5100

CRICOS Provider No. 00002B
Privacy, Disclaimer and Copyright Information 2003
Feedback: ed@uow.edu.au

Figure 4-9 CV reporter and helper

University of Wollongong
Faculty of Education

Site Search
All of UOW

Home > Faculty of Education > Home > Publications Management > Export List to Word

Export List to Word :

Quotation Style :

Advanced Sorting Options :

Book : ☒ Use Default ☐ Use Modified

Title	<input type="checkbox"/> Use To Sort	Heading 1	Ascending
Year of Publication	<input type="checkbox"/> Use To Sort	Heading 2	Ascending
Edition	<input type="checkbox"/> Use To Sort	Heading 3	Ascending
Place of Publication	<input type="checkbox"/> Use To Sort	Heading 4	Ascending
Publisher	<input type="checkbox"/> Use To Sort	Heading 5	Ascending
ISBN/ISSN	<input type="checkbox"/> Use To Sort	Heading 6	Ascending

Book Chapter : ☒ Use Default ☐ Use Modified

Title	<input type="checkbox"/> Use To Sort	Heading 1	Ascending
Year of Publication	<input type="checkbox"/> Use To Sort	Heading 2	Ascending
Book Title	<input type="checkbox"/> Use To Sort	Heading 3	Ascending
Page Numbers	<input type="checkbox"/> Use To Sort	Heading 4	Ascending
Place of Publication	<input type="checkbox"/> Use To Sort	Heading 5	Ascending
Publisher	<input type="checkbox"/> Use To Sort	Heading 6	Ascending
ISBN/ISSN	<input type="checkbox"/> Use To Sort	Heading 7	Ascending

Figure 4-10 The screen layout for Advanced Sort Options for exporting Publication Lists to Word

The CV creation feature was included as it was seen as another way to get people to enter more data into FMS as it would help them when they applied for promotions or when applying for grants where a CV was needed. If the user had all the data up to date in the system it would cut the time needed filling out applications and increase their chance of success. It could also be argued that by having the operating core enter the data, it will reduce the reporting work for the support staff and will mean that the data is more inclined to be correct, as the owner of the data is the one entering the information into the system.

ISSUE 8# - Changing operating core work practices will affect other work practices in the organisation for other organisational units such as the support staff.

Figure 4-10 also shows some of the complexity that is involved with the system. Complicated functions like the one shown in Figure 4-10 were included in the system because of the need to cater for a diverse set of needs. FMS was designed for one specific organisational division, however it tries to support multiple formats for constituent groups. One of these reasons is because the academics within the Faculty publish within several other fields such as psychology and technology, each of which has its own referencing style.

ISSUE 9# -. The more varied the needs of the constituent groups, the more elaborate the system will become.

ISSUE 10# -. The more elaborate the system will become the less likely it is to be used by the operating core.

ISSUE 12# - As the system becomes more complex and diverse, the documentation and training that accompanies the system will grow proportionally.



Figure 4-11 The Publication list for a Staff member under the Education Portal

Figure 4-11 and Figure 4-12 show, as previously discussed, how the same information can be viewed differently depending on how it is accessed. They show the same web page differences discussed with Figure 4-5 and Figure 4-6. It also shows how some publications can appear on one page and not the other. While these are relatively simple features when it comes to the operating core with its minimal interaction, they are very complex in terms of Technostructure. Emlab was required to find all the different styles not just for the “look and feel” but also for functions such as the different reporting styles of the publications.

ISSUE 13# - Making the system simple for the operating core through simple functionality will increase adoption.

The inclusion of these complex features can impact on the maintenance of the system as much more detailed documentation is required for the developers to understand the system and for people coming back to do updates when required.

ISSUE 14# - Making the system simple will increase the workload of the Technostructure.



Figure 4-12 The Publication list for the same Staff member under the RILE Portal

To encourage academics to provide as much data as possible, the project team used an incentive approach often referred to as “the carrot and the stick” method. As explained in the interview with those in charge of the project “This involved a two week grace period in which academics could submit publications to administration staff (Support Staff) who would enter them into the system so the academic did not have to” (Interview, 2005b). This approach was successful as the academic staff was already in favour of FMS and therefore did not need to be persuaded to use it. This was more of an attempt to encourage the inclusion of historical data to make the system more complete and improve the completeness of the information on public profiles. This proved a big success and the majority of data was entered this way, to the delight of both the academics (Operating Core) and the Dean (Strategic Apex). However, it did mean that care had to be taken to make sure that the support staff had been trained to use the system. Another effect was that while FMS would make the work of the support staff easier in the future it also meant that in the initial stages of the new system the workload of the support staff was significantly increased. Furthermore, the support staff would need to have access to the system that would allow them to enter data for other people. As this was a decentralised approach, getting the Technostructure to do this was relatively simple.

ISSUE 15# - As the KM system becomes more complex the Support Staff and Operating Core will require more training.

ISSUE 17# - To get the most out of a KM system you need to have as much data as possible.

ISSUE 18# - As the amount of data entry or data modification increases, the cost and workload of support staff will increase.

ISSUE 19# - New KM systems may create a need for staff to have access to private or sensitive information that they previously did not.

4.6 Follow Up Phase

One of the first things that was noticed by the Dean (strategic apex) was that FMS contributed to better reporting for the “Workloads” and DEST Collections (i.e. get better publications that meet DEST standards to improve quality of research). It can be argued that a more rigorous recording process, which made staff output available to all staff, became an incentive for staff to produce more publications, to increase their apparent worth. This coupled with a Faculty initiative (sparked by the introduction of the research quality framework by the federal government, discussed in chapter 6) to increase the number of publications in higher DEST categories, improved the quality of publications. All staff could see not only the number of papers published by their colleagues but also the quality of their papers and the journals and conferences they published in. Moreover, linking both the number of publications and the quality of output to the workload model would have been a major incentive to improve both quality and quantity. This cultural change would have been far more difficult without FMS and its ability to make staff output transparent. This was a real bonus for the Faculty and meant that it would not only have better stature within the University but it actually transferred into more funding through the internal research funding for the faculties provided by the university.

ISSUE 20# - The KM system may directly increase the performance of the operating core and hence the funding / income of the organisational unit.

The technology staff who built the system felt that its success was due to strong leadership, because the Dean (Strategic Apex) had fully supported the project and used a top-down approach to drive the redevelopment faculty wide implementation of the system but allowed a user-driven approach to drive the initial development. This allowed the operating core to develop a system that they wanted with a strong leadership to get it implemented without too much project creep. It also meant that the system catered to exactly what the operating core wanted, and it was only after this was achieved that the strategic apex became involved in the process

Given the success of the publication function, the Faculty decided to develop a research grants database, as research grants are also a key performance indicator for academic staff. The development team had constructed the grants database tables and had a prototype ready for beta testing when the process was interrupted. It was discovered by the faculty that the University had embarked on a process of creating a publication recording system of its own, which would make both the FMS and the proposed research grants database redundant.

The decentralised approach appears to work only when it is allowed to remain decentralised. When organisational changes come from the strategic apex (i.e. local systems are taken over by organisational systems), the decentralised approach must a) stop, and b) must somehow ensure that the functionality it has produced is not lost in the new centralised version.

ISSUE 21# - Regardless of the approach taken to KM, there is always a possibility that a centralised approach will dominate.

4.7 The Impact of Centralisation.

With the University developing its own version of the FMS, the Education Faculty was presented with a dilemma. The strategic apex had to decide whether to continue with the use of FMS or to adopt the proposed University-wide system. Initial enquiries suggested that the University-wide system would be based on COGNOS, the University's current BI system. However, this system was not intended to support most of the KM functions provided by FMS. Therefore, it appeared that FMS would still be necessary. When it was discovered by the University that organisational divisions other than the Educational Faculty were also developing publication systems (see chapter 5), the University decided to develop or purchase a more comprehensive system to support all faculties. This still left the Education Faculty with some decisions to make. It was initially uncertain if use of the University-wide system would be mandatory or voluntary. If it was voluntary, then the Faculty might be allowed to continue to use FMS. It did not appear that the initial system would include a grants database so there was still a justification for developing the FMS grants database and continuing to use FMS. Moreover, it was difficult to imagine how a single University-wide system could support 9 different faculty workload models. Since each faculty had been allowed to develop a separate model because it was deemed to be too difficult to develop a single model, then surely it would be too difficult to develop a single application to support the 9 different models. Another factor being considered by the Education Faculty was the possibility that they could continue to use FMS and then feed data from FMS into the University-wide system.

ISSUE 22# - When similar KM solutions are developed by more than one organisational division it may indicate a need for an organisation-wide system.

4.8 Decentralised Approach.

From this case study several preliminary observations can be made about the decentralised approach. Firstly, the use of this approach within a professional organisation appears to work very well. This is shown by the successful implementation of the system within this case study. The decentralised approach allows for a quick turn around time from conception to implementation, however this may depend as much on the people who are involved in the project and their ability to perform their jobs when asked as it does on the decentralised approach.

The decentralised approach allows for the creation of highly specialised tools for the Faculty because it is done in-house and therefore only has to meet the standards and requirements of a single faculty. This was highlighted in an interview with two members of the project team where it was stated that “there is going to be individual needs of faculties that can’t be addressed by something that’s general” (Interview, 2005b). This allows for faster and simpler development (in principle), however is reliant on the skills and ability of the faculty’s IT staff. It also means that the staff working on the tool should have an understanding of the Faculty and how it works, making it easier to understand the purpose of the system and how it will function within the Faculty. This would also mean that the developers are better able to construct the tool as they have a closer relationship with the operating core and therefore would tailor the system to the abilities of the operating core. This was also highlighted in the interview where the culture of IT use in the Faculty was described as being “supportive” and so there

were no real issues in getting people to use technology (Interview, 2005b). Getting this relationship between developers and users can be done in larger systems but would require detailed analysis and requirements gathering techniques to gain the same level of knowledge that the members of the faculty already have.

Nonetheless, there are some problems with the decentralised approach. This was seen when the tool was to be expanded from the initial research group system to the Faculty Management System (FMS). This required a re-write of the system to include new levels of tasks that were not originally seen in the first generation of the FMS. This was again observed when FMS was superseded by the University system and when other faculties enquired if they could use FMS. It is interesting to note though one of the project members in the interview said that “as far as we know they don’t want to adopt it across the university as an adopted system” (Interview, 2005b). This was later proven to be wrong. The nature of the development required too much input from the in-house development team which did not have the time, resources or desire to assist other faculties in the to use of FMS. However, it was stated in the interview (Interview, 2005b) that the Faculty was willing to give the tool to other faculties if they wanted it, as long as there was no technology support expected along with it, meaning the faculties were on their own with redevelopment and deployment. Due to the highly independent nature of the workloads models, the FMS also did not meet the requirements of other faculties as they used different ways to calculate the workload performed by their academics.

It should be noted here that the programmers who developed the FMS system were eventually given the task by the University to develop the University-wide system

because of the success they had achieved in the Education Faculty and the quality of the system they had produced. This again highlights the importance of having quality people when developing a system.

This is the first of three case studies of the use of knowledge management in a professional organisation. This case study used a decentralised approach to develop a system to increase the productivity and quality of output by academics within the organisational division. The case study describes a largely successful development of a knowledge management system using the decentralised approach and identified key issues associated with that approach. The following two chapters will examine two other approaches (a centralised and a hybrid approach) to develop similar knowledge management systems within the same organisation and determine if they experience similar or different issues to those identified in this case study.

Chapter 5: SITACS Case Study

5.1 Introduction

To continue the review of how knowledge management can be deployed within a professional organisation (an Australian university) and how it can be done effectively, this chapter examines the second of the three case studies discussed earlier. This case study is set in the School of Information Technology and Computer Science (SITACS), and it followed the ‘Hybrid’ approach discussed in the chapter 2.

5.2 Background

5.2.1 About the Faculty

SITACS was part of the Informatics Faculty in the University of Wollongong. The Informatics Faculty is responsible for all of the degrees in the broad field of Information and Communication Technology (ICT). The web site for the Informatics Faculty provides their mission statement as “To provide the highest quality education to produce outstanding graduates in the areas of Information Systems and Technology, Computer Science and Software Engineering, Electrical, Computer and Telecommunications Engineering, and Mathematics and Applied Statistics.” (UOW, 2007a). The Faculty offers a wide variety of courses catering to students ranging from school-leaver undergraduates to more experienced postgraduates, studying either full-time or part-time. The courses are flexible, allowing students to cater to specific interests of industry professions or to gain skills in a variety of different fields. The Faculty also conducts broad research in their respective fields as these fields are shown on the Faculty web site. “The core areas of research strength include (in no particular

order): information and computer security, networking and wireless communications, multimedia signal processing and content management, IT policy and management, software engineering, data mining, computer engineering, pure and applied financial and industrial mathematics, applied statistics, information systems, enterprise technologies and electronic commerce, location based services, power engineering, robotics, and engineering manufacturing.” (UOW, 2007a).

5.2.2 About the School

At the time this case study was started, the Faculty was made up of three specialised schools and a number of research institutes and research centres. The first and largest of the schools was the School of Information Technology and Computer Science (SITACS), which offered degrees in both Information Technology (e.g. Business Information Systems) and Computer Science (e.g. Object Oriented Programming). By the conclusion of the case study SITACS had been broken up into two separate schools, one being the School of Computer Science and Software Engineering (SCSSE) and the School of Information Systems and Technology (SISAT).

The members of the three schools in the Faculty also belong to several research institutes and centres including Telecommunications and Information Technology Research Institute (TITR), Institute of Mathematics and Applied Statistics (IMAS) and the Centre for E-Business Applications Research. These focus on specific areas within the ICT discipline and allow for collaboration on research topics and projects.

5.2.3 The School of Information Technology and Computer Science (SITACS)

When the case study was conducted, SITACS was one of the largest schools in the University. Its size, in both staff and student numbers, even rivalled that of some of the other faculties at the University. At the time of the study, the school had over 40 academic staff (operating core) and over 15 administrative staff (Support staff and Technostructure). This is one of the reasons that the school was chosen as one of the case studies. The school taught in two distinct areas, one being Computer Science, the other Information Technology. SITACS offered a variety of degrees from undergraduate degrees, with comprehensive masters, honours masters and doctorate of philosophy programs (SITACS, 2007). These degrees covered many topics including: security, e-applications, software engineering, intelligent systems, cryptography, computer security, network and multimedia security, distributed systems security, artificial intelligence techniques for decision support, machine perception, mobile robotics, neural networks, data mining, e-commerce, e-education, e-health, information management and telecommunications network planning (SITACS, 2007). Staff and students also belonged to research groups that are contained completely within the Faculty or are jointly operated with other faculties. Figure 5-1 shows how SITACS falls in the organisational structure of Wollongong University.

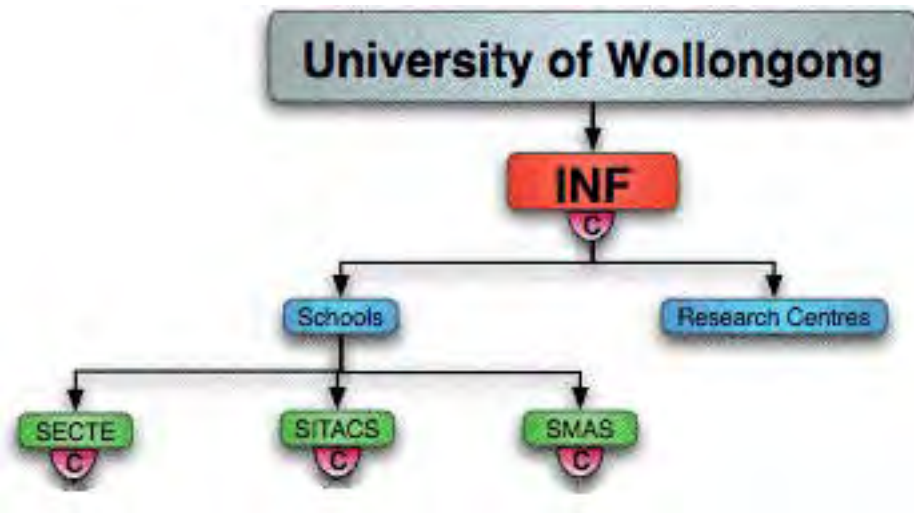


Figure 5-1 Informatics Structure when case study commenced

5.3 Initial Phase

SITACS was selected as the second case study because they were in a position where they were not currently using many knowledge management techniques and because the organisational unit was about to undertake a self-evaluation to see where processes and techniques could be improved. This occurred because SITACS had just appointed a new head of the unit (Middle Line) who was keen to put into place some changes to improve the unit's processes and business practices.

The new head of unit was supported in this by the assistant head of unit and their most senior clerical staff. So, the motivation for this KM project was a small group of middle managers (or Middle Line + some operating core), observing a need for better knowledge sharing and integration.

To do this the head of the unit felt that some type of "structure" should be in place to guide the project and make sure it achieved its goals. Therefore, after discussing the

project with the assistant head (Middle Line/Operating Core) it was decided that some type of framework or method should be followed, or at least used as a guide. A basic investigation by the assistant head and one of his postgraduate students led to the selection of a framework that showed how to incorporate knowledge management into an organisation. The framework was from a research paper by Sunassee and Sewry (2002) which studied knowledge management implementation strategies.

The strategy consisted of focusing on three core issues:

- Knowledge Management of the Organisation
- Knowledge Management of the People
- Knowledge Management of the Infrastructure and Processes (Sunassee and Sewry, 2002).
-



Figure 5-2 Sunassee and Sewry Framework (Sunassee and Sewry, 2002)

This framework (shown in Figure 5-2) was chosen as it addressed several of the major concerns of the middle line, namely: how to deal with the staff (operating core), the technology aspect of the unit and the tools to be used. However it was decided that the framework was not to be adhered to strictly but rather used as a guide.

One concern with the selection of this framework was that it had been tested on manufacturing style organisations and, as shown in Chapter 2, these are a different style of organisation to a university or professional organisation. This issue was discussed at the middle line of the unit and it was decided that the framework seemed flexible enough and as it was not specifically tailored to one style of organisation, it was tried to see if it was useful.

The framework suggests specific tasks for each of the three components. By looking at each of these three components in turn we can better understand what SITACS was trying to accomplish. The first component to be analysed is knowledge management of the organisation, which is made up of seven sub-tasks. These are as follows:

- “Perform a knowledge – based SWOT analysis.
- Create a vision for knowledge management initiative and provide a leader.
- Align knowledge management effort with business strategy.
- Plan and design knowledge management project (set goals and objectives).
- Manage organisational culture & change(s).
- Manage with holistic approach, including: Stakeholders, Competitors, Business Environment, and Overall Environment.
- Create and manage organisational learning” (Sunassee and Sewry, 2002, pp 238-239).

As described by Sunassee and Sewry (Sunassee and Sewry, 2002), the goal of this component is to evaluate the overall activities that need to be executed within the organisation during the proposed project.

The second component to be analysed is knowledge management of the people, which is made up of the four following sub-tasks:

- “Manage people as individuals.
- Encourage sharing and use of knowledge.
- Encourage individual learning and innovative thinking.
- Implement reward plans and incentives to promote above” (Sunassee and Sewry, 2002, pp 242).

The main goal of this component is to manage the people of the organisation; managing their behaviour, their expectations and their potential to contribute to the development of the project as it is undertaken (Sunassee and Sewry, 2002). This goal was seen as crucial in the success of the SITACS project because the organisation was of a professional style, so the operating core are very important. It was believed by those heading the project that unless the members of the operating core were properly looked after, the project would be unsuccessful, as the operating core were highly skilled and drove the unit.

The final component, knowledge management of the infrastructure and processes, is made up of two simple sub-tasks:

- “Managing the technology.
- Managing the processes” (Sunassee and Sewry, 2002,, pp243).

Managing the technology refers to planning what technology will be used in the knowledge management effort. This sub-task also recommends managing the technologies chosen to ensure that they are both compatible with the organisation's infrastructure and the processes or issues selected to be fixed. The emphasis ensures that the leader of the project makes sure that workers who are not computer literate are not overlooked and that their input and contributions are not overlooked (Sunassee and Sewry, 2002). While this was deemed to be important in the planning of the SITACS project, it was felt that in this situation it would not be a problem as this was a technology-based unit, so everyone would be computer literate. The framework states that if customised software is to be built then the users (operating core in this case) should be included in the systems' development process from the beginning. This was considered to be important in the SITACS project.

The first step that was undertaken was that the head and the assistant head of school devised a plan for the project using points from the framework. The following is an excerpt from the plan.

Plan of action

Within the selected business unit:

1. Carry out an audit of business processes that would benefit from the introduction of KM
2. Perform a knowledge-based SWOT analysis on the Faculty to identify the organisation's knowledge gaps

3. Analyse and organise the gaps identified in terms of the knowledge matrix below

	Implicit	Explicit
know-what		
know-why		
know-how		
know-who		

4. Align the KM effort with the business strategy, identify leaders for the project and create a vision for the KM initiative.
5. Identify candidate processes for which KM support would be beneficial
6. Select one or two processes that have a high likelihood of success, given the current level of KM use/acceptance
7. Assess the social and technical problems associated with each of the business processes
8. Identify management structures and support necessary for the introduction of KM to these processes
9. Identify one or more KM applications that could be used to support these processes
10. Identify current infrastructure/technology support requirements that would be required for these chosen KM applications
11. Align chosen KM applications with organisational/ IT goals
12. Test application

13. Deploy the application, train staff

14. Repeat 5 to 13 for each deployment

Two important decisions are implicit in the selection of this plan. The first, implied in steps 2 and 11, is that the unit would use a hybrid approach to KM deployment (see chapter 2). Unlike the EDUC case, SITACS fully intended the proposed KM tool to be consistent with the IT goals of the organisation as a whole. This meant that the proposed KM tools would be able to download data from University-wide systems and, where possible, the University-wide guidelines would be followed. Nonetheless, the impetus for change came solely from the organisational unit. As a result of this decision, the SITACS case study avoided or reduced the impact of the following issue:

ISSUE 1# – Depending on who instigates the project, some approaches may be better suited to the task than others. (Approaches: centralised, decentralised and hybrid).

The second decision is implied in step 14, which indicates that the KM plan is an iterative one that would support the development and deployment of further tools.

The iterative nature of the plan would support the deployment and development of further tools. From the outset the development of the system was viewed as a process that could and would be repeated to continually improve the unit, as is the case with most knowledge management initiatives.

ISSUE 23# – Knowledge Management initiatives are an ongoing process that require constant revision and maintenance.

According to the plan, the first step was to audit business processes that would benefit from the introduction of knowledge management. It was decided that this would be done in conjunction with step two, which was to perform a SWOT analysis on the organisational unit. In conducting the SWOT analysis, each member of the unit (Operating Core and Middle Line) was asked to analyse the unit and identify the strengths and weaknesses of the unit. Responses were not compulsory, however many responses were received and these were compiled into a report that was given to the head of the unit (Middle Line). The report was then used in a planning day in which these issues were taken to the members (Operating Core) by the head and assistant head of the unit (Middle Line) and discussed in detail. What came out of this was the identification of several issues. Some of these included streamlining some of the administrative processes to reduce workload on staff (Operating Core and Support Staff) by better allocation of research, teaching and administrative workloads, tracking publications, tracking grant submissions and better allocation of resources.

5.4 Task Selection

After the planning day the head and assistant head of SITACS decided that a task known as the “Workloads Document” be developed into an electronic system to reduce the workload on clerical staff (Support Staff) and academics (Operating Core) and to stop double handling of information. This was seen by the head and assistant head of school as a good project as it could be expanded to include more processes at a later date. Therefore, it fitted perfectly with the plan and the iterative nature of the development supported by the plan. This iterative approach reduced the likelihood of redevelopment.

ISSUE 6# - Correct definition of scope/requirements will affect the amount of redevelopment/maintenance.

While improving overall efficiency, the proposed project would result in a shift in the workload from operating core to support staff.

ISSUE 8# - Changing operating core work practices will affect other work practices in the organisation for other organisational units such as the support staff.

After discussion with several clerical staff (Support Staff) and academics (Operating Core), it was decided by the head of school that when the workloads tool was populated with data, a tool known as the “Who’s Who” tool would be developed in conjunction with the workloads tool. “Who’s Who” would allow people external to the unit to use a web-based search tool to find information that they needed, such as which academics are teaching which subjects, details about the academics, such as their room numbers and roles within the school, and other important information, such as who are first aid officers, fire marshals etc (roles usually performed by the Support Staff).

ISSUE 24# – KM tools may have related overlapping functions so some tools may be better developed in parallel.

Once the initial project had been undertaken, the organisational unit looked at the progress after six months and decided to expand the suite of tools being constructed. The review decided that it would be beneficial to include a publication tool to administer and keep track of the publications for the unit. Also, a tool that was similar to the publication tool would be created to record the grants won by the unit. As these

two tools catered to the research area this brought up an issue of whether the new tools would also keep track of research output by postgraduate students. This then led to the planned development of a third tool, which would contain information on postgraduate students and feed this information into other systems.

Information about publications was routinely distributed to the school. However, the grants and publications tools would make it very clear as to who was publishing and who was not. Similarly, without the new tools, it would be difficult to discover who had received a research grant recently or how many postgraduate research students each staff member was supervising. The new tools would reveal who were poor performers in a number of key performance indicators. While this was extremely useful to middle management (middle line) it was a threat to academic staff (operating core) as it could put their job at risk.

ISSUE 19# - New KM systems may create a need for staff to have access to private or sensitive information that they previously did not.

5.5 Development Methods Selection.

Once it was approved, the project was given to a group of undergraduate students as their final-year project. This is routinely done by the unit as it has proven to be an effective way to get software built for a variety of purposes as students are marked for their work and therefore are required to produce high-quality software to get good marks. It also allows for cheap construction of the software as students use computers in the labs and therefore the cost is effectively nil. This process was initiated by writing up a brief description of the project (PROJECT-01) and submitting it to the coordinators of

the final-year projects. The description submitted was the following; “This project is an opportunity to work on a project with real life implications. It involves working with [SITACS] and [the University’s IT support unit] ITS. You will be developing a system to assist with process improvement and help in the management of knowledge and information within the SITACS unit. The system will have to interact with existing University databases in different areas. It will require not only data retrieval, but also data entry and reporting capabilities. The system will have to be cross platform capable and most likely will have a web based front end. It will not only have to keep current data but have historical capabilities for reporting issues. You will be working in close contact with the ITS department at Wollongong University so that the system not only works, but that it meets security requirement standards set by the university as well as functional requirements. This is a real opportunity to gain new skills and work on a project that will simulate a real world experience.” (SITACS, 2005). All project descriptions are given to the students who then have the option to either choose a project from the list or conduct one of their own. In the event that two or more groups want to do the same project, the supervisor of the project (usually an academic [member of the operating core]) will select the group that they wish to work with and the groups that miss out must select a new project. One group approached the supervisor of the KM project and requested the opportunity to undertake the task. After meeting with the group, the supervisor found them to be knowledgeable enough to carry out the project and agreed for them to commence work on the project, which was started in August 2004.

ISSUE 2# - The competence of the Technostructure will affect the decision to build or buy the system.

ISSUE 25# – KM tools can be developed by end users at a very low cost but this will affect the quality and integration with existing systems.

ISSUE 26# – A KM tools quality and integration with existing systems will be better with professional developers at the helm of the project.

5.6 Development Phase

Meetings were held with the project group and all interested parties within SITACS to discuss functionality, the technologies required and the purpose of undertaking the project. It was hoped that having a better understanding of why the system was being built would allow the students to build a better system. The students education was boosted in the process. Meetings were held with the University's IT staff (ITS) (Technostructure) and the project group to make sure that the technologies used would work with existing platforms and databases to allow for incorporating data from a single source to stop the double handling of data. This is the main aspect of a hybrid approach, that while operating independently of the organisation, there is a serious effort to still conform to the standards set by the organisation.

ISSUE 4# - The approach taken may affect compliance with organisational standards or policies e.g. standard look and feel of web pages.

Six months into the development of the tool, two more project groups (PROJECT-02) and (PROJECT-03) groups were incorporated to expand the suite of tools to include a publications tracker, grants tracker (PROJECT-02) and a research student database (PROJECT-03).

On completion of the tools they were given the approval for implementation. This is where the project ran into some problems.

5.7 Run Out Phase

The three projects completed their tools at different times (first PROJECT-01 then 02 and 03). This meant that the system and its advanced functions were ready for implementation. However, PROJECT-01 was used as a pilot for deployment, with 02 and 03 intended to be deployed when 01 was up and running successfully.

5.7.1 Project One Software Functionally

The first of the project groups produced the “Academic Workloads Review” tool and the “Who’s Who?” tool. These two tools had very different functions.

The “Academic Workloads Review” tool was intended to assist in the administrative “workloads” process discussed in Chapter Four. As this chapter describes the “workloads” tool, it will become clearer what the “Workloads process” involves. The tool was produced so that “This online version of the Academic Workload Review [tool] will help SITACS staff in terms of cost saving and mobility. Information which staff will provide includes:

- Teaching – Formal contact hours with students (including research students)
- Administration – includes course co-ordination, subject co-ordination, etc.
- Research and scholarly activities – which leads to research outputs such as refereed conference papers, journal articles, books and chapters.
- Community Activities – hours spent in participation in external bodies related to

professional practice, membership of professional bodies/committees,
membership of local charitable, trust institutions, etc.” (Kwan et al., 2005, pp 1)

The workloads tool needed data about subjects taught, responsibilities, course co-ordination, etc, all of which would be useful for other purposes. The “Who’s Who” tool is a staff directory. As stated in the user manual, “This search directory contains relevant information regarding the people who work in SITACS. The search directory is useful in aiding students as well as staff to find people and their roles within SITACS” (Kwan et al., 2005, pp1). Information collected included:

- “Staff username
- Title
- First name
- Last name
- Phone number
- Room number
- Email address
- Subjects taught in the current semester
- Skills (e.g., Fire Warden, First Aid Knowledge)
- Responsibilities (e.g., Head of School, Associate Lecturer, WebCT Support, Course Coordinators)” (Kwan et al., 2005, pp1).

Much of this information already existed in separate University databases but the tool was an attempt to consolidate the information and use the information captured in the “Academic Workloads Review” tool’s database so that the most up-to-date and correct information was being sourced. The quality of data can impact on the decisions made in

the organisation. This is why the unit felt that getting a centralised repository from both the University and their own data would allow them to make better decisions about workloads within the unit.

ISSUE 17# - To get the most out of a KM system you need to have as much data as possible.

ISSUE 18# - As the amount of data entry or data modification increases, the cost and workload of support staff will increase.

5.7.1.1 Technical Specifications

These specifications are based on the basic standards on the University. This was purposely done by the project group to keep with the “Hybrid” approach being used by the organisational unit. These tools were built to the following technical specifications:

“2.0 Recommended System Requirements

2.1 Minimum Hardware Requirements

Pentium MMX 200MHz (or equivalent processor) or above

128MB RAM

Windows 98 or above

2.2 Software Requirements

Web Server - Recommended web server Apache 1.3.33 Server

Source <http://httpd.apache.org/download.cgi>

PHP - Recommended PHP software PHP 4.3.10

Source www.php.net/downloads.php

Database System - Recommended database system Oracle 9i

Source www.oracle.com/index.html

Web browser – Academic Workload Review

Recommended web browser Internet Explorer 5 or above

Source Embedded with all Microsoft Windows operating system.

Web browser – Who's Who Search Engine

Recommended web browser Internet Explorer 5 or above, Firefox, Netscape, Mozilla.

Source Embedded with all most operating systems and can be found at www.download.com" (Kwan et al., 2005, pp2)

The decision to build rather than buy a tool and to build in conformity with the organisations' chosen platform had immediate effects on the process. The developers were severely limited in the technologies they could use. Had the University's preferred platform been a poor one, it could have negatively impacted on the tool resulting in a fail attempt to improve the process within the school and possibly hindering any future endeavours in developing KM systems.

ISSUE 3# - The build/buy decision will affect ongoing maintenance and the role of the Technostructure.

ISSUE 4# - The approach taken may affect compliance with organisational standards or policies e.g. standard look and feel of web pages.

5.7.1.2 Program Functionality

This section describes what each of the two tools actually do, starting with the “Academic Workloads Review”.

The first of the screen shots is the login page. Both to assist with user acceptance and to comply with the Hybrid approach, it was designed to have a similar “look-and-feel” to the web mail login page that staff were already familiar with. It was originally intended to use the same login name and password for the Workload tool as for the staff web mail system but this part was not finalised before the project was halted due to the introduction of a centralised system. A successful login would enable a staff member to enter the system and provide the data that would be used in calculating his or her academic workload for the year. Under the login entry text boxes there is a checkbox for administrators. Administrators use the “Administrator Login” allowing them to have the authority to make changes to or approve an academic’s workload data.

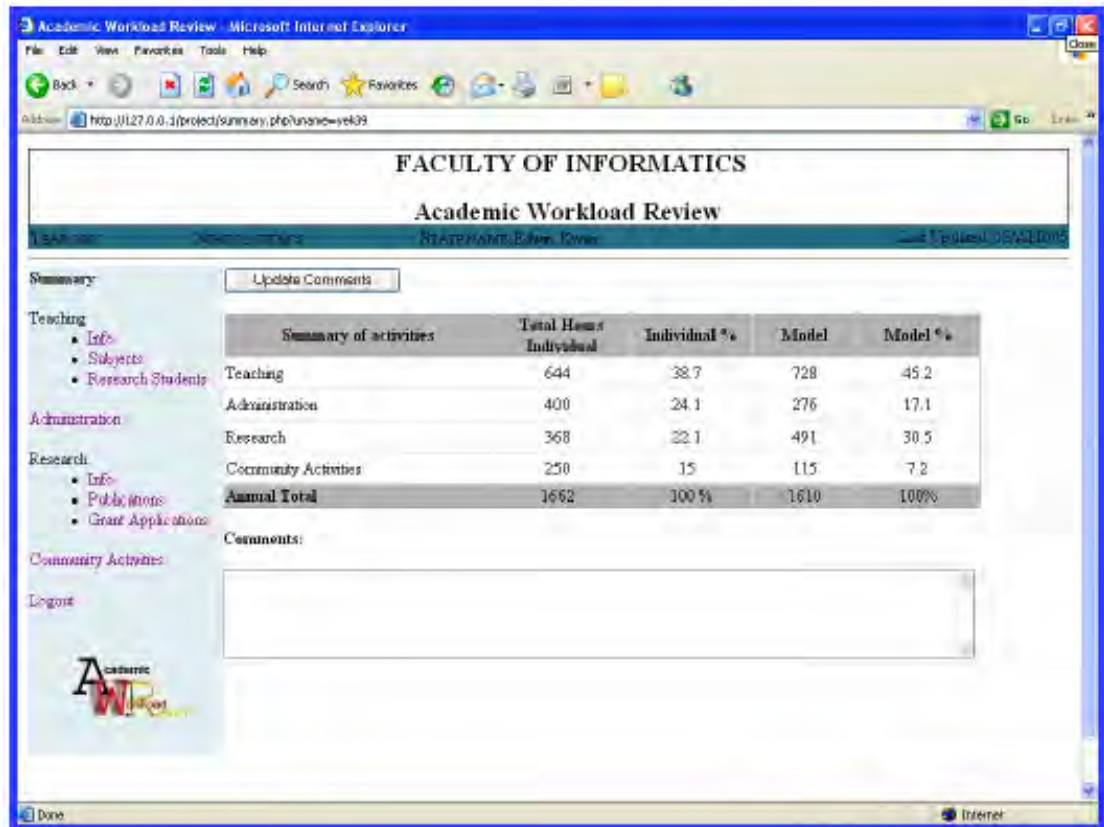


Figure 5-4 Summary Screen from Workload tool

The data entry process is divided into four stages, each one corresponding to an entry in the navigation bar on the left side of the screen. It should be noted that the Teaching and Research stages are divided into sub-stages, as shown in the hierarchical structure of the navigation bar. The Workloads tool gathers data from other business processes, such as subject allocations (done a month or so before), allocation of coordination roles, determination of workload associated with a coordination role and definition of teaching workload for each subject (all carried over from the previous year) etc. These values are either: a) uploaded or entered into the Workloads tool during those other processes or b) copied from the previous year's values. The first thing an academic sees on logging in is a summary or default workload allocation for the coming year. The one in Figure 5-4 shows that the academic has been allocated 644 hours of teaching for the year. The

Workload tool can calculate this value because the subject allocations for each academic were generated earlier in the year in another process and were entered into the Workload tool. The Workload tool also knows the number of hours teaching associated with each subject in previous years. It can use these two teaching sets of data to calculate a default teaching allocation, in this case 644 hours. The administration value of 400 hours is based on the coordination roles taken by the academic and the workloads allocated to those roles in the previous year. If an academic is no longer carrying out a particular coordination or administrative role, one of the clerical support staff will have removed that from the academic's allocation and the default value for administration will drop accordingly. More details of how these values are calculated are provided in the explanation of the following screens.

Figure 5-5 shows the screen for the "Teaching Subjects" section of the workloads tool or the first stage in the whole process corresponding to the second entry in the navigation bar on the left. This screen, as stated in the user manual "displays the details which have already been added by a staff [member]." (Kwan et al., 2005). This refers to things that have already been included in the system, that is, data that the school already knows from other work processes. These are either already entered by one of the clerical staff of the faculty or automatically taken from existing university systems (NOTE: this auto update feature was never implemented as the project was stopped by the introduction of a centralized system before it had the chance to be done).

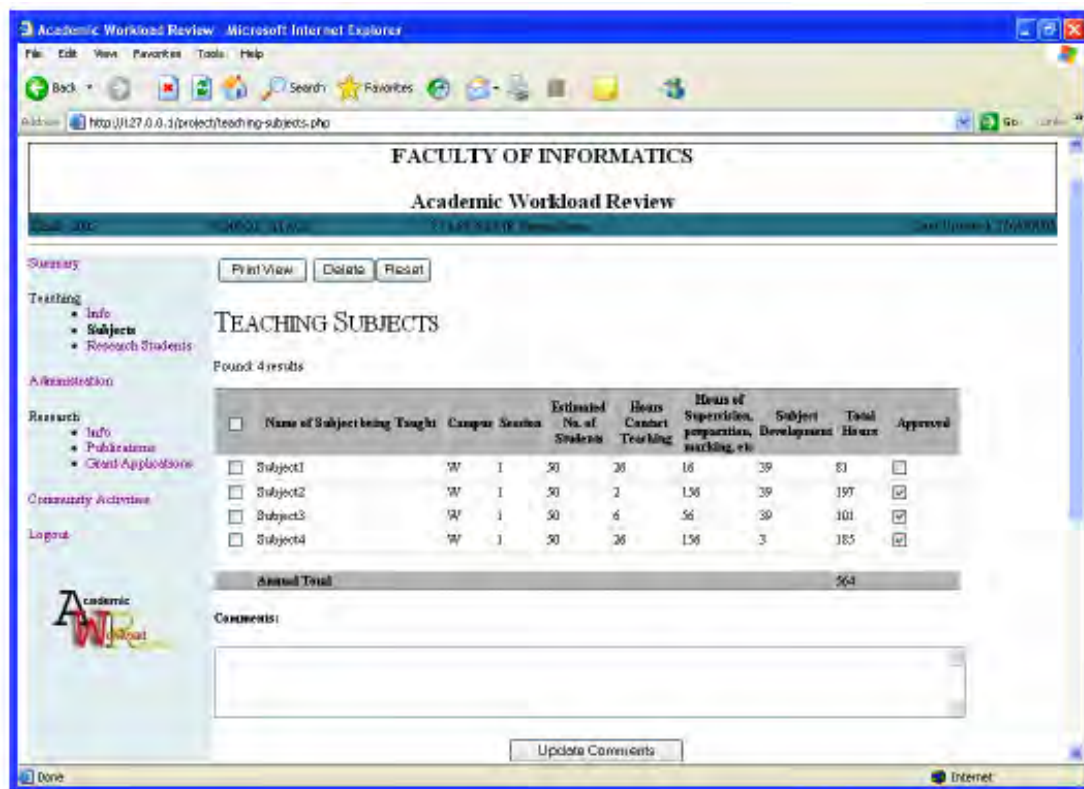


Figure 5-5 Teaching - Subjects Screen

The column “Approved” indicates the subjects which had already been approved by the administrator when the subject allocation had been added to the tool. If the academic was teaching a subject that was not shown in the list of subjects he or she could scroll down and use the area under the comments box to add the missing subject. It was intended that this be used as little as possible as the clerical staff would have most of the teaching information entered already so this was something that the academic should not have to re-enter.

ISSUE 8# - Changing operating core work practices will affect other work practices in the organisation for other organisational units such as the support staff.

Making the tool easy to use for the academics (operating core) increased the workload of the support staff (support staff) and increased the complexity of the tool. Workload information is regarded by academics as being private, so the systems required security mechanisms so that academics could not view each others allocations.

ISSUE 19# - New KM systems may create a need for staff to have access to considered private or sensitive information that they previously did not.

Separate administrative interface was required for support staff. Both the security mechanisms and administrative interfaces added significantly to the complexity of the tool.

ISSUE 13# - Making the system simple for the operating core through simple functionality will increase adoption.

ISSUE 14# - Making the system simple will increase the workload of the Technostructure.

The next screen, Figure 5-6, is the “Teaching – Research” screen which shows all the research students that the academic supervises. This information should already be in the system but it does allow the academic to keep this information up to date as some existing research students may have finished their studies and new research students may have commenced.

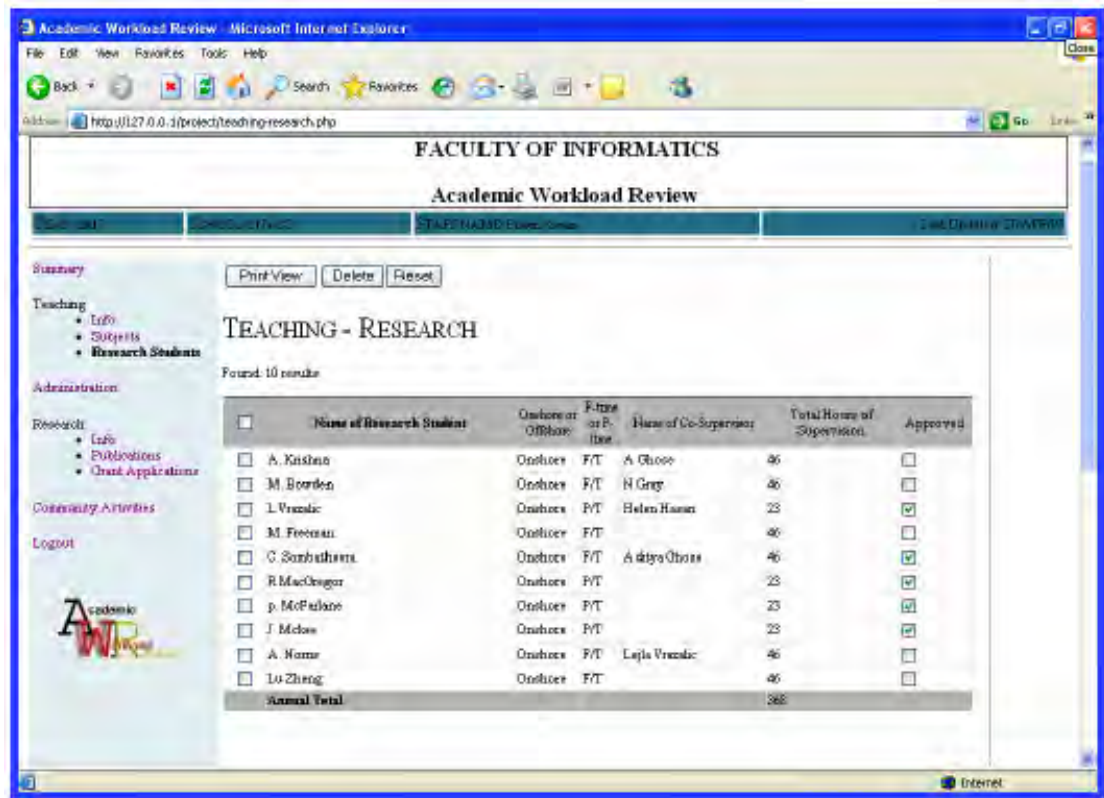


Figure 5-6 Teaching – Research Screen

Although this information is kept by the Research Student Centre (RSC), which is administered by the University, that data is often out of date. As students often forget to inform the RSC of changes. It is preferable for the Faculty and School to keep their own data. This also allowed the co-supervisor's information to be kept up to date, something which was also seen to be incorrect by academics and support staff a lot of the time.

ISSUE 27# – Hybrid and Centralised approaches rely more on organisational data being correct but this is not always the case.

The next stage in the process is the recording of Administration tasks. Figure 5-7 shows how the system records data about non-research and non-teaching duties that are also part of the day-to-day workload of the academic. The tasks that are recorded include: course coordination, subject coordination, membership of Faculty and School committees, and the participation in recognized School and Faculty activities, such as, orientation days, course development and early entry interviews which involves interviewing high school students for advanced entry and placement into degrees in the Faculty. The screen shows how the academic has entered four tasks they perform (one general, one subject and two student tasks). The second to last column shows the hourly weighting assigned to the task and the last column shows which of these tasks are approved by the unit head.

FACULTY OF INFORMATICS
Academic Workload Review

YEAR: 2005 SCHOOL: STACS STAFF NAME: Edwin Kwan Last Updated: 27/APE/05

Summary [Print View] [Delete] [Reset]

ADMINISTRATION

Administration: includes course co-ordination, subject co-ordination, membership of and contribution to Faculty and University Committees, participation in recognized Faculty activity, eg Early Entry, Orientation etc, significant involvement in course development, strategic planning, policy or organizational change and day to day handling of paper work, Emails etc.

Found: 4 results

<input type="checkbox"/> Academic administration task being undertaken (please specify)	Campus	Session	Hours of subject co-ordination	Hours of School/Faculty Governance	Hours of University/Coordination Governance	Other Hours	Total Hours	Approved
General administration								
<input type="checkbox"/> Something2	W	1	100	100	100	100	400	<input type="checkbox"/>
Subject Co-ordination								
<input type="checkbox"/> Something3	W	1	100	100	100	100	400	<input type="checkbox"/>
Official Student Activities								
<input type="checkbox"/> Something4	W	1	100	100	100	100	400	<input checked="" type="checkbox"/>
<input type="checkbox"/> Something5	W	1	100	100	100	100	400	<input type="checkbox"/>
Annual Total							400	

Figure 5-7 Administration Screen

The third stage in the workload process is to record the research done by each academic (note the fourth entry in the navigation bar on the left). It aims to capture and quantify both publication and grant outcomes for each academic and there are separate sub-stages for each of these (see the navigation bar). The first of these screens, Figure 5-8, shows an information screen which explains to the user what each section means and how the entries are quantified into hours. The “Teaching” section also has one of these screens which has not been included which describes what is expected of them and how the information is broken down.

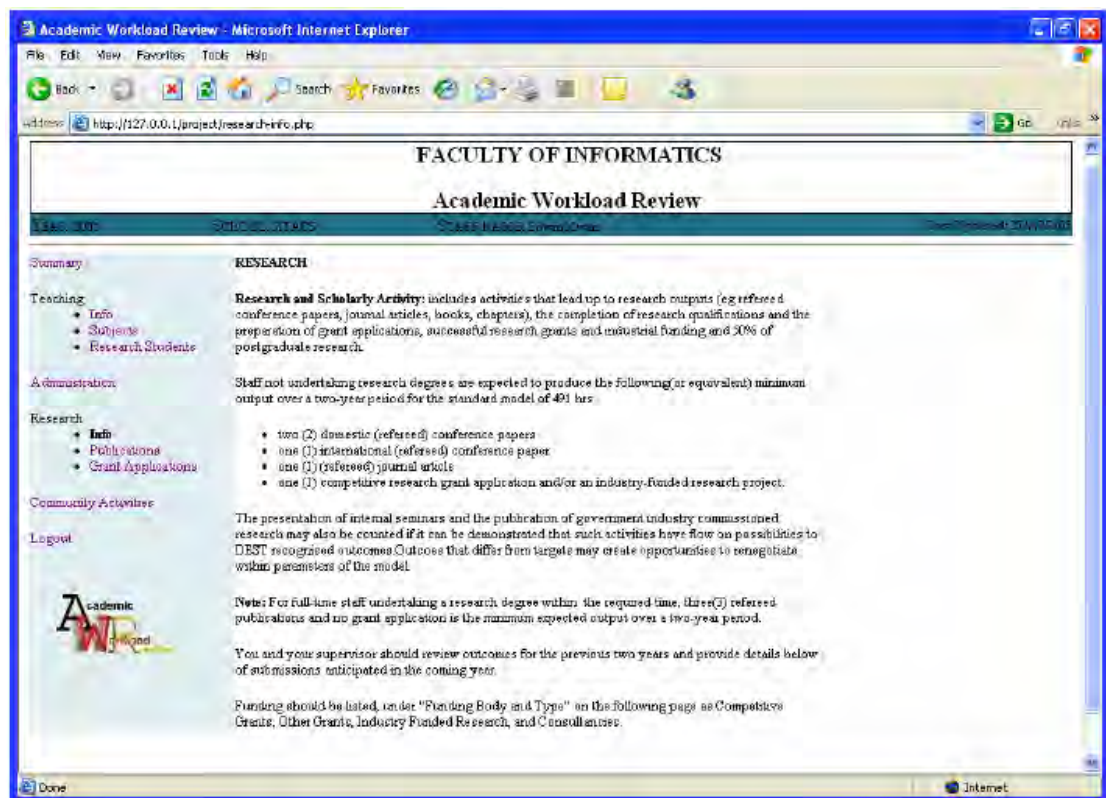


Figure 5-8 Research Information Screen

The first sub-stage of recording Research (see Figure 5-9) is the “Publication” section which captures information about publications that an academic proposes to write in the coming year. It captures all types of publications including journal articles, book

chapters, conference proceedings and so on. The academic enters the title of any publication that he or she plans to write, when they expect to submit the publication, where the publication is being submitted and whether it is a domestic or international publication. The Workload tool is flexible enough to accept the information even if the academic is unsure where they will publish the document, by classifying it as “unknown”. At the time this tool was being developed, none of this data could be automatically generated so the academic would need to add, edit and delete publications as they would for the previous task. It should be noted that the various research outputs are not directly converted to hours of workload. Instead, they are used in negotiations with the Head of School to argue for a reduction in teaching or administrative workloads by high-performance researches. This negotiation can sometimes take several attempts to find the correct balance between the four different categories.

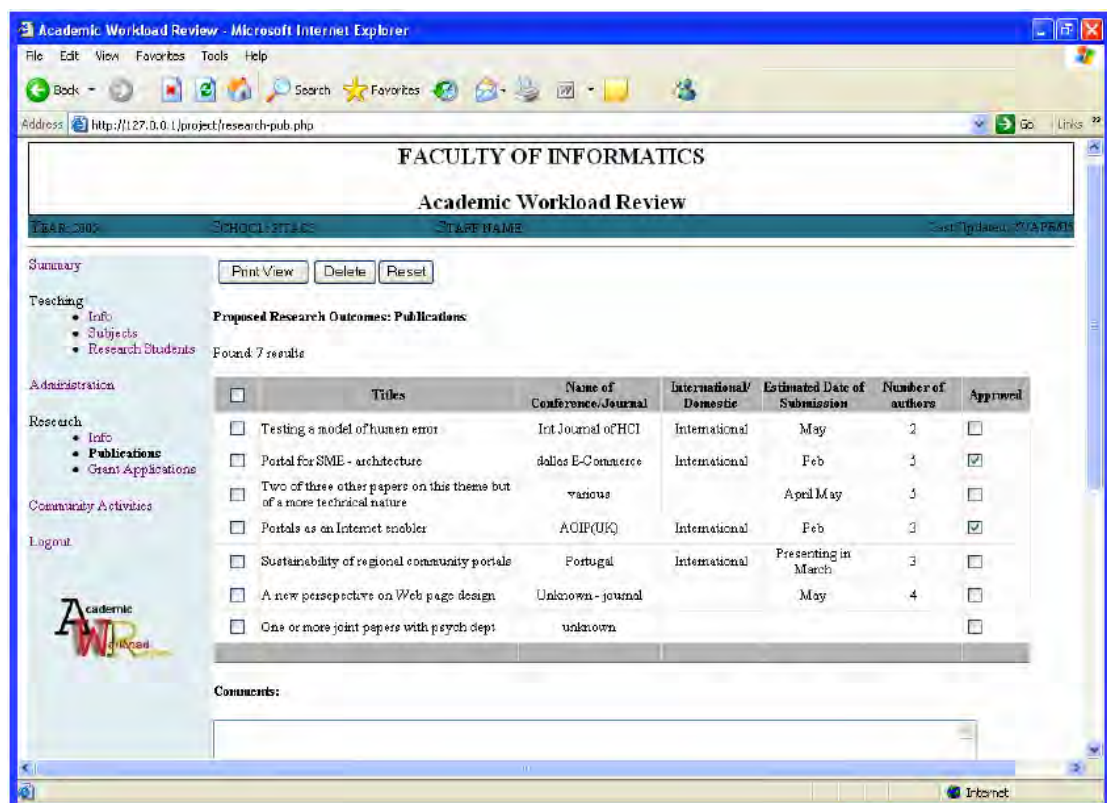


Figure 5-9 Research Publications Screen

The grant sub-stage shown in Figure 5-10 operates much like the publication sub-stage, with the academic entering information about grants they propose to apply for in the following year. The tool records typical grant information like the proposed funding body and estimated amount of the grant. This information is then negotiated, much like the publication information, contributing to the academic's overall workload.

Academic Workload Review - Microsoft Internet Explorer

File Edit View Favorites Tools Help

Address http://127.0.0.1/project/research-grant.php

FACULTY OF INFORMATICS

Academic Workload Review

Home SCHOOL STAFF STAFF INFO MR. Eileen Kavanagh Last updated: 27/06/2004

Summary Print View Delete Reset

Teaching

- Info
- Subjects
- Research Students

Administration

Research

- Info
- Publications
- Grant Applications

Community Activities

Logout

Proposed Research Outcomes: Grant Application

Found 2 results

	Titles	Funding Body and Type	Estimated Amount \$ w UOW	Estimated date of submission	Approved
<input type="checkbox"/>	Regional Community Portals	ARC linkage	\$100k	First round 2004	<input checked="" type="checkbox"/>
<input type="checkbox"/>	e-Market portal for regional SMEs	ARC APA I	\$100k	First round 2004	<input type="checkbox"/>

Comments:

Update Comments

Academic Workload Review

Figure 5-10 Research Grants Screen

The last of the stages that captures information in the workloads process is Community Activities, shown in Figure 5-11. This stage captures work the academic does outside his or her day-to-day work at the University, such as membership of professional organisations, chairing committees or running / participating in conferences. This sub-stage records work by the academic that benefits the University's public and professional reputation and so still contributes to an academic's actual workload. Figure 5-11 shows the academic is only involved in one activity, chairing a conference.

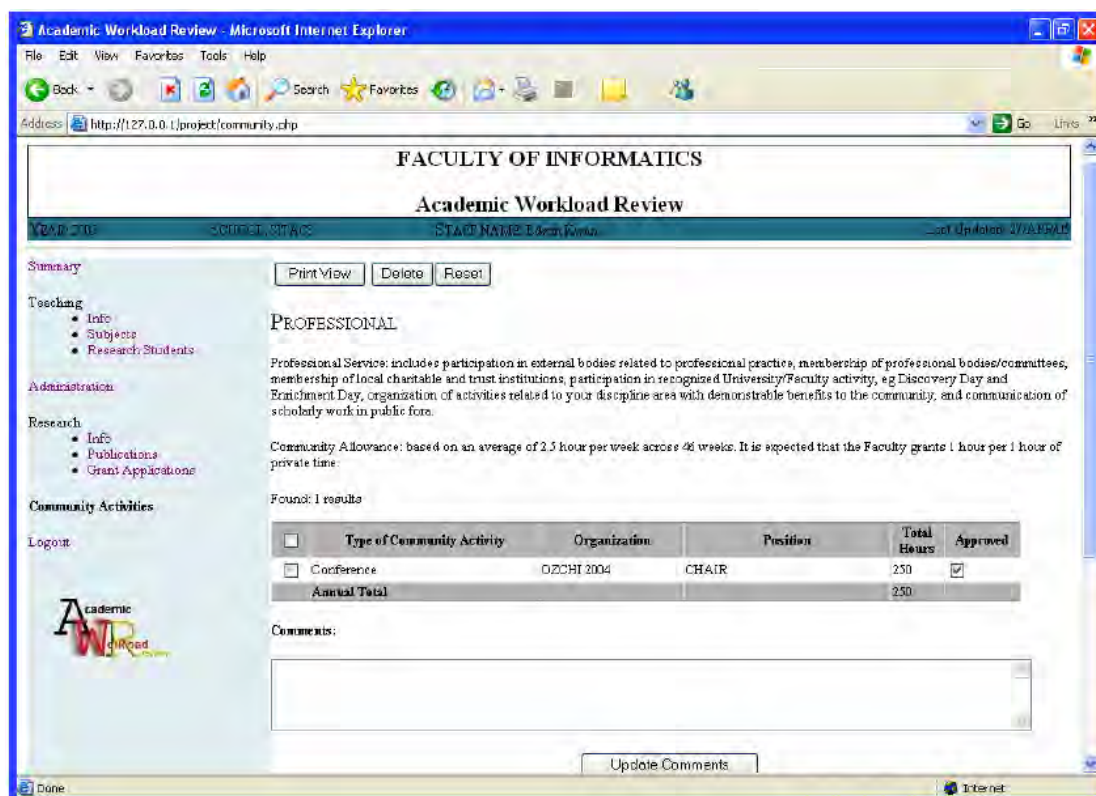


Figure 5-11 Professional Services / Community Activities

As discussed in Chapter Four, once the academic has entered all the necessary data into the workload tool he or she discusses his or her workload with the Head of School. With this new tool, the Head of School can login and review the data for each academic at his or her convenience. This is done by logging in (see Figure 5-3) and checking the admin check box. The Head of the School may then select a member of staff from the drop down list (shown in Figure 5-12) and that academic's workload information is displayed. Part of the problem with the previous paper-based system was that it did not allow for a review of previous documents and comparisons with what the academic had actually done. This was built into the new tool and the Head of School could select previous years and review how each academic was spending his or her time. This was seen as a huge step forward as it allowed for better planning, where strong performing researchers could be rewarded with a lighter teaching or administrative load, while less

productive researchers would be given other teaching or administrative duties to make up their workload.

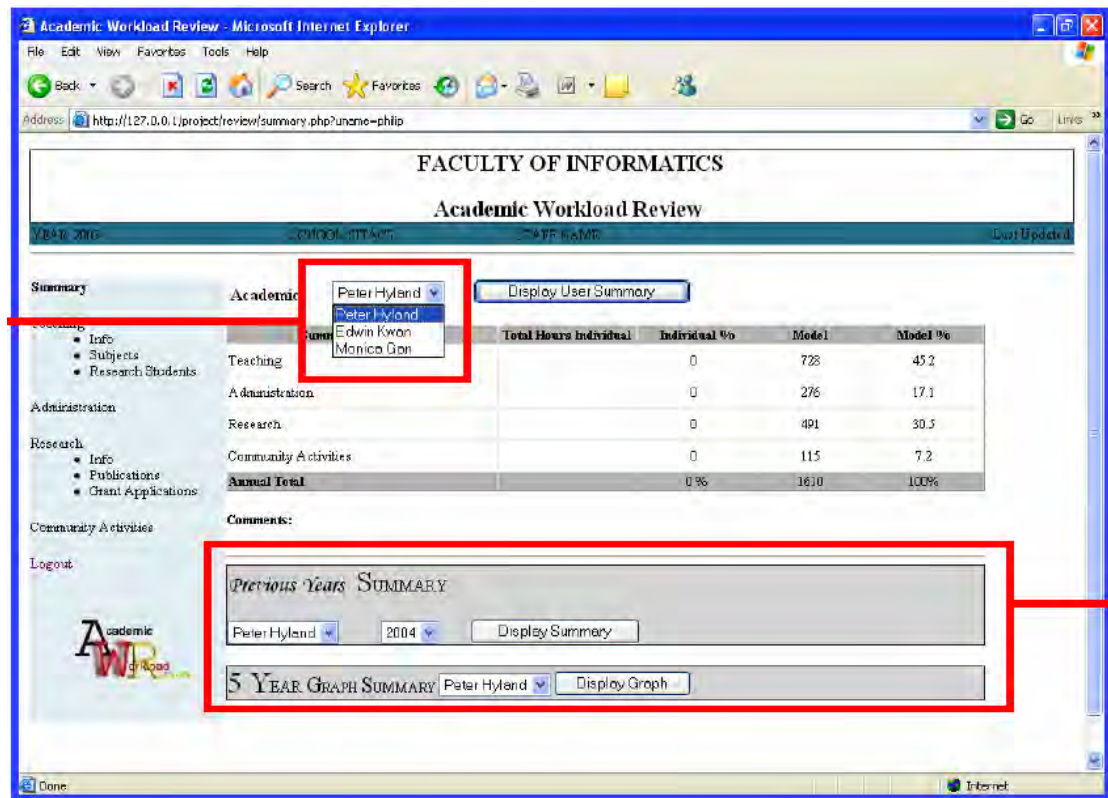


Figure 5-12 Administrator's Main Page

Another feature that was built into the Workload tool was the graphing of the academic's workload distribution over the last five years (see Figure 5-13). This gave a visual representation of how each academic was spending his or her time and was included at the request of the Head of School during requirements gathering. This feature also contributed to a better management of the school as it allowed the Head of School to see those who were underperforming and those who were increasing their performance from year to year. While this function was seen as very beneficial to the School it never came to fruition as the function never became fully operational and therefore these benefits were never truly realized due to the introduction of the

centralised system.

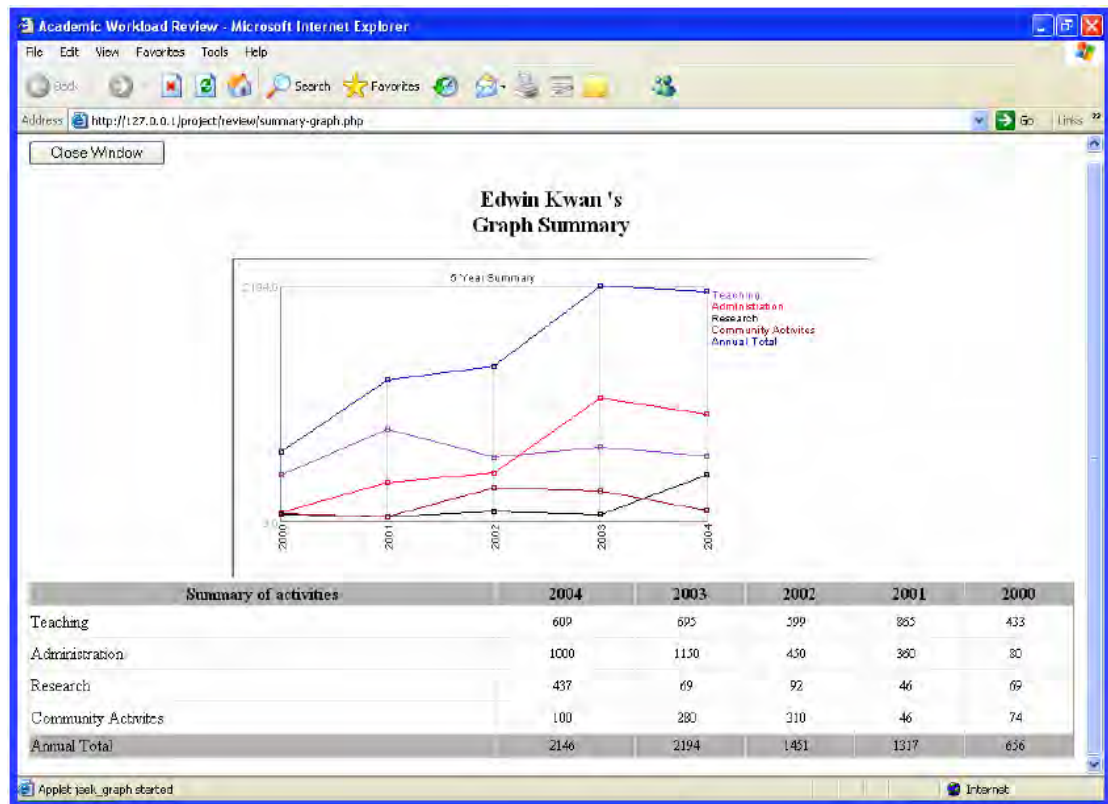


Figure 5-13 Graphing Users Workload Distribution

This feature was the first example of using the information to better utilise academics within the School. It demonstrated to the “middle line” that these tools could be a benefit and was responsible for the expansion of the suite of tools and the continuing of the project after the initial tools were finished.

Although the information in the workloads tool about any individual was not available to other academic staff, it was available to the Head of the School. The ability to compare planned output to actual output made academics much more aware of their own performance against both an agreed form and their own stated goals. This has resulted in improved performance by many academics.

ISSUE 20# - The KM system may directly increase the performance of the operating core and hence the funding / income of the organisational unit.

The second tool that was developed by the project group (PROJECT-01) was the “Who’s Who” tool. This allowed people to search for information, some of which was already available and some of which was not. This was done by drawing information from other sources and also using information gathered through the workloads process that was stored in a local database. Figure 5-14 shows the main page of the search tool and the different categories that someone can search on including:

- Name
- Subject Code
- Subject Name
- Unix ID
- Position Description
- Skill/Expertise
- Role
- List of Postgraduate Course Coordinators
- List of Undergraduate Course Coordinators



Figure 5-14 Who's Who Main Page

While some of this information could be found using other search facilities offered by the University, such as the staff directory on the University's website (UOW, 2007b), a lot of the information was not available electronically or, if it was, it was hard to locate. This is why "Who's Who" was seen as a good chance to incorporate additional information that was being captured by the workload process and use it to the School's advantage. This information included things like roles and skills of staff in the School, allowing people to search and find out who was the fire marshal or the first aid officer, details that were known by only a few people at a local level within the School. Figure 5-15 and Figure 5-16 show an example of a search by position (i.e. senior lecturer). The results display all the senior lecturers in the department and the details the tool has stored about them.



Figure 5-15 Who's Who Search Example Screen



Figure 5-16 Who's Who Search Results Example Screen

This discussion has highlighted the functionality of the first project group's software. As this system was being finalised two other projects (PROJECT-02) and (PROJECT-03) were undertaken to expand on this suite of tools. These tools will be discussed in sub-section 5.7.2.

5.7.1.3 Functionality and System Comparison

Having seen some of the functionality from two of the case studies, it is worthwhile comparing the two approaches at this time.

There was no attempt by EDUC to produce a "Who's Who" tool. This is surprising because the EDUC system must have had similar underlying database sets to the SITACS workloads tool and so could easily have supported a Who's Who tool.

Does this difference depend on the hybrid approach? In theory, we would not expect it to because the hybrid approach is somewhat more constrained than the fully decentralised approach and, as such, we would expect the hybrid approach to produce fewer tools, rather than more. In reality, however, the decision to produce the Who's Who tool appears to have depended on the individuals involved rather than on the approach taken. This observation would seem to disagree with an issue identified in the EDUC case study. Perhaps the degree of autonomy in both decentralised and hybrid approaches is sufficiently similar to allow significant customisation.

Continuing the discussion of the Who's Who tool, it should be noted that it was largely the idea of the Office Manager (Support Staff). This, in itself, is interesting. SITACS is a school whose core teaching and research is "systems development". One might have

expected the academics (Operating Core) in this school to have come up with a host of potential tools. However, the second tool that was developed was suggested by the Office Manager (Support Staff) who has no formal training in “system development” at all. The lack of suggestions for KM tools by academics is probably because they were not actively engaged in the project as a whole. The fact that useful tools were suggested by clerical staff (Support Staff) is an important observation. It suggests that KM tools are often developed or acquired because of a perceived need rather than because they are “the latest technology”. The data in “Who’s Who” was used by clerical staff on a daily basis. Consequently, producing a Who’s Who was a logical result of a perceived need.

While the SITACS case study has given rise to a different tool to the EDUC case study, it is highly significant that both gave rise to a tool which supports workloads. What does this tell us about the KM process in professional organisations? Firstly, it suggests that, although different units in a professional organisation will have minor differences in their operating procedures, many of these procedures will have a high degree of commonality. Consequently several units may need similar KM tools.

Having described the functionality of both workloads tools in chapters 4 and 5, we are now in a position to see several differences. Firstly, there is a difference in the “look and feel”. Can this be attributed to the approach taken in each of the case studies? In fact it can because the developers in the EDUC case study chose their look and feel for aesthetic reasons; it was what the developer thought “looked good”. The developers in the SITACS case study chose their “look and feel” because of their hybrid approach i.e. the “look and feel” was the same as the University’s “look and feel” as set by the

Universities IT support [ITS] in their meeting with the project groups. This resulted in two very different looking systems.

Therefore the approach to KM deployment does lead to some differences in the resultant KM tools. Moreover, the hybrid approach required that the SITACS case study use the same development platform as the University. Given that in both case studies the development platform was significantly different, it is highly unlikely that it would result in the same “look and feel”. So, for two reasons, the hybrid approach was different to the decentralised approach.

However, it should be asked if the “look and feel” would have been the same if both case studies had used the same approach. It is highly unlikely. Any two teams of developers would probably have come up with different aesthetic designs had they been using a decentralised approach due to the unstructured and freedom give in the use of the approach. Although the two approaches have definitely resulted in differences in the KM tools developed, it is likely that these differences would still have occurred even if both groups had used a decentralised approach.

The differences discussed so far are largely cosmetic. However, significant functional differences exist between the EDUC and the SITACS workloads tools. The EDUC tool has been primarily for storing data about research outcomes, whereas the SITACS tool includes data about teaching, administration and community/professional activities and so requires an interface to gather that data and mechanisms to generate workloads from that data. This is a major functional difference.

It is highly unlikely that the approach has directly resulted in the differences seen here. Two other factors have resulted in significant differences in the two KM tools. Firstly, the differences are partly dependent on the history of each tool's development. The EDUC tool was developed out of a need for a tool to publicise the research of a specific research group. The focus of the EDUC case study was on reporting research outcomes. Conversely, the SITACS case study began with the perceived need for a workloads' tool. These different starting points are not a result of the different approaches used but of the perceived needs in each case study. In fact, it could actually be argued that the selection of the approach came about as a result of the way the case studies began. The EDUC case study was driven firstly by the operating core and then later by the needs of middle management which later gave rise to a workloads tool. The SITACS case study was driven initially by the needs of middle management which wanted a workloads tool and later by clerical staff who needed a search tool.

At this stage in the SITACS case study, we already see surprisingly large differences in the functionality of the suites of KM tools built in the first of the two case studies. However, these differences become far less apparent as the SITACS case study proceeds and the fundamental similarities in the two case studies lead the two suites of tools to converge.

5.7.2 Project Two Software Functionality

The Online Publication Auditing System or OPAS was the second project (PROJECT-02) undertaken. An earlier version of OPAS had been developed but it was never deployed due to incompatibilities between the original OPAS platform and the technical environment that the University required. Given the initial success of the Workloads

tool and the Who's Who tool, it was decided to develop a new version of OPAS. This new version involved splitting the project into two parts: one in which the original OPAS would be migrated from its original platform to the one required by the University and the second was to add a new Grants Management tool and integrate it with the existing the OPAS tool.

5.7.2.1 Development Process

A modified evolutionary prototyping method was chosen for a number of reasons. These included the relatively short time available for the project; the technical skills and methodological understanding of the PROJECT-02 group members and because feedback was very important during the development of OPAS as not all requirements were known at the project commencement.

The first step taken by the PROJECT-02 group was to analyse the existing documentation from the earlier version and talk to the project supervisor to clearly understand the requirements for the tool. After the project group had obtained the source code for the original system, a version was used for source control. The technical documentation for the earlier version provided a wealth of information about the structure of the original OPAS as well as how it was supposed to function (Lee et al., 2005a). A meeting was held with the Emerging Technologies Manager from the Information Technology Services (ITS) department of the University to identify the platforms and environments supported by the University as well as other development practices that should be adhered to when developing University-compliant systems. An analysis was then conducted to determine the suitability of using the existing OPAS source code to extend its functionality and make it compliant with University standards

(Lee et al., 2005a). The next step was to re-design the database that supported OPAS. After discussions with the project coordinator, it became apparent that OPAS needed to be consistent with the Who's Who and Workloads tool as all three tools were intended for the same users and all three shared significant amounts of data.

ISSUE 17# - To get the most out of a KM system you need to have as much data as possible.

ISSUE 18# - As the amount of data entry or data modification increases, the cost and workload of support staff will increase.

The PROJECT-02 group began to migrate the OPAS database to a University-compliant platform, i.e. changing the database from MySQL to Oracle 9i, which they did in stages, migrating one module at a time. Regression testing was also done at the end of each cycle to ensure that nothing in the program stopped working (Lee et al., 2005a). Once the migration of the original database was completed, the project group identified the new requirements for the tool. Draft preliminary requirements were received from the project supervisor and a meeting with an Executive Officer from the Faculty checked and refined these requirements. Designs were then made by the project group using expanded BPM diagrams.

Using the BPM diagrams, implementation was done modularly with each member of the project group assigned a module to work on which was then merged using the source control. Once more, regression testing was performed on the complete tool to ensure that all modules worked correctly (Lee et al., 2005a).

5.7.2.2 Technical Specifications

Following the hybrid approach, these tools were built to the same technical specifications as PROJECT-01 with the following three minor changes:

“Platform:

There are no installation requirements for users of the OPAS application. The OPAS client end is platform independent, as it is browser interpreted. This was done to meet the many different browsers used within the University.

Compatibility:

OPAS has been design and written in JSP. The system is browser interpreted and platform independent. Therefore OPAS’s database design would not be suitable for a diverse range of applications.

Installation:

The OPAS package is stored in the appropriate Apache Tomcat 4.0 web directory, which is the web server currently used by [the School] for a multitude of other web-based applications.” (Lee et al., 2005b, pp13)

5.7.2.3 Program Functionality

As Explained in section 5.7.1.3, the functionality of the suite of tools developed by SITACS began to converge with those in the EDUC case study. This convergence is so striking that it is only necessary to examine a few of the following screens to verify this factor.

The redesigned version of OPAS opens with the following login screen (see Figure 5-17). Here the two tools are still divergent because the SITACS tool tries to include the audit process carried out by the library on behalf of the University's Research Office (RO). This audit process was not supported by the EDUC tool but it was, not surprisingly, included in the University-wide tool (See chapter 6)

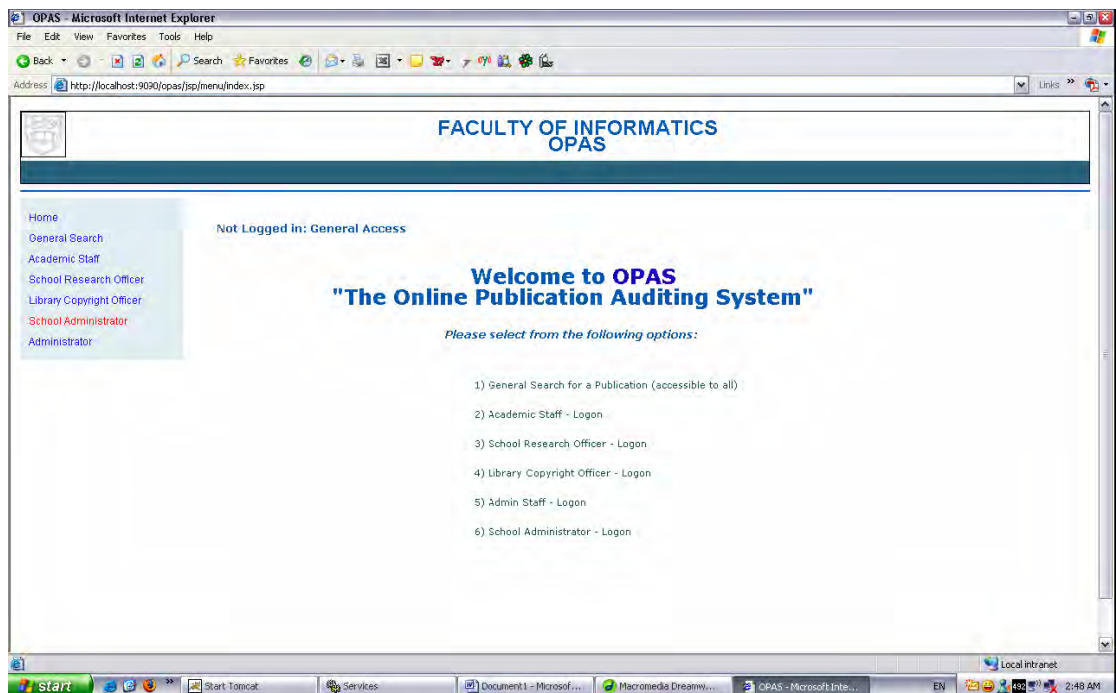


Figure 5-17 OPAS Main Screen

As shown in Figure 5-18, OPAS provides a standard search tool to locate any publication allowing the user to search records in the OPAS database. This search is functionally very similar to the search feature seen in the EDUC tool shown in Figure 4-11.

OPAS Online Publication Auditing System

[Back](#) [Help](#)

Not Logged in: General Access

Search for a Publication

Please complete the form below


Reference No.:	<input type="text"/>
Publication Title:	<input type="text"/>
Publication Author:	<input type="text"/>
Year Published:	<input type="text" value="Year.."/>

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Figure 5-18 General Search Screen

The results of an OPAS search are shown in Figure 5-19. Once again the functionality here is remarkably similar to that provided by the EDUC tool.



Online Publication Auditing System

[Back](#)
[Help](#)

Not Logged in: General Access

Display Publication - Creative Work

Publication Category: J1 - Major Original Creative work		Reference No.: INF019
Publication Title: Opera House		
University of Wollongong Authors:		
Author 1: Peter Hyland	Author 2: 	
Author 3: 	Author 4: 	
Author 5: 	Author 6: 	
Author 7: 	Author 8: 	
External Authors: (Use a comma to separate each author, eg. Mr. John Smith, Dr. Arthur Jones)		
		
Number of UOW authors: 1	Number of external authors: 0	Total number of authors: 1
Publisher Name: Prentice-Hall Inc	Place: Sydney	Year: 2001
For Exhibited Works: (complete only the following fields)		
Exhibition Place: University of Wollongong	Exhibition Date: 01/01/2002	
Place Exhibition Advertised: EAP3	Date Exhibition Advertised: 04/04/2001	
Date 1st Performed: 04/04/2002		
For Published Works: (complete only the following fields)		
Type Of Work: Audio CD	ISBN: ISBN20003z	
Edition: 4	Page Numbers: 0	
For Recorded Works: (complete only the following fields)		
Recording Type: Visual	Recording Medium: CD	
Date of Recording: 28/08/01	Date 1st Performed: 01/01/03	

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Figure 5-19 Publication record Display Screen

Despite the fact that SITACS and EDUC used two different approaches, the results are remarkably similar. This is not surprising because the tools are dealing with “fundamental entities”. A publication in Education is almost identical to a publication in the ICT domain so the tools that manage the “fundamental entities” are remarkably similar.

These fundamental entities exist in other professional organisations: a dental chart, a legal case brief, a medical record etc. We could assume that tools built to deal with the fundamental entities in other professional organisations would also show remarkable similarities to one another but would be strikingly different to the tools used in different professions to manage their fundamental entities.

Returning to the SITACS case study, we observe some differences. The EDUC tool allowed publications to be displayed in different citation styles (See Figure 4-10). The SITACS tool does not support this function. However, the absence of this function does not arise from the choice of a hybrid approach; there is no reason why conformity with University standards would preclude the need to support different citation styles. It might be thought this difference is specific to the ICT and Education disciplines, i.e. ICT publications all use one citation style whereas Education uses several citation styles. However, this is not the case. Computer science publications use a different citation style to publications about ICT adoption, so the missing functionality is also actually needed by SITACS. Why then is it missing? It is almost certainly because the SITACS tool was decommissioned before it was fully mature. If it had been allowed to evolve further, the functionality relating to fundamental entities would have converged even more. Instead it was replaced by the centralised system.

OPAS Online Publication Auditing System

Logout Menu Back Help
Logged in as: Academic

Add New Publication - Book

Please complete the form below

<input type="button" value="Check List"/>		Publication Category: <input type="text" value="Select the category"/>	Reference No.: <input type="text"/>
Book Title: <input type="text"/>			
University of Wollongong Authors:			
Author 1: <input type="text" value="Select a UOW Author....."/>	Author 2: <input type="text" value="Select a UOW Author....."/>		
Author 3: <input type="text" value="Select a UOW Author....."/>	Author 4: <input type="text" value="Select a UOW Author....."/>		
Author 5: <input type="text" value="Select a UOW Author....."/>	Author 6: <input type="text" value="Select a UOW Author....."/>		
Author 7: <input type="text" value="Select a UOW Author....."/>	Author 8: <input type="text" value="Select a UOW Author....."/>		
External Authors: (Use a semi colon to separate each author, eg. Mr. John Smith; Dr. Arthur Jones)			
<input type="text"/>			
Number of UOW authors: <input type="text"/>	Number of external authors: <input type="text"/>	Total number of authors: <input type="text"/>	
Publisher Name: <input type="text"/>	Place: <input type="text"/>	Year: <input type="text" value="Year.."/>	
ISBN: <input type="text"/>	Edition: <input type="text"/>		
<input type="button" value="Submit"/> <input type="button" value="Reset"/>			

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Figure 5-20 Add a New publication Screen

Another fundamental entity is a research grant but only SITACS managed to produce a grant tool. EDUC had plans to get this functionality added to its tool until it was replaced by the University-wide tool, as discussed in chapter 4. The second tool developed by PROJECT-02 was grant applications.

It is interesting to see while one group managed to develop the tool and the other did not. One of the reasons for this concerns the methods used in the project development. The SITACS project used an iterative development method which allowed for reviewing during the development stage and expansion of the project while it was ongoing. SITACS also used several development teams which allowed extra functionality to be developed without the initial project being affected and so remained

on task and on time. With EDUC having only one group writing the system it would have occurred a delay in the initial launch of the system for something that was not considered a priority at the time. The origin of the project also had an effect on what was produced. SITACS was driven by a performance review where grants and publication information were needed and so it was more important to have these included. Whereas, the project in the EDUC case study initially had no interest in grants as the research group was only concerned with managing their own publications. This may explain why the grants information was omitted from the initial EDUC system. Examples of the SITACS grant system can be found in the appendix.

As described at the beginning of this section, OPAS also provided support for the University publication audit process. Figure 5-17 shows the menu items which support this and Figure 5-20 shows the screen completed by the School's audit officer. This audit process requires academics to complete a publication recording form which gives the bibliographic details of a publication and provides documentary evidence that the publication exists and has been correctly recorded.

Figure 5-20 allows the school audit officer to manage this process. Moreover, the tool reduces the workload for academics because there is no need to record the bibliographic details of a publication if it is already recorded in the OPAS database.

One of the motivations for academics to use OPAS was that it not only provided a list of publications for display on the website but also reduce the workload involved in having a publication audited. This audit process is very important because University funding is, in a small part, dependent on publication output. Before the development of

OPAS, the University had actually received less funding than it might have done because either a) some publications were incorrectly recorded and so were eliminated from the funding calculations or b) some publications were neither recorded nor audited because academics “did not have the time” to record their publications or to provide the documentary evidence. Correct recording and more complete recording are two ways the OPAS tool had the potential of directly influencing funding.

As we saw in the EDUC case study, recording of publications and their automatic display on School or Faculty web pages motivated academics to increase the number of quality publications, reduce the recording of publications data in multiple tools, reduce academic workloads and made it easier for more publications to be audited successfully, thereby directly and immediately increasing funding.

OPAS provided a reporting tool, (see appendix A) to further streamline the audit process and a tool that might be used by the University’s Audit Officer. This last screen is a very interesting one. That SITACS produced an audit tool and EDUC did not because a hybrid approach was taken by SITACS is debatable. The hybrid approach is not simply a matter of “look and feel” or of using the same development platform. It is about ensuring that locally-based KM integrates well with organisational systems and procedures. SITACS used a hybrid approach because they were aware of the University’s audit process and endeavored to integrate it. This awareness took place in two phases. Firstly, the PROJECT-02 group became aware of the process at a faculty-level and later at a university-level. If there had been no part of this process at faculty-level, it is uncertain that OPAS would have supported the process at a higher level.

Nonetheless, the hybrid approach has resulted in additional functionality to the decentralised approach.

ISSUE 28# – Some approaches (Centralised, Decentralised, Hybrid) result in functionality that is useful at more levels in the organisation.

5.8 Deployment

To get the software implemented, help was needed from the local technology support unit S-ITS (Technostructure) However, this was a period of time when there was a high turn over of staff in the School. First, work was done co-ordinating with the Head of the School but, when he left just before the task was to be done, this process had to be done all over again with the new Head. Then, an IT support person was assigned to the task and, when he left, the project was stalled until a new IT support person was assigned. This took some time as the School was short staffed and this project was not seen as a high priority. When another person was finally given the project, he made some initial headway but then he too left and the project stalled again. When the backlog was finally resolved and a new IT support person was attached to the project, there were still problems because the previous IT person had used technologies that the rest of the IT support unit was not proficient with. Consequently the third IT support person attached to the project had to spend time learning about the new technologies.

The tools were finally deployed in a pilot form and, after some initial beta testing, alterations were suggested. Before these enhancements were made, the project was shelved because the University announced it was about to implement a system to provide some of the functions of the SITACS suite of tools. It was thought that

academics (Operating Core) would be required to do too much work entering data into the local system only to see it scrapped six months later because of the new University-wide system.

ISSUE 21# - Regardless of the approach taken to KM, there is always a possibility that a centralised approach will dominate.

The proposed University system was, in fact, developed and was called the Research Information System (RIS). The development and deployment of RIS is the third case study discussed in Chapter 6.

5.9 Faculty Progress

To reiterate, due to the introduction of a RIS system, the Faculty decided against deploying the KM tools to avoid double entry of data into competing Faculty and University Systems. However this was not the end of the KM process for the school. The Head of School (Middle Line) still thought that the work that had been done warranted further development. Since a significant amount of work had gone into the three projects and there was some benefit to be gained from the tools, the Head of School decided to employ the student from the PROJECT-01 group who had created the “Academics Workload Review” and “Who’s Who” functions and the central database structure and had him turn these existing pieces of software into a tool set that could benefit the school. He was chosen for his previous knowledge of the tool set and also because he had, since the completion of his section of the tool set, been working as a professional programmer and had significantly increased his skills. The programmer took the initial database structures which he and the other groups had developed and

constructed a new tool that helped manage information within the unit. This is when the SITACS Information Management System (SIMS) was created.

“The SITACS Information Management System (SIMS) is an oracle database that can display data to the user in a format similar to an excel spreadsheet. Users can create new tables and also add, edit or delete information from new or existing tables” (Kwan, 2006). Users of the system can also upload entire Excel spreadsheets into the oracle database or download data from the database and present it in the form of an Excel file (Kwan, 2006).

The main benefit of this system as seen by the school is that the most current copy of any information can be stored within the system and therefore it is readily available to anyone (who has the access rights), anywhere. This system replaced the previous way data was stored in SITACS, which was that “each clerical staff member had his/her own personal Excel spreadsheet for any of the information he/she was personally responsible for or needed as part of his/her duties” (Kwan, 2006). For example the Financial Officer, who is in charge of the process of paying casual tutors, had all the information about tutors (their contact details, what subject they are tutoring etc.) stored on her computer. If for any reason, anybody else in the school needed to find out information about a tutor, they had to go to the Financial Officer and ask for the information. With the introduction of SIMS, the Financial Officer could upload and store the data on the oracle database and anyone with the assigned permission could log into SIMS and view the information (Kwan, 2006).

Another benefit of SIMS is that you can ask the system "questions". The system does this by joining two tables together and outputting the merged values. For example, the Financial Officer stored the details about the tutors, for example which tutor teaches what subject. However he/she did not maintain the tutor's contact details since tutors are usually students whose information was kept by university administration. SIMS merges the two tables together and outputs a new table with the tutors' details and what they teach (Kwan, 2006). While this functionality would be possible with Oracle, SIMS actually provides a simpler user interface with which to do this and clerical staff do not need to become familiar with Oracle.

A user can also choose to view only a subset of the attributes in any chosen database table. For instance the user may only want two attributes: first name and last name, from a particular table; these alone can be viewed and the other attributes omitted. The relevant attributes can then be exported into an Excel sheet which is useful when only some details from a table are required (Kwan, 2006). SIMS has been continually developed for the past three years and is now central to the school's operations and culture.

Although SIMS is regarded by the clerical staff as a great success, its current complexity does raise issues. Staff need to be trained to use the system and it has to be fully documented.

ISSUE 12# - As the system becomes more complex and diverse, the documentation and training that accompanies the system will grow proportionally.

ISSUE 15# - As the KM system becomes more complex the Support Staff and Operating Core will require more training.

SIMS is now so complex that the S-ITS support unit will not support it and maintenance/upgrades are done by the developer.

ISSUE 13# - Making the system simple for the operating core through simple functionality will increase adoption.

ISSUE 14# - Making the system simple will increase the workload of the Technostructure.

Because the SIMS developer is highly professional, he insists on having a detailed set of requirements for each tool and conducts interviews with multiple stakeholders to ensure that he has the specifications right. Consequently, SIMS rarely requires maintenance, only increased functionality.

ISSUE 6# - Correct definition of scope/requirements will affect the amount of redevelopment/maintenance.

SIMS is used regularly, almost daily, by the clerical staff and the Head of School. However, it is not much used by academic staff, except for workloads. This challenges somewhat the issue identified in the EDUC case study, namely: Issue 9 shown below.

ISSUE 9# -. The more varied the needs of the constituent groups, the more elaborate the system will become.

ISSUE 10# -. The more elaborate the system will become the less likely it is to be used by the operating core.

SIMS is not “less likely to be used by the operating core” despite its complexity, but because only some of the functionality is relevant to the operating core. Similarly, SIMS challenges issue 23.

ISSUE 23# – Knowledge Management initiatives are an ongoing process that require constant revision and maintenance.

SIMS has not required “constant revision and maintenance”. It does require occasional maintenance but the revision is more in the form of adding functionality to the system.

5.10 Hybrid Approach

Analysis of this hybrid case study has yielded several outcomes. The first of these is in regard to the Technostructure. From the review of this case study it can be seen that the Technostructure is very important when implementing these technologies and tools at this level of the organisation as they require specialised skills to be successful. There are many examples of when these issues arise within the case study and each of them shows how the Technostructure of the unit contributes to the success of the knowledge management project.

The next issue that was observed was the inclusion of the Operating Core in the identification of the problem. This is essential in identifying problems within the professional organisation. Through SWOT analysis, several problems were identified that were unknown to the Middle Line and Strategic Apex. Because of the unique structure of the professional organisation, where the key stakeholders are in the operating core, they are essential in the identification and solutions to many of the knowledge management issues of the unit.

The Operating Core are also essential in continuing to select areas to move forward with as their involvement is key to the success of the organisation due to the nature of the Professional Organisation. This was seen with the realisation that a new University-wide system was going to be introduced, the operating core encouraged the focus of KM development to shift towards new areas that would assist the unit in new ways.

There have been other preliminary issues observed. These issues are as follows:

- The use of students proved a minor success. Some groups were better than other at the construction of the tools but, as a whole, the experience was successful. It allowed the unit to keep costs down significantly so that when the project was superseded, the unit had not wasted any of its budget on the project.
- With the use of University-standard technologies, it appeared that the software would be distributed to other business units with little need to tailor them to the needs of those units, unlike the situation with FMS (see Chapter 4)
- The workloads project was chosen as it would have decreased the workload of the Operating Core. This meant that there was significant interest from the

academics and reveals the fact that the culture of the unit was open and willing to change if the project seemed worthwhile.

- Once the project was scrapped, parts of the system were taken and transformed into a new system to assist with other tasks or activities within the unit. The use and success of SIMS is yet to be analysed.
- The eagerness of the Strategic Apex to change things meant that there was strong leadership to drive the project. This was seen again when the project was superseded by the University-wide system, as the Strategic Apex moved to capitalise on the existing work that had been done and transform to solve other problems. This is similar to the situation in Education when the centralised system made their FMS system redundant. (see Chapter 4).

The case study has identified a number of aspects of KM deployment that are unlikely to occur in other organisational types, such as the Entrepreneurial or the Machine type. These include the significant power the Operating Core wield when making decisions and choosing what projects are undertaken. With the Professional Organisation dependent on its highly skilled workers, it makes sense that they choose the areas that need improvement, and that they be consulted on future directions the unit should take. A hybrid approach was taken in the case study, with the unit consulting University groups on technical issues, however, it still operated on its own when it came to construction and deployment. This approach seems to be well-suited to a Professional Organisation because it allows the professionals to be involved actively in the requirements, determination and development of the functionality of the KM. However, our case study shows that many of the benefits of KM were to be derived from the Technostructure group rather than the professionals themselves. The hybrid approach

was also well-suited to the development of KM for the technostucture in a professional organisation. However, it is unclear from a single case study as to whether it would meet the needs of the professionals themselves.

Chapter 6: Research Information System (RIS)

Case Study

6.1 Introduction

To further the research on how knowledge management (KM) is deployed within a professional organisation (Australian university) and how it can be done effectively, this chapter examines the third of the three case studies discussed earlier. This case study spans the entire University and so affected all faculties and schools within the University. The Research Information System (RIS) is a University-wide project similar in function to the previous two systems. This project followed the ‘Centralised’ method discussed previously in chapter 2.

6.2 Background to the University

To understand the complexity involved in the RIS project, it is necessary to get a grasp of the complexity of the University and its research activities. The University describes itself as “An enterprising institution with a personalised style, [the University] is confidently building an international reputation for quality research and education” (UOW, 2007a).

6.2.1 Origin

In 1951 a division of New South Wales University was established in Wollongong. Ten years later the division became the Wollongong College of the University of New South Wales. In 1975, the New South Wales Parliament incorporated the University of

Wollongong as an independent institution of higher learning (UOW, 2007a). This institution ran until 1982 when the University amalgamated with the Wollongong Institute of Higher Education (originally the Wollongong Teachers' College, started in 1962) (UOW, 2007a). This merger was used as the basis for the new organisation which in the 1980s prospered and grew leading to the emergence of the University's current form was realised.

As stated on the University's website, over a 50-year period, the University:

“has grown from a provincial feeder college with 300 students to an international university with over 18,000 students spread across three campuses and five access centres. Originally established as a provider of technical education for engineers and metallurgists required for the region's steel industry, the University now offers a wide range of courses across nine faculties - Arts, Education, Health & Behavioural Sciences, Engineering, Law, Science, Informatics, Commerce and Creative Arts. These faculties incorporate 40 teaching units with some 760 members of academic staff and 1,600 staff overall.

Since its foundation, the University has conferred more than 52,000 degrees, diplomas and certificates. Its student population, originally drawn predominantly from the local Illawarra region, is now comprised of students from over 70 countries with international students accounting for more than 30 percent of total enrolments.” (UOW, 2007a)

6.2.2 Structure

The University has developed over the last 50 years into a multi-campus institution. The main campus is on the original site, five kilometres north-west of the city centre in Wollongong and now covers an area of 82.4 hectares with 94 permanent buildings including 6 student residences (UOW, 2007a). There are 2 other campuses that make up the University; the Dubai Campus in the United Arab Emirates and the Shoalhaven Campus at Nowra on the New South Wales South Coast (UOW, 2007a). In addition, there are University Education Centres in Bega, Batemans Bay, Moss Vale and Loftus, as well as the Business School in Sydney (UOW, 2007a). The University also offers courses in conjunction with partner institutions in a number of offshore locations including Singapore, Malaysia China and Hong Kong (UOW, 2007a).

The University has a highly structured top end or strategic apex (Mintzberg, 1979), as shown in Figure 6-1.

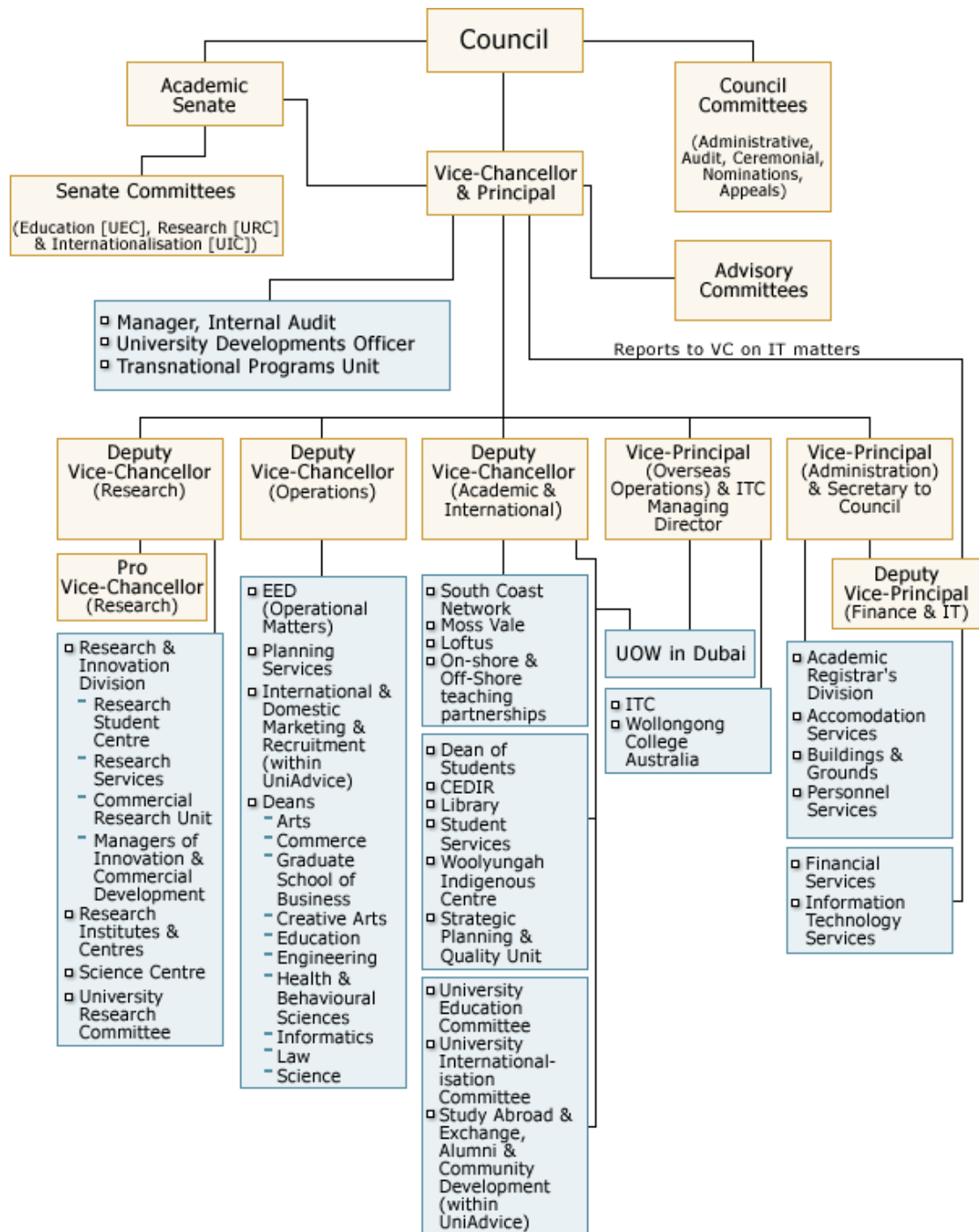


Figure 6-1 University of Wollongong Strategic Apex Structure (UOW, 2007a)

This complex structure had a significant impact on the current case study as it highlights the complexity associated when dealing with the University as a whole and not just one of its smaller faculties or schools. Below this structure are the faculties, led by a Dean, and, in most faculties, below that are schools led by more middle line managers (Heads

of Schools) and then the operating core. When dealing with the University as a whole, there is a complex organisational structure in which a project manager must navigate between the different organisational power structures and pulls as well as the differing organisational cultures as you move from faculty to faculty. This can, in some instances, make even the simplest of tasks quite difficult, as will be shown later in the case study.

ISSUE 30# Increasing the scale of the project may increase the likelihood that organisational politics, culture and power will impact the project.

6.2.2.1 Key Statistics

The following (Table 6.1) are some basic statistics to give a perception to the size of the organisation before the current case study was to begin (2006) (UOW, 2007a).

Table 6.1 University Statistics

Total Student Enrolment:	22,754
Undergraduate	14,904
Postgraduate	7,140
Non-Award/Cross-Institutional Enrolment	710
Total International Enrolment:	9,114
International Onshore	5,218
International Offshore	3,896
Staff Numbers:	
Full Time Academic staff	747
Full Time General staff	730
Graduands:	
Doctorate Completions	104
Masters Research Completions	48
Annual Values of Grants	
National Competitive Grants	A\$13.0M
Other Public Sector Grants	A\$2.8M
Industry Grants	A\$4.8M
Cooperative Research Centres	A\$2.5M

6.2.3 Research Structure

The current case study concerns a system to support the University's research activities. To understand this we need to understand the complexity of research across the University and its importance to the success of the organisation.

“The University has always had a strong research focus and has developed an international reputation for its applied research (often in partnership with industry or government) in areas relevant to national economic, technological and social goals. It is home to eight Research Institutes and three ARC Key Centres for Teaching and Research - in Smart Foods, Bulk Solids and Particulate Technologies and Asia Pacific Social Transformation Studies. In addition, the University is a partner in four Co-operative Research Centres (CRC) - in Intelligent Manufacturing Systems, Railway & Engineering Technologies, Welded Structures and Smart Internet Technology.

The University has developed as a State "Centre of Excellence" in telecommunications. It is one of the largest sites of information technology, multimedia and telecommunications research in the Southern Hemisphere. Other areas of expertise include superconductors, intelligent polymers, steel processing and products, microwave technology, biomedical research, medical radiation physics and environmental research.

The University's strength in collaborative research was acknowledged when in 1999 the University was announced joint winner of the Good Universities Guide 'University of Year' Award for 1999-2000 for its "Outstanding Research and Development Partnerships" (UOW, 2007a)

The need to manage such research structure also had a significant impact on the current case study.

6.2.4 Research Services Office (RSO)

The Research Services Office was the starting point for the Research Information System (RIS) project, due to their heavy involvement with publications and grant information. As stated on their website, the objective of the Research Services Office is to “collaborate with University research staff to achieve excellence in research and thereby to ensure the University retains its position as a leading research institution” (Research Services Office, 2007). The Research Services Office has three main duties:

- Firstly, it is the “central co-ordination point for the University's research grant activities and provides guidance to academic staff on developing, submitting and managing research grants” (Research Services Office, 2007). This means that it is responsible for most grant applications within the University and maintains records of both successful and unsuccessful grant applications.
- Secondly, it is also responsible for managing all research ethics (human and animal and gene technology) for University staff and students.
- Finally, it is also responsible for managing the development and maintenance of research information systems and research performance data. This includes data on things like publications and the data required for the reporting on the Research Quality Framework (RQF).

6.2.5 Research Quality Framework (RQF)

To understand the University's motivation for developing RIS, it is necessary to understand a little about the proposed Research Quality Framework (RQF).

The Research Quality Framework (RQF) was a scheme initiated by the Australian Federal Government and Department of Education, Science and Training (DEST) to develop an assessment structure for Australian research institutions (Universities). RQF was to be assessed through an internationally recognized process and involves assessing research performance across research institutions.

6.2.5.1 Origin of the Research Quality Framework

As stated on the DEST website, the RQF was instigated in May 2004 when the Prime Minister announced that the Australian Government was going to establish Quality and Accessibility Frameworks for Publicly Funded Research as part of the Backing Australia's Ability – Building our Future through Science and Innovation initiative (DEST, 2007a)

The website stated that the aim of the Research Quality Framework initiative was “to develop the basis for an improved assessment of the quality and impact of publicly funded research and an effective process to achieve this.” (DEST, 2007a). The site claimed that the framework should:

- Be transparent to government and taxpayers so that they are better informed about the results of the public investment in research.
- Ensure that all publicly funded research agencies and research providers are encouraged to focus on the quality and relevance of their research; and
- Avoid a high cost of implementation and imposing a high administration burden on research providers.

The website stated “Two frameworks for publicly funded research are to be developed in consultation with universities and publicly funded research agencies: a Research Quality Framework to measure the quality of research conducted in universities and publicly funded research agencies, as well as its benefits to the wider community; and a Research Accessibility Framework to ensure that information about research and how to access it is available to researchers and the wider community. The Government is providing \$2.8 million over two years to support the development of the frameworks.” (DEST, 2007a).

The recommended research quality framework developed by the RQF development Advisory group is shown in Figure 6-2 below.

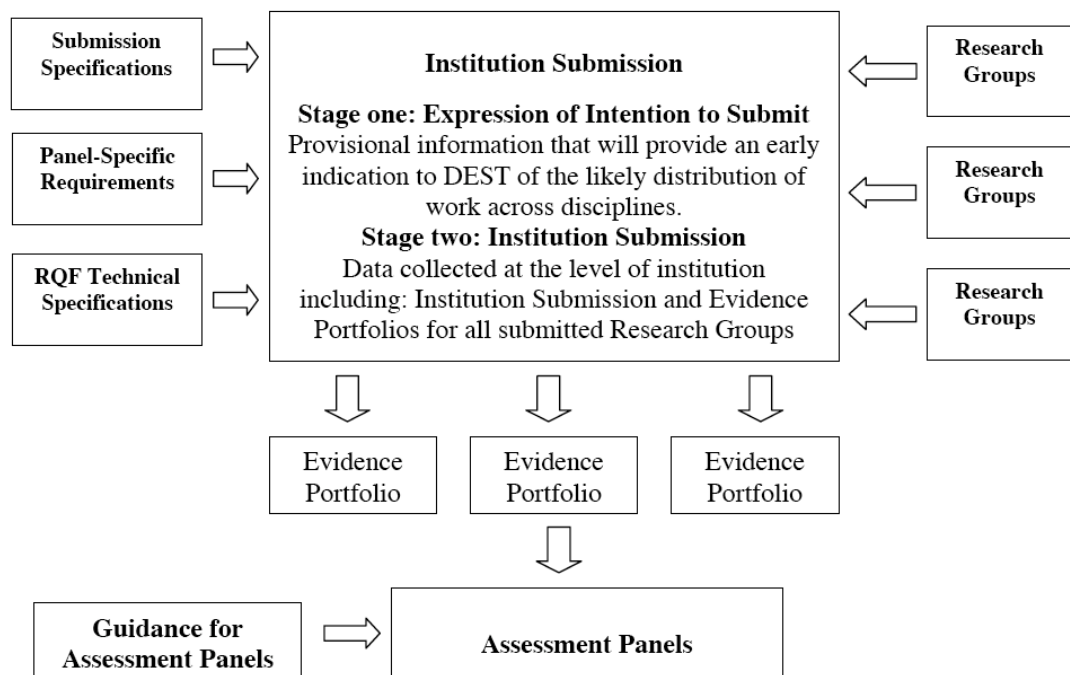


Figure 6-2 Recommended RQF (DEST, 2007b)

The reasoning behind the incorporation of a Research Quality Framework as stated on the Department of Education, Science and Trainings website, was that:

“The Australian Government makes a major investment in research, science and innovation (totalling over \$5 billion in 2003–04).

Currently there is no robust and consistent way to measure the quality of research conducted in universities and publicly funded research agencies and its benefits to research and the wider community.

Nor is there a mechanism through which a researcher or member of the community can be sure that he or she is aware of all the research that has been done in a particular field and how to access it.

The Research Quality and Accessibility Frameworks will address these gaps. They will also help institutions to focus on improving the quality and impact of their research and make it easier for researchers from different institutions and agencies to network and collaborate.” (DEST, 2007a).

In order to gauge the effectiveness and functionality of the Research Quality Framework, a trial run was held in 2007 with selected universities participating to see if and how the process worked.

6.2.5.2 RQF Pre-Implementation Trials

Trials were conducted in May/June 2007 for periods of about six weeks in which 13 universities (including the one being studied in this thesis) participated. Based on these trials some recommendations were made and the following is a diagram (Figure 6-3) showing how the revised RQF was to work.

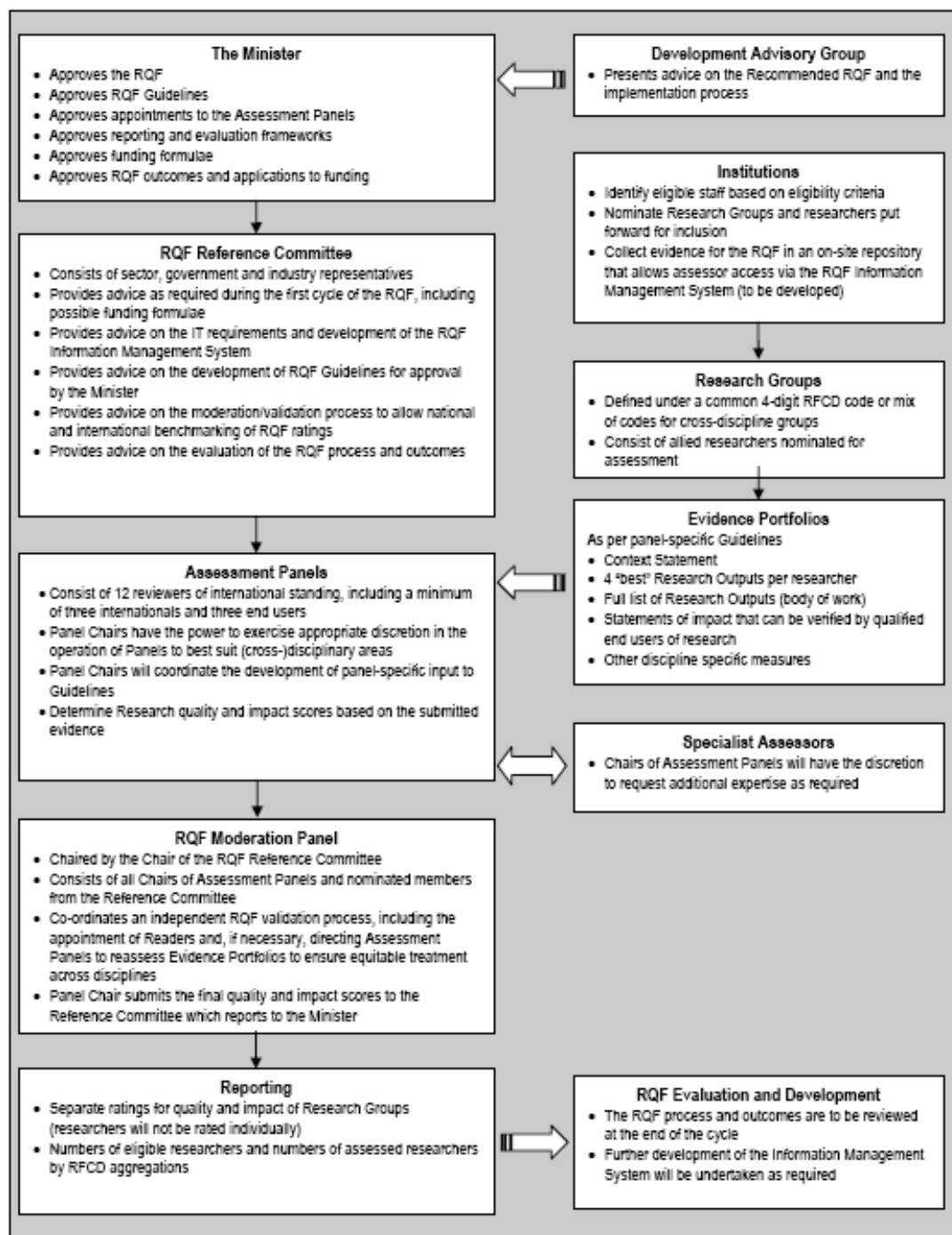


Figure 6-3 The RQF process in detail (DEST, 2006)

The relevance of this is that neither of the previous two case studies took the RQF process into account when developing their tools. Both the previous case studies each had their own driving factors that led to the creation of similar tools but both were for “local” or “independent” issues, unlike this case study which had both internal and external factors driving the project. While neither of the two previous case studies took the RQF into account, the data collected by them would have been useful to the RQF, deriving an unexpected benefit for the two case study organisations. Moreover, the complexity of the reporting for RQF made it vital that the University could track all of the RQF data and this coincidentally provided a KM tool for the whole campus. Unexpected benefits arose from this tool, with researchers being able to compare performances with other academics and allowing them to become aware of other possibilities and avenues for research funding, research publication and research collaboration.

ISSUE 19# - New KM systems may create a need for staff to have access to considered private or sensitive information that they previously did not.

6.3 Initial Phase of Research Information System (RIS) project

The previous two case studies were selected for the current research because they were based on the “decentralised” or “hybrid” methods described earlier and were successful in the identification, development and initial implementation of a set of KM tools. An interesting factor that came from these two case studies is that they both ended up building separate systems to deal with similar issues. However, both case studies were at different stages of implementation when the University announced that it would build a system based on the functions and business processes that the two groups, SITACS

and Education, were currently working on. This new University-wide system would make their systems redundant. This new project, the Research Information System (RIS) then became the third and “centralised” case study because it was to cover every part of the organisation, based on the requirements and design of the central management.

The idea for the RIS was derived from the Research Services Office (RSO) who needed to update many of the current systems they used to manage the research performance data of the University. With the expected introduction of the Research Quality Framework (RQF) and the consequent need for accurate data and detailed reporting on research performance, this was seen by the strategic apex as the ideal time to review current practices and develop better systems. This led the RSO to employ an external consultant who assessed the University’s research systems and framework. As a result of the analysis a report was produced summarising the findings and recommendations of the consultant’s work. As stated in the report, the primary objective of the project was to “review and improve the University’s research information systems framework” (Cole, 2005).

The report describes the four major aims that the project was to cover. These were:

- a. Map the research data needs of UOW senior management, academic and administrative staff and key stakeholders;
- b. Assess the capability of current UOW information systems to meet needs and identify gaps;
- c. Investigate whether research information systems used by other Universities could be adapted to meet UOW’s identified needs;

- d. Make recommendations for the implementation of a new integrated research information system. (Cole, 2005).

The initial report outlined the background to the project and the key issues that were to be addressed by the proposed project. The following is an extract from the report:

Project background:

“There are currently a number of separate information systems, each used by different areas of UOW to collect and report on key research performance indicators such as:

- HDR students (enrolments, completions, scholarships, etc);
- research income (grants, contracts, consultancies, etc);
- research publications (books, book chapters, journals, conference papers etc)
- research staff (FTE, supervisors, AOU)
- faculty data collections

Key issues:

Problems arising from existing information systems include:

- lack of access to data by key staff in faculties and Research Strengths;
- stand-alone databases without online interfaces means data collection (e.g., publications) is time-consuming, cumbersome, current systems are not meeting needs;
- lack of integration and communication amongst current systems developed and maintained by different administrative units leads to duplication of effort;
- fragmentation of systems leads to significant difficulties gathering reliable and accurate data for internal and external reporting purposes.” (Cole, 2005).

This report highlighted the current problems facing the University and showed how some current business processes could be improved. The report also detailed a current systems overview and how each of the systems were independent of each other and how the data in them was used by several different units within the University. From this initial report a more detailed report was produced which included the findings of the investigation of the consultant. This second report was presented to the strategic apex of the university several months after the initial report and included a review of existing software, a project overview, scope, indicators, budget and recommendations for the University. The most significant issues to come from the report were the significant cost savings to the University if they built the system themselves using their in-house technostucture (figures withheld at request of University management). Also noted was the effectiveness of the current software to meet the highly specific needs of the University as apposed to the ability to build exactly what was needed. This is highlighted in the table below taken from the report (Cole, 2006):

Table 6.2 Package Comparison Table (Cole, 2006)

Required Characteristics	Research Master	infoEd	UOW RIS Project
1. Integrate/replace all downstream, standalone and faculty databases	5	5	10
2. Web-enabled	3	10	10
3. Links to core systems	6	7	10
4. Achieve ITS core system status	5	5	10
5. Appropriate security and verification	5	6	10
6. Tailored to UOW environment	6	3	10
7. Effective access to research data by appropriate groupings/segments	6	6	10
8. Enhanced reporting	6	7	10
9. Gathers research data at source	4	7	8
10. Ongoing flexibility in meeting new requirements/ongoing support	5	4	10
EFFECTIVENESS RATING	51/100	60/100	98/100

The table compares two off-the-shelf products to a custom built product. Ten highlighted characteristics were given a score out of 10 in order to create a way to compare the three products. A score of 1 was given if it was far from meeting the needs of the organisation and a score of 10 was given if it did. The results can be seen in the table (Table 6.2)

The initial phase of the assessment process looked at the existing systems to assess their strengths and weaknesses, in particular looking for ways in which improvements could be made to improve RSO management of data. This analysis identified several areas within the current processes used by the Research Services Office that could be improved (see in the key issues on page 182).

Once these issues had been identified, RSO set about finding a solution. The consultant looked at software currently available both externally (i.e. commercially available) and software that was already being used within the organisation (this included the tools produced by the other two case studies).

In the end, it was decided by the external consultant that the RIS system would be built internally because many of the existing systems are also produced in-house and this would allow for better integration of those systems with RIS.

As stated in an interview with the consultant “RIS was to be based on the Faculty of Education’s Faculty Management System (FMS) (the system from the “decentralised” case study)” (Interview, 2005a). It was chosen because it met the criteria for the new system and the staff at EmLab, who developed FMS, were available to assist in making it a University-wide system which was a “crucial factor” (Interview, 2005a) to the consultant.

ISSUE 2# - The competence of the Technostructure will affect the decision to build or buy the system.

However, the code for RIS had to be completely rewritten to cater to the University’s stringent technology policies and to meet the new requirements caused by the inclusion of other faculties with different needs. Figure 6-4, shows the organisation workflow that the initial RIS system was to transfer into, that is, it had to go from its current form into a more refined digital process. This diagram was also used to show the developers how

the RIS system would be expanded from the original FMS to incorporate new organisational steps not included in the original version.

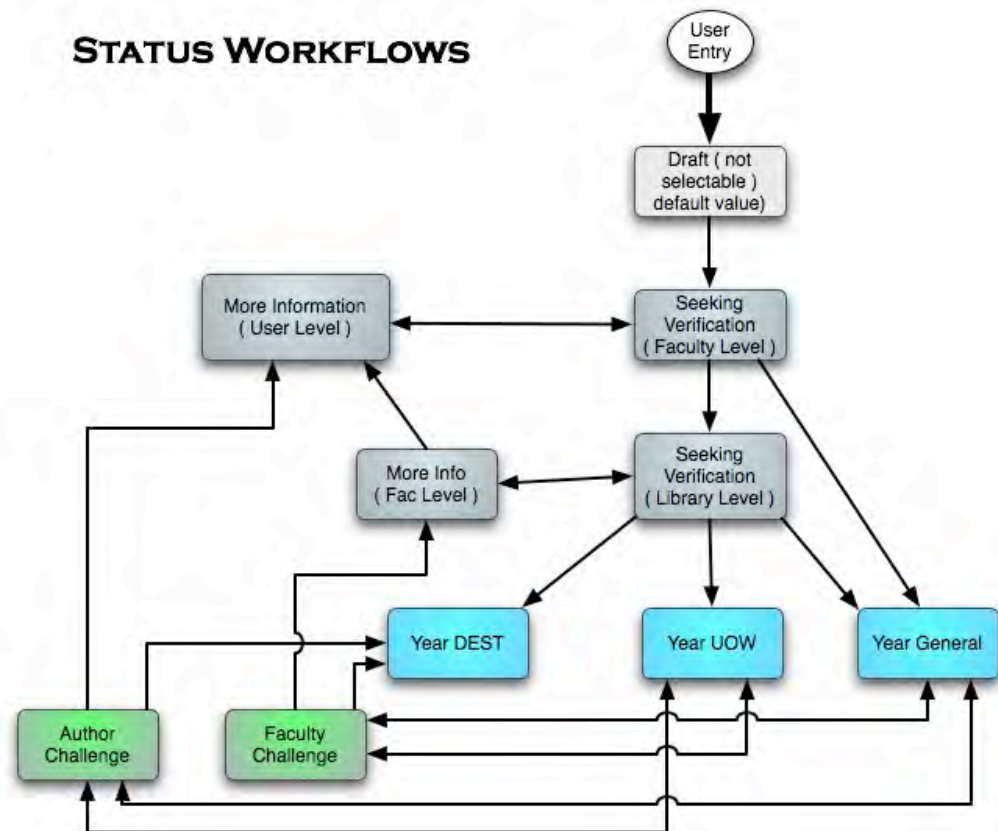


Figure 6-4 RIS System Status Workflows

6.4 Task Selection

The first part of Research Information System (RIS) was developed over a period of approximately six months and then testing and bug fixing took place over the next two months, as did the inclusion of several other requirements that had appeared during the course of the build.

ISSUE 6# - Correct definition of scope/requirements will affect the amount of redevelopment/maintenance.

Even though a formal and lengthy requirements determination had been undertaken, the scope of the RIS tool was still poorly understood because of the different requirements of many different faculties and research centres. With each organisational unit being highly specialised, each unit often had its own unique requirements that despite the lengthy requirements determination had still not been fully captured.

This initial part of RIS would focus on recording publications, recording and maintaining research clusters of staff and building better public profiles for members. Below (Table 6.3) is an outline of what the project set out to do and the initial timeframe.

Table 6.3 Proposed Timetable

Stage 1 - Build faculty-wide, core system - EMLAB, ITS	Stage 2 - Final user analysis and rollout of RIS (1.0) - RSO, EMLAB, ITS	Stage 3 - User requirements for RIS(2.0) - RSO	Stage 4 - Build and implement RIS (2.0) - RSO, EMLAB, ITS
1/06 Build	1/06 Analysis	Digital repository Document handling IP management Enhanced portal Enhanced marketing	
end 6/06	end 6/06	Respond to user feedback Any new RQF	
	Deploy Publications end 7/06 Grants end 9/06 Ethics end 11/06 HDR students RIS(1.0) end 3/07	Begin RIS 2.0 Specs. end 3/07	
			Build and implement RIS (2.0) end 12/07

6.5 Development Phase

To begin the project, a review was undertaken of the functionality of the existing FMS and the functionality that would be needed in a University-wide system.

6.5.1 Differences Between FMS and RIS

Figure 6-5 shows what was already done in FMS and what would need to be produced to make it into RIS. The actual functionality is explained in section 6.7.

Area	Functionality	Completed within FMS
Group Management	Creation of multiple faculties	✗
	Creation of multiple groups within a Faculty	✓
	Creation of a Super UOW Group	✗
	Captures Group Details	✓
	Captures Faculty specific details	✗
	Assign members to roles within a group (Publication Officers, Web Masters)	✗
	Assign Coordinators	✓
	Group Membership management	✓
	Group Position Set Management	✗
	Group Position management	✓
	Member position management	✓
	Group Wide Emails	✓
	Group CV/Report Helper Tool	✓
	Open/Closed Groups	✓
	Email Coordinators about new members to open groups	✗
	Form for requesting to join closed group	✓
	Email Coordinators when a member leaves an open group	✓
	Form for requesting to leave a closed group	✓
	Design Templates	✓
People Management	Allows for 3 different member types	✓
	Common attributes for all 3 types	✓
	Specific attributes for Staff	✓
	Specific attributes for Post graduate students	✓
	Specific attributes for Externals	✓
	Sync with SMP for Post graduate students	✗
	Sync with Payroll for Staff	✗
	Non central syncing staff and students	✓
	RADIUS authentication	✓
	Personal Info management	✓
	Upload a photo of themselves	✓
	Indicate if a person has a personal page or not	✓
	2 levels of Access, Admin/Normal	✓

	Unlimited Access for Admins	✓
	Ability to keep external profiles up-to-date	✓
	Handle changes in name	✓
Publication Types	Dynamic Publication types and rules	✓
	Non normal Attributes	✓
	Admin ability to define and modify publication types, through the site	✓
	Switch Publications between types without losing data	✓
Styles	Support multiple styles per Publication Type	✓
	Ability to use styles anywhere (website or document export)	✓
	Ability to have styles which display authors alphabetically instead of by primary/secondary	✗
Publications	Enter a Publication	✓
	Unlimited number of Authors	✓
	Unlimited number of Editors	✓
	Author/Editor able to be any of the three user types	✓
	Quick and Easy Author/Editor management	✓
	Quick way of adding new external authors	✓
	Consistent author/editor order	✓
	Check if a publication is already in the system	✓
	Automatic email to all UOW authors/editors involved	✓
	Have place for workload percentages	✓
	Publications to have a single owner	✓
	Ability to reassign the owner of the publication to any UOW member	✗
	Restricted view access for Normal users who aren't the owner of a publication	✓
	Quick email from Publications details page	✓
	Publications assigned to a particular group	✓
	Parents to display children's publications as well as their own on the public portal	✓
	Import last 5 years worth of Publications	✗
	Define search criteria for the publication list under publication management	✓
	Sort the publications list by either Date or Title	✓
	Email members every time their % is changed	✗
	Have a URL which can be pointed at a file copy of the publication, no matter where the publication is	✗
Workloads	Allow Faculties to indicate that they wish to use the workloads side of publications	✗
	Workloads values on a per Faculty level	✗
	Workload reports	✗
CV/Report Helper	Export lists of publications to Microsoft Word	✓
	Define what publications to export	✓
	Define the sort order by publication type	✓

	Choose the quotation style when exporting	✓
	Have personal details included if desired	✓
Verification	Multiple verification status	✗
	Change status and provide comments why it was changed	✗
	Quick views for faculty Officer and Library on what's waiting to be verified	✗
Public Portal	Each group to have its own portal	✓
	Portal's Intro Page	✓
	Publications list page	✓
	Ability to search on the publications page	✓
	Ability to sort on the publications page	✓
	Members names to appear as hyperlinks	✓
	Members list page, sorted by position	✓
	Personal profile page for members	✓
	Ability for groups to define what info to display on personal pages and what not to	✓
	Hide areas which have no info for the selected member	✓
	Link to the member's publication list	✓
	List which Research Students a staff member is supervising	✗
Meeting Core Status	Ensure front-end back-end integrity	✗
	Java	✓
	Oracle	✗
	Adequate audit trails	✗
	SOLS/WebKiosk Interface	✗

Figure 6-5 Outline of functionality of RIS and what needs to be done (McKerrow, 2006)

Analyzing the table it can be seen that the vast majority of the RIS functions were already provided by FMS. However some functions were added such as “Creation of Multiple Faculties” directly as a result of the increase in the scope of the project. Others were additional functions which could not be provided by FMS because the Education Faculty did not have access to other corporate systems. For example, the “Synch with SMP for PG students” (synchronise with Student Marks Package for Postgraduate students) requires access to private postgraduate student information in the centralised University systems. This function could have been provided in FMS if the Education Faculty had been given access rights to the corporate SMP database used to manage student results. However, faculty projects do not have such access; the function could

not be supported until it became a University-wide system. So one of the advantages of a centralised system is that it conveys access rights which in turn support a higher degree of integration. Finally, some functions were simply extensions to the functionality provided by FMS, e.g. “Email co-ordinators when a member leaves an open group”. This function is not about the change in scope to a University-wide system, nor is it connected with increased integration with other university systems, it is simply a useful function that was overlooked in the original FMS.

6.5.2 Critical Organisational Criteria for Systems Development

In order for RIS to be hosted and run on ITS servers (the University’s technology support unit responsible for managing all University information and systems), ITS indicated that the system would need to meet certain organisational criteria. These criteria are listed below as well as the steps that were taken to ensure each was met.

- Establishing the mission-critical nature of the application: With research funding providing a significant percentage of the University’s operational funds, there is agreement at the strategic apex that a centralised Research Information System is considered mission critical.
- Ensuring that the front-end and back-end integrity of RIS’s interfaces with other University core systems: RSO, Emlab and ITS had to work together to define the relationships between the RIS and the other University core systems. Areas such as whose data is ‘Gold Standard’, what data will be pushed and what data will be pulled from RIS and the desired synchronisation cycle would be clarified before the project commenced. ‘Gold Standard’ was an organisational term used

to describe the ‘correct’ data within the organisation from which all other organisational units would draw. The reason this is such an important issue is because ownership of the ‘gold standard’ version of data within the university means that they were the only unit with ‘write’ privileges to the database, while everyone else had to contend with ‘read only’ privileges. This meant that there was huge organisational power and political repercussions as to who would ‘own’ the data.

ISSUE 31# – Organisational politics, culture and power will impact the project at different stages of development in different ways.

- Adopting Java/Oracle platform: RIS was required to use an Oracle database as its back end. RIS was also to be delivered as either a standard J2EE Application or a WAR file (depending on the final decision on how and where within ITS’s current server structure the system was to be deployed). This means that it could have been deployed under any J2EE compliant application server; Emlab and ITS worked together to ensure that this was the case.
- The need to provide adequate ITS audit trails for file changes: RIS needed to have complete audit trails for all interactions with a Publication. Emlab sought guidance from ITS in regard to the extent and details of ITS audit trails required for both the Administration and Public sides of the system and then incorporated them as part of Stage 1 development.

- Using the Student Online Services (SOLS) system and the Staff Intranet as standard user interfaces and access points for RIS: ITS and Emlab worked together to produce portals from SOLS and the Staff Intranet that link into the RIS system for students and staff.
- Establishing clear systems ownership/management duties in regards to the RIS system and the data it holds: As previously stated, the issues of ownership of the system would have significant repercussions throughout the organisation as the body who ended up with control of the data would have increased political sway within the organisation.

Several of these requirements were discussed at the beginning of the project and highlight one of the major differences between the three approaches. Clearly, a centralised approach must comply with corporate look and feel, development environments and corporate policies, such as the need for ITS audit trails unlike the hybrid and decentralised approaches.

The decision as to whether to base RIS on FMS or SITACS was a complex one. Because SITACS had been built using a hybrid approach, it was already compliant with the University's look and feel, and development environments. Because FMS had been built using a decentralised approach it was not compliant with either the look and feel or the development environments. There would be appear to be good reason to base RIS on SITACS to reduce development costs. Moreover, SITACS was better integrated with the ITS audit process than FMS, thereby strengthening its appeal. However, the decision was made to use FMS as the basis for RIS because the core functionality was

better developed in FMS than in SITACS, probably because of the competence of the programmers in EmLab. Nonetheless, the cost of porting FMS to a University-wide compliant development environment / platform was considerable.

ISSUE 22# - When similar KM solutions are developed by more than one organisational division it may indicate a need for an organisation-wide system.

6.6 Research Information System (RIS) Software Functionality

The first function to be discussed in section 6.6.1 is setting up a new publication. Note that the entry screen has a University of Wollongong look and feel. The screen examples used in the section were taken from the online help section to ensure no sensitive data is disclosed (RIS, 2010).

6.6.1 Program Functionality – Author Tasks

The screenshot shows the 'Set up a new Publication' screen of the UOW Research Information System. The page has a green header with the UOW logo and navigation links. The main content area is white with a grey header. It contains several form fields and buttons, numbered 1 through 6 for reference.

1. Please select the type of publication you would like to enter :
Other (Not there ? Find)

2. Please select the Group for this publication's reporting group :
Faculty of Education (Not there ? Find)

3. Please enter the Title of the new Publication :
(be specific eg Chapter or Paper title, NOT the Journal or Conference title)

4. If your publication type has authors, how many are there ?
0

5. If your publication type has editors, how many are there ?
0

6. Submit

Figure 6-6 Initial Entry Screen of RIS

This is the initial entry (Figure 6-6) screen for a new publication into the RIS system. The main focus of this portion of the system is to gather the basic publication information to identify what specific details will be collected. This is done by the user selecting the publication type (1), from the system. They are presented with a drop-down menu containing items such as book, journal article and other forms of publications. However if the publication type they are looking for does not appear in the drop down list, there is a find option available for them to search all types in the system.

The next piece of information needed is the Group that the publication will belong to (see 2). By using the drop down menu, the group where this publication will be reported is selected and the publication will then appear on that Group's web site and that Group will receive the Department of Education Science and Training (DEST) points for the Publication. This is an important step in the system as it effects who the publication belongs to within the University. It will also effect which parts of the University website the publication appears on as well as where the funding will be allocated. This issue will be discussed in more detail later in this chapter. The rest of the information entered (3,4,5) is simple data about the publication including title (see 3), number of authors (see 4) and number of editors (see 5). Once the submit button (see 6) is clicked, the system compares the title of the publication to the rest of the titles in the system to see if it has already been entered by one of the publication's other authors. This was included in the system's functionality to help increase the integrity of the data collected by the University and to make sure no duplicates were put into the system.

ISSUE 27# – Hybrid and Centralised approaches rely more on organisational data being correct but this is not always the case.

Naturally the functionality shown here is very similar to that of FMS. This is because RIS is based on FMS. However, RIS is also very similar to the SITACS tool because it deals with a “fundamental entity”, as described in 5.7.2.3.

University of Wollongong

UOW Research Information System

RIS > Main Menu > Publication Management > Publication Details Owen, you are signed in. [Sign Out](#)

Publication Details

My New Publication

- Specific Information
- Editors
- Supplementary Information
- The Abstract
- Group Information
- Status

Specific Information

The Abstract

Authors

Editors

Group Information

Supplementary Information

Status

Save Changes Delete Publication

Preview:

Figure 6-7 Publication Details

Figure 6-7 shows how the 8 categories of information that need to be collected were broken up to assist the user in collecting all the information needed. These will be discussed in more detail with accompanying screen shots. It is of note that, once again, the functions and data elements described in this screen are very similar to the previous case study systems because they deal with “fundamental entities” used throughout the whole organization.

Specific Information **2a**

Please fill in the following details for your Journal Article.

* Title:

My New Publication

* Year of Publication:

2b

* Journal Title:

ISBN/ISSN:

Volume Number:

Issue Number:

Page Numbers:

Publisher:

URL:

The Publication was completed Externally To UOW :

☐

2c

URL for file:

Figure 6-8 Specific Publication Information

Users were encouraged to enter as much information as possible however for the purposes of reporting only certain fields were required. These fields are indicated in Figure 6-8 by the symbol ' * '.

Figure 6-8 is the screen where users enter all the information about the publication such as year of publication, publisher page numbers, etc. While only the first three fields were required, users are encouraged to enter all information to assist in better reporting for the University and its faculty. Figure 6-9 shows where the user enters the Author's details. The person entering the publication is automatically added to the publication and then blank authors are listed below, depending on the number of authors indicated in screen shown in Figure 6-6.

Authors

Note: Please enter Authors in Primary, Secondary, etc order, even if they appear in *alphabetical* order on the publication.

* Author:	Contribution:	Actions:	Order:
Brian Ferry Name to be used for Publication: Brian <input type="text"/> <input type="text"/> Ferry <input type="text"/>	50 %	Select Author Remove Author	1
--- No Author selected ---	50 %	Select Author Remove Author	2

Add another Author

Figure 6-9 Author Details Screen

The user then uses buttons such as 4d to search the system for the other authors of the paper and selects them from the list. As shown, they can then change the order of the authors (4f) to indicate who is the primary author and also alter the percentage shown in 4c to indicate what proportion each author contributed to the publication. These two issues were of great concern in the planning and development of the system.

The order of the authors created some problems that were not seen in the other two case studies due to the differing requirements of different faculties. In most faculties, the author placed at the start of the reference is the most important and contributed the most to the article. However, in the science faculty the author with the most importance is placed last. Also, the referencing styles used in some faculties required the authors to be in alphabetical order. This initially created a very big problem as the initial system (FMS) did not take this into account and therefore there was a very negative reaction from the science faculty towards the system as it did not effectively represent the contribution its members were making in regards to the publications. This highlights one of the problems with the centralised method as it makes it a very complex system when you have to individually cater to each organizational unit, with each unit having very specific methods and customs that must be included in the entire system. This can

cause specifications to increase significantly, impacting on development timetables, testing timetables, implementation and training issues. It more than likely will lead to project creep and increased development costs in order to make the system complete and satisfy the true organisation's needs.

The contribution percentage was also a volatile issue in development and deployment. It was included as it was one of the features of the Education system and was deemed by that faculty to be important to their 'workload process' (see chapter 4). Other faculties were happy to include this new feature into their 'workload process' to assist staff to better reflect in the research work they were doing. However, some faculties did not want to use the figures and therefore asked if it could just be equally spread as a default as they would not use the contribution percentages in their yearly review. This produced the first of several issues to come from this simple feature. When academics reported on publications involving authors from different faculties, this issue was important for some and not others. The problem with including these figures is that if the author who did not need the percentage entered the publication they left the ratio as the default regardless of what the contribution to the publication was. This resulted in inaccurate figures for the other faculties with staff either receiving more or less credit given to the research part of their 'workload'. Which, in turn, caused the need for all authors to be able to access the publication and be able to dispute or correct these percentages.

This ability to dispute contribution percentages gave rise to the next issues to come from this feature. RIS created a situation that had not previously existed within the organizational culture and therefore had significantly altered the way the operating core interacted within the organisation. While most publications did not result in conflict, it

opened the opportunity for staff to argue over who had made the greater contribution to the research and therefore who would receive more credit. While this issue did exist in some form before the RIS system was introduced, it put this issue into a quantifiable figure that would directly affect how much work the academic would have to do. It also meant that many staff who did not previously give this issue much thought now paid close attention to it as it affected their future workload in the coming year. Thus, it can be seen that the introduction of centralized systems into the organization can significantly alter the organisational culture and work processes for the better, or in this case, for the worse.

Another interesting factor to emerge from the contribution percentage was ownership of information. RIS highlighted a lot more cross-faculty publications and the control that each author had over it, creating more insight into the ownership of the information itself. With faculties previously operating independently on the collection of publications, the introduction of RIS has created a grey area in regards to who actually “owns” the publication information inside the organisation. Previously, faculties regarded their publication list to be their own property and therefore controlled its use and availability. Now with the process of dealing with publications becoming a centralised organisational process, ownership of the information becomes a far more ambiguous issue.

ISSUE 9# -. The more varied the needs of the constituent groups, the more elaborate the system will become.

ISSUE 10# -. The more elaborate the system will become the less likely it is to be used by the operating core.

ISSUE 19# - New KM systems may create a need for staff to have access to considered private or sensitive information that they previously did not.

ISSUE 20# - The KM system may directly increase the performance of the operating core and hence the funding / income of the organisational unit.

ISSUE 31# – Organisational politics, culture and power will impact the project at different stages of development in different ways.

Figure 6-10 below shows an extension of the previous task, highlighting how the author selects other authors to add to the publication.

Publication Details

Member Search

First Name:

Last Name: **4h**

Staff/Student Number:

Person code:

Email:

Search **4i**

Results:

Please select the person you wish to associate as an Author of this publication.

Staff:

[Brian Ferry - Faculty of Education](#) **4j**

Students:

---- There are no Students who match those search criteria ----

External Members: **4k**

[J M Ferryman](#) [M Ferry](#)

[Michael Ferry](#) [G. Ferry](#)

[Create a New External Person](#) **4l**

[Cancel](#)

Figure 6-10 Author Selection Screen

This screen is significant as it created a problem in regard to the inclusion of people external to the organization. RIS was built with access to both the staff and student 'Gold Standard' information so that it would reduce data entry and simplify the process. This would help limit errors, like spelling names wrongly, and increase data integrity. However, as the process was analysed, it was realised by the development team that many publications are done with people external to the organisation, such as academics from other intuitions and industry professionals. Therefore, RIS had to be modified to include these people. This was information which, previously, the University had not had access to. The development of RIS allowed the University to keep track of those people external to the organisation who were making contributions that may not have been previously acknowledged. Identifying this information could help with the recruitment of new staff and the identification of people to target for grant partnerships and industry collaborations. The development of RIS created a new way for the University to track and improve its research capabilities. It also allowed the University to keep track of academics who had moved away from the organization to see if they were still publishing with colleagues who were still employed by the University.

ISSUE 19# - New KM systems may create a need for staff to have access to considered private or sensitive information that they previously did not.

ISSUE 20# - The KM system may directly increase the performance of the operating core and hence the funding / income of the organisational unit.

ISSUE 28# – Some approaches (Centralised, Decentralised, Hybrid) result in functionality that is useful at more levels in the organisation.

The purpose of the part of the process that is shown in Figure 6-11 is the identification of the main group that the publication is going to belong to.

The screenshot shows a web interface titled "Group Information". It contains the following elements:

- Publication's Reporting Group:** A dropdown menu with "Faculty of Education" selected, followed by "(Not there?)" and a "Find" button. A red circle labeled "6a" is next to the "Find" button.
- Associated Website Groups:** A section with two entries:
 - Faculty of Education:** A checkbox is checked, and there is a "Remove Group" button. A red circle labeled "6b" is next to the checkbox.
 - University of Wollongong:** A checkbox is checked, and there is a "Remove Group" button. A red circle labeled "6c" is next to the button.
- Add an Associated Website Group:** A button at the bottom with a red circle labeled "6d" next to it.

Figure 6-11 Group information Screen

The screen above is important as it determines where the publication can be seen within the system and externally. It will also impact on the funding allocated to the publication, in regards to which group will receive its portion or which group will receive the points weighting allocated to the publication i.e. receives the DEST points for that publication. The reason for the importance of the group allocation is that, depending on the level of group chosen, the publication will show up on the main group's webpage and its children, as well as the primary groups of the other authors of the publication. Groups can be manually added (as Figure 6-11 shows) but, in practice, users tended to leave them as the default or only add groups that they were associated. This was mainly because they did not know which groups other academics associated with the publication belonged to. More information on groups and their children is discussed later in this chapter.

Figure 6-12 shows the section of RIS where authors were required to input codes and categories associated with the publication that were required for reporting purposes both internally and externally for the University.

Supplementary Information

• RFCD Codes:

7a Add RFCD Code

--- None set ---

UOW Category:

7b Please select...

7c Pre-System (2005): false

Please select...

- C1 : Article in scholarly refereed journal
- C2 : Other refereed contribution to a scholarly journal
- C3 : Non-refereed articles in a scholarly or professional journal
- C4 : Letter or note
- D : Major Reviews
- P3 : Journal Article – General

Figure 6-12 Supplementary Information

This section caused the most confusion in the publication entry process. Firstly, the user was required to enter the Research Fields, Courses and Disciplines (RFCD) codes, but many of the staff did not know what these were or what codes applied to them. While it was mandatory to enter at least one RFCD code, it was preferred that the user entered 2 or 3. Many users who did not know what the codes were would not select the correct code for the publication. Subsequently, an option to search through the codes was added which made it easier for the user. This process is shown in Figure 6-15 below.

The second thing that was required in Figure 6-12 was the need to enter the UOW publication type. This was a rating given to each publication type by the University. It was hoped that requiring the user to input the publication type would encourage the academic to submit publications in more highly rated conferences and journals which in turn, would improve the University's overall standard of research.

The RFCD codes were not used in the previous EDUC and SITACS case studies tools because the units developing those tools were not responsible for reporting to an external agency on research output for each RFCD code. When KM tools are developed centrally i.e. by the organisation as a whole, functionality is needed to support

organisational procedures or strategic initiatives. These functions are unlikely to be generated at lower levels in the organisation.

ISSUE 4# - The approach taken may affect compliance with organisational standards or policies e.g. standard look and feel of web pages.

The screenshot shows a web interface titled "Search For the RFCD Code". Below the title is a horizontal line. The text "Search for the RFCD Code you wish to associate with this Publication." is followed by a paragraph: "You can use * as a wildcard. That is if you wish to search for all RFCD Codes in the 31000 family, you would type 31* into the RFCD Code field below." There are two input fields: "RFCD Code:" with the value "31*" and "RFCD Name:". Below these is a "Search" button and a "Cancel" link. A horizontal line separates the search area from the results. The results list four categories, each with a "Select" link: "310000 - Architecture, Urban Environment and Building - Select", "310100 - Architecture and Urban Environment - Select", "310200 - Building - Select", and "319900 - Other Architecture, Urban Environment and Building - Select". Three red circular callouts with white numbers are overlaid on the image: "1" points to the "RFCD Code:" input field, "2" points to the "Cancel" link, and "3" points to the "Select" link for the "310100" category.

Search For the RFCD Code

Search for the RFCD Code you wish to associate with this Publication.

You can use * as a wildcard. That is if you wish to search for all RFCD Codes in the 31000 family, you would type 31* into the RFCD Code field below.

RFCD Code: 31*

RFCD Name:

Search

Cancel

310000 - Architecture, Urban Environment and Building - Select

310100 - Architecture and Urban Environment - Select

310200 - Building - Select

319900 - Other Architecture, Urban Environment and Building - Select

Figure 6-13 RFCD Search Screen

There were two options to use in the search function. The first of these was a “number search” where users could enter a specific code, or the beginning of one, to select from a list of associated codes. The problem with this was that most of the staff had no idea what codes they used so a “name search” was incorporated so that they could type in a term related to their field of research and see what options came up. It was felt that, as the system was used, more and more users would become familiar with the codes that related to their specific fields and that this would become easier.

The RFCD code function is significant because it changes our perception of a fundamental entity. It was previously noted that the striking similarities in some FMS and SITACS tool functions existed because those functions dealt with a fundamental

entity, for instance, a publication. However, RIS needed the RFCD function because the fundamental entity had different characteristics when seen at an organisational level. In other words, as RFCD codes are not used at faculty or school levels they are not seen as essential attributes of the publication entity. However, at an organisational level, RFCD codes are essential attributes of that entity. It would be interesting to see if this phenomenon occurs in other types of professional organisations. For example, a fundamental entity like a patient record in a hospital ward may require additional attributes at a hospital administration level, e.g. a Medicare or health fund number.

ISSUE 32# – Fundamental Entities of the organisation may differ in structure or detail depending on what organisational level they are viewed from.

Figure 6-14 shows the status of a publication.

The screenshot displays a web application interface for managing publication status. At the top, there is a 'Status' header. Below it, the 'Checklists' section is highlighted with a red circle 8a. The 'Comments and Publications Status' section is marked with a red circle 8b. A table with columns 'Date', 'Status', 'Comment', and 'Person' is shown. Below the table, the 'Change Status' dropdown menu is open, showing options 'New' (selected) and 'Seeking Faculty Verification', with a red circle 8c. The 'Comment' text area is marked with a red circle 8d. There are 'shrink' and 'expand' buttons next to the comment area.

Figure 6-14 Status of the Publication

The last section which the user added about a publication was the status of the publication. This gave the user the option to save the entry and come back to it later if they were missing information or they did not have enough time to finish the process.

Once the user had completed all the data entry, he or she would change the status (see 8c) to "Seeking Faculty Verification". By changing the publication to this level and submitting it, the publication would be sent to the Faculty's Publication Officer who then checked it against the DEST requirement lists. Depending on the accuracy and completeness of the submission, it would then be moved further along the DEST verification process to the University's library or a request for more information to complete the submission process would be sent back to the academic. This meant that when users logged in to the system they would see status updates and track the publication through the system, supplying additional information as needed.

Figure 6-14 confirms the previous observation about organisation level functions and attributes. Figure 6-14 relates to the need to audit each publication i.e. to demonstrate that a given publication meet the DEST criteria for the category to which the publication had been assigned. Although this DEST audit process is started at the school level and further processed at the faculty level, neither the school-based SITACS tool nor the faculty-based FMS tool dealt with the DEST audit process as thoroughly as was done in the organization-based RIS.

One might have expected the SITACS tool would have supported the DEST audit process less than FMS because awareness of the DEST audit process would have been lower at the school-level than the faculty-level. However, this was not the case. There are two possible explanations for this unexpected lack of support for the DEST audit process by FMS. Firstly, EDUC does not have any schools, so the entire DEST audit process is dealt with at a faculty-level. In SITACS the DEST audit process is started at the school-level and then passed to the faculty-level. Secondly FMS used a decentralized approach while SITACS used a hybrid one which attempts to fit in with organisational requirements more fully than a decentralized approach.

6.6.2 Program Functionality – Publication Officer Tasks

Once the publication has been submitted, it is the job of the faculty's publication officer to verify that the publication is authentic. The publication officer is required to manage part of the DEST verification process for a faculty's publications. This involves marking checklists and changing a publication's status.

The available options to the publication officer vary to reflect where the publication sits in the verification process. Depending on the purpose for the publication submission (whether it is for DEST verification or only for internal faculty reporting), staff from the library will be engaged at some point within the verification process but only if it is a DEST publication. Various challenges and requests for information can be generated within the RIS as it is needed for each publication. Details of these are shown in Figure 6-15 below.

Status

Checklists

1

Checklist for Status **Seeking Faculty Verification** and Type **Journal Article**

Verified	Task	Modified On	Modified By
<input type="checkbox"/>	2 Supply one copy of entire journal article.	3 03/08/06 09:44	Barry Harper
<input type="checkbox"/>	Supply copies of the following: * title page & verso, showing: * ISSN * volume and issue * publication and/or copyright dates	03/08/06 09:44	Barry Harper
<input type="checkbox"/>	Supply copy showing authors name and affiliation with UOW within or on the work being claimed. Where author affiliation with UOW is not identified within the work, the following evidence is required: * a statement from the author indicating that they undertook the research in their capacity as a staff member or student of UOW and either * a statement from the Director of Human Resources or Dean of Students indicating that the author was an appointee or student of UOW in the collection year OR * an extract from UOW's staff or student list.	03/08/06 09:44	Barry Harper
<input type="checkbox"/>	Supply evidence of peer review which may include any of the following: * the journal is listed in the ISI database * the journal is classified as 'refereed' in Ulrichs database * the journal is included in the DEST register of refereed journals * there is a statement which shows that contributions are peer reviewed * there is a statement or acknowledgement from the journal editor which shows that the contributions are peer reviewed * a copy of a reviewer's assessment relating to the article.	03/08/06 09:44	Barry Harper

Comments and Publications Status

Date	4 Status	Comment	Person
01/08/2006 13:15	New	Test Save	Barry Harper
01/08/2006 13:25	Seeking Faculty Verification		Barry Harper
29/08/2006 17:03	* Asking Author for More Info	I still need to see the hard copy please for verification.	Karen McRae

Change Status

5

Status:

Asking Author for More Info

Comment:

6

shrink expand

Asking Author for More Info

✓ Seeking Faculty Verification

Seeking Library Verification

2006 General

Pre 2000

2004 GENERAL

2000 GENERAL

2005 GENERAL

2001 GENERAL

2002 GENERAL

2003 GENERAL

Figure 6-15 Faculty Verification of Publication

The status of the publication shown in Figure 6-15 has been set at 'Seeking Faculty Verification'. This level determines the checkboxes that are made visible to the user. The checkboxes reflect the combination of the status and the progress through the DEST verification process. Once these verification tasks have been completed they are checked off to show all users of the system where the publication is at during the verification process. If there are tasks that are not completed due to missing or incorrect information the publication officer must send a comment/request to the publication owner.

To fit with the University's own internal ITS auditing policy, RIS also tracks every change to a publication's status. This tracking process creates an ITS audit trail that records the date the publication was modified and the name of the person who made the modifications. Once the publication meets all the requirements at a faculty level, it is ready to enter the 'Seeking Library Verification' stage if it is a DEST level publication. This process is similar to the one above, as the library has the ability to send requests and change the publication's status in similar ways to the other users described in this chapter. Once the library has verified the publication or the faculty publication officer has and no longer requires to be verified by the library, the publication is displayed on the corresponding group's websites.

The previous description of the DEST audit process and Figure 6-15 confirm the observation made previously with Figure 6-14, namely, that organisational level functions can be extremely complex compared to the functions needed to support lower-level units such as faculties or schools. This added complexity has major implications for KM projects. Firstly, it adds enormously to the development time and maintenance cost of the KM project.

ISSUE 9# -. The more varied the needs of the constituent groups, the more elaborate the system will become.

ISSUE 10# -. The more elaborate the system will become the less likely it is to be used by the operating core.

Secondly, it makes the tool larger and so more difficult for users in schools and faculties to use. Since its implementation at lower levels in the organisation, RIS has been widely criticised by staff for being far too complex.

ISSUE 13# - Making the system simple for the operating core through simple functionality will increase adoption.

ISSUE 14# - Making the system simple will increase the workload of the Technostructure.

Thirdly the DEST audit process requires the tool to be used by academics and clerical staff at the school level, various clerical staff at the faculty level and library and clerical staff at the university level. All of these users have different access levels which all have to be built into and managed by RIS. This exacerbates both the previous points

ISSUE 12# - As the system becomes more complex and diverse, the documentation and training that accompanies the system will grow proportionally.

The complexity of RIS means that formal training was required. There are also attracted costs with developing training materials, running courses and so on.

6.6.3 Program Functionality – Group Configuration

Figure 6-16 shows the Group configuration screen. It is the starting point for the management of the research groups that academics belong to, dividing the different types of research that they are conducting.

Menu

- My Publications
- Publications ToDo
- Publication Search
- Group Management
- External Members
- The User Guide

Group Configuration

- Group Configuration
- Membership Management
- Email Group
- Utilities
- Workloads Report
- Public Portal Configuration
- Publication Preferences
- CV/Report Helper
- Summary

Engineering (33)

Name: Engineering

Short Name: ENG

Group Code: 33

Group Type: Faculty

Created: 25/07/2006

Closed: -- Still active --

Parents: University of Wollongong
Visual Signal & Information Processing Group
War, State and Community
Welding Engineering Research Group
Whisper Labs

Active: ☒

Children: School of Civil, Mining & Environmental Engineering
School of Mechanical, Materials & Mechatronics Engineering
School of Engineering Physics
Institute for Superconducting and Electronic Materials
Intelligent Polymer Research Institute
Engineering Manufacturing
Engineering Materials Institute
Medical Radiation Physics
Intelligent Polymer Research Institute (In Active)
Rail CRC
Advanced Structural Engineering and Construction Materials Group
Geotechnical and Railway Engineering Research Group
Sustainable Water and Energy Research Group

Uses Workloads: ☐

Save to database Delete

Personal Options

- Change Personal Details
- CV/Report Helper

Messages

- You have 37 new messages.
- You have 5 read messages.

Figure 6-16 Main Group Configuration Screen

This section of RIS is important as it is where the research groups are created that the members of the academic staff belong to. This screen allows a user to enter a new group's details such as name, type and association with other groups within the University. The "type" refers to the different types of organizational structures there are within the university (Faculty, research centre, school, discipline, unit etc). This is one of the main things that make a professional organisation different from other styles of organisations - the complex nature of the operating core.

The last section on the page is for the person creating the group to check whether the ‘Workloads’ portion of the system will be used by the group. While this is up to the organiser of the group, he/she may be overruled by the head of the school or dean of the faculty as to whether they can use it or not. The (1) on the screen shot also shows other functions that the group section offers, including ‘Member Management’, where the person creating the group places existing members into a new group, and other features such as ‘Public Portal Configuration’ and ‘Publication Preferences’ where the user sets up what the group’s web presence will look like and the default referencing styles available to the group (as well as the style in which publications will be displayed on their public site). However, this creates another complex problem for the system developers namely that these “groups” can occur at several levels of the University, can include different sections of separate faculties and can also combine different levels of separate faculties. This creates a very complex structure for the system developers to include in a centralised system that would not be seen in locally based systems, that is, at faculty and school level.

ISSUE 9# -. The more varied the needs of the constituent groups, the more elaborate the system will become.

6.6.4 Functionality Summary

As a result of the demands of highly specialised and independent organisational units, RIS has a significant increase in the number and complexity of functions needed. One could argue that both these changes are derived directly from the centralised approach used to develop this system. Because the centralised approach must meet the requirements of all specialised units within the organisation, this will require a lot of

specialised functions that may only be used by one specific section or unit. This is not seen in the other case studies as they are able to tailor their systems to meet their unique needs, especially in the decentralised approach where all standards are set by themselves to meet specific needs at a specific time. This is why the centralised approach will make the project more complex and increase the number of functions within the system compared to one developed in either a hybrid or decentralised approach.

ISSUE 9# -. The more varied the needs of the constituent groups, the more elaborate the system will become.

6.7 Run Out Phase

Once RIS was functioning, the mammoth task of entering data into the system was undertaken. Firstly, all staff data was entered into RIS by linking RIS to the current payroll system. Once this had been achieved, the task of entering research students was done by linking RIS to one of the current student management systems developed by the University. This was very closely related to the centralised approach only partially observed in the hybrid approach and not seen at all in the decentralised approach.

The task of gathering all publications, verifying them and entering them into RIS was then initiated. This proved to be a monumental task, with over 10,000 publications needing to be checked, and while some smaller organisational units succeeded in entering their publications, several faculties found it impossible to enter their publications in the time requested by senior management, resulting in the project stalling until that data entry was completed. Much of this was due to the time it took to

verify all the publications for the specific unit, and the delays from academics not returning information quickly enough to meet the set deadline.

ISSUE 29# – The scale of the project is directly proportional to the approach taken.

ISSUE 17# - To get the most out of a KM system you need to have as much data as possible.

ISSUE 18# - As the amount of data entry or data modification increases, the cost and workload of support staff will increase.

Once the data was entered and RIS was ‘running live’, the task of training the staff was set in motion. This was done in several ways. Separate training was organized for the different types of users, with training to be conducted for publication officers, web masters and academic users of the system. All publication officers from all over the University were brought together in two two-hour training sessions where they learned how to use RIS and perform tasks they needed to do, such as verify publications and manage personnel information. Training sessions like this were also held for the web officers in different faculties to show how to use the features of the system and how to incorporate them into the current web sites they have. This was necessary because RIS was far more complex than either FMS or SITACS.

The training sessions above were different from the academic training session as each faculty was required to send their respective representative to a specific training session

for that organizational role. It was thought this would be the best method as there were only a relatively small number to be trained for the specific roles above and it was thought that it would be more practical and efficient to train them all at once rather than individually in each faculty. The session was run by one of the senior developers of RIS with detailed knowledge of RIS and its development. This meant that there were people from several backgrounds all learning the system at the same time. While they theoretically had the same role within the organisation, each had separate customs specific to their organisational unit and therefore made it difficult to come up with one generic training program. While the person giving the demonstration had a general guide to show how to do the steps required for the various processes, there had to be a lot of flexibility to allow the training to be customised ‘on the fly’ during the training session.

ISSUE 15# - As the KM system becomes more complex the Support Staff and Operating Core will require more training.

Once this training was complete, training for the academics and research students (operating core) was embarked upon. The trainers found that there were significant differences depending on the faculty or group they were training. When it came to groups such as the Informatics or the Engineering Faculties, the trainer could focus more on what RIS did and how to use the functionality, while those who trained groups such as the Creative Arts Faculty needed to spend more time explaining how to access RIS and navigate through it, as these trainees were less technologically savvy.

This is another example of how the centralized approach increases complexity compared to the hybrid and decentralized approaches. While there was one training

guide provided for all trainers and all the trainers sat through a similar induction before they conducted the training sessions themselves, each trainer found that they had to tailor their session to meet the cultural differences of that specific organizational unit. This meant things such as spending time at the start on the technology itself before showing the process of entering publications, or skipping sections of the training as people in that organizational unit were already familiar enough to work that part out and it would be counter productive to spend time on it.

ISSUE 12# - As the system becomes more complex and diverse, the documentation and training that accompanies the system will grow proportionally.

Another issue with the training was the availability of computer labs, or the reluctance to use them, which resulted in two distinct teaching styles. The first method, which was conducted in labs, had each of the staff following along on a computer (much like the training method used for the specific roles training) while the trainer showed the process step by step at the front of the room. The other style was more of a demonstration style, where users sat in a classroom and watched as the trainer demonstrated how to navigate the system. While there was no in-depth analyses conducted by the RIS project team to see which of the two styles was more successful, each style had benefits and faults.

With the use of labs and the “hands on” following along on a computer, users were seen to have more of a grasp of how to do the processes. However, it did mean that the trainer was stuck at the start of each session dealing with users whose logins did not work. Also some users would skip ahead in the process feeling that they could do it better or faster, and this would often lead to them encountering problems later in the

process due to their not filling something in or filling it in incorrectly. Since the version of RIS they were using in training was 'live', this also meant that they were able to view the data about themselves that was already in the system. This resulted in several problems previously undiscovered. Firstly, many of the staff discovered that some of the information that was stored about them within the University's system was incorrect. An example of this was the title of an academic member. Some found that the title used to describe them within the organisation was wrong. The system was still showing what their title was when they were first employed at the University. If they had gained further qualifications, this information had not been kept up to date by the University (e.g. they were listed as Mr. when they were actually a Dr.). This often resulted in the user focusing on this rather than learning RIS and, interestingly, had the effect of creating a negative view of RIS by the user before they had even begun to use it. It was often hard to overcome this negative view throughout the session, with these users more inclined to become disruptive or counter productive during the training sessions, sometimes influencing or affecting other users' perceptions.

ISSUE 33# – A user's first impression of the new KM system may greatly impact their overall opinion of the system in the end.

Another problem that was identified concerned the user's name. While the person's proper name was correctly entered into the system, some users published by a different name, for example, publishing using their second given name and their surname, and not using their first. This was a problem as the system only allowed them to use the name entered in the system from the staff repository, which was 'Gold Standard'. This resulted in the project development team having to go back and incorporate new fields

into RIS allowing these users to enter the name by which they published so that the records could be correct. This was a very interesting observation in regards to the case study as it made the University aware that information in their database that they considered to be ‘Gold Standard’ was, in fact, incorrect and significantly outdated in some instances. The reason for this is that, once the data was entered into the payroll system for a new employee, it was often not used again. Therefore, with the emergence of a new use for the data, the University learnt that there were instances where data capture and integrity standards were incorrect. This resulted in a reassessment of the University’s ‘Gold Standard’ data.

ISSUE 27# – Hybrid and Centralised approaches rely more on organisational data being correct but this is not always the case.

ISSUE 19# - New KM systems may create a need for staff to have access to considered private or sensitive information that they previously did not.

6.7.1 Issues Encountered In Differing Organisational Units

The following are issues that were discovered across the University during the training of academics. Four quite different faculties have been chosen to highlight the range of problems that can be encountered with the centralised method.

6.7.1.1 Faculty of Arts

The training for the Faculty of Arts consisted of a total of 4 sessions. One of these sessions was conducted in a demonstration style as previously discussed in this chapter. The other three sessions were hands-on tutorials in the ITS training labs.

It appeared that the demonstration style session worked better for this Faculty as some of the questions asked were general computer questions, not RIS specific questions. This took time away from learning the use of RIS to answer irrelevant questions about how to use web browsers which meant that time was a problem.

6.7.1.2 General Attitude towards technology

Most attendees from this Faculty were hesitant about using new systems and technology. Some had the attitude that these systems were designed for and should only be used by administration staff (if used at all). Some had issues because they had a Macintosh computer in their office and they did not think that RIS would work when they went back to their office. This was the catalyst for the realisation that some form of help system was needed to support RIS. This is discussed in section 6.8.

6.7.1.3 Training issues

A number of the Arts staff had issues with what had been previously entered into RIS and wanted incorrect details fixed on the spot. This meant time had to be taken to explain that this is not what these sessions were for and that there were proper avenues to rectify such errors. However, it became obvious that the simplest way to deal with this was to take these issues back to the project coordinator.

ISSUE 16# – More complex KM systems will require more complex and ongoing help desk functions.

Some staff did not have access to RIS during the hands-on tutorials which led to disgruntled attendees and less trust in the system and the process. Staff did not understand what RFCD codes were or which one their publications belonged to. This again was an issue outside the training session scope which had to be addressed “on the fly”. Some staff did not wait for concepts to be explained by the demonstrator and so created problems during the training session. For example, they chose ‘publish’ (not ‘new’) before instructions were given and they sent the publications to the publication officer for verification. They were not willing to understand how the system worked or watch the demonstration. Some even seemed to attend the training just to find issues with RIS so that they could complain about it.

6.7.1.4 Attitude towards system

Overall, the attitude the staff showed dislike towards RIS. They did not feel that it was their job to enter this information and did not want to provide this information in the first place.

ISSUE 19# - New KM systems may create a need for staff to have access to considered private or sensitive information that they previously did not.

The staff felt that the process was a burden on their already substantial workload. They did not like the term ‘New’ to describe a publications status, instead suggesting ‘Draft’ as an alternative. They also had issues that the system did not support non-English characters.

ISSUE 8# - Changing operating core work practices will affect other work practices in the organisation for other organisational units such as the support staff.

6.7.1.5 Faculty of Creative Arts

There were only two sessions for the training in the Creative Arts Faculty. Both of these were hands-on tutorial in the Faculty's Computer Labs. The low number of sessions still accounted for most of the staff.

6.7.1.6 General Attitude towards technology

Most staff were comfortable and enjoyed using technology but had concerns that RIS would not work on Macs which they were using. When informed that RIS was developed on this platform they were still concerned that the system would not work correctly. The interesting thing was that the training was in a lab with Macs so it was extremely strange that this was an issue at all.

6.7.1.7 Training issues

Some staff did not have access to RIS and therefore could not participate in the training and were forced to watch on the projector or follow the person next to them. Again, staff did not understand what RFCD codes were or which one their publications belonged to.

6.7.1.8 Attitude towards system

Staff from the Creative Arts Faculty were unhappy that they did not have access to RIS because half the faculty had been accidentally set to "external" not "staff". This meant they had to watch other participants during the training. However, most were happy to use RIS and saw the benefits that RIS could provide in the long term to the University and to themselves. The range of research activities that FCA staff engage in are not "typical" research, so they did not have a way to record or get recognition for these

research outputs at a University level. Interestingly, the FCA saw RIS as a way for the University to recognise work that they all did but which was not recorded in any current University system. The information was kept at a Faculty level and with its incorporation into University-wide system it would allow academics to grow their profile both within the University and from a public point of view.

6.7.1.9 Faculty of Informatics

A total of five sessions were conducted in the Informatics faculty. All sessions were hands-on tutorials performed in one of the Informatics computer labs. They were conducted over one week at lunch time with all staff required to attend one of the sessions.

6.7.1.10 General Attitude towards technology

The attitudes of staff in regards to technology were not a problem with this group because the staff from the Informatics faculty were highly skilled with the technology used in RIS. This actually made the training run a little smoother than other faculties as time was not wasted on irrelevant issues.

6.7.1.11 Training issues

As with the Arts Faculty, a number of staff wanted incorrect details fixed during the session. This meant time had to be taken to explain that this was not what these sessions were for and that there were proper avenues to rectify this. Again, these issues were taken back to the project coordinator. Some staff did not have access to RIS during the hands-on tutorials which led to disgruntled attendees and some even left without watching the demonstration. Staff did not understand what RFCD codes were or which

one their publications belonged to. Once again, this was an issue outside the training scope and had to be addressed “on the fly”.

6.7.1.12 Attitude towards system

One of the main concerns that the staff had was that RIS would take over the current web pages that they had designed and were ‘widely’ used. The current web pages had much more functionality and more information and they were worried that this functionality and data would be lost. Some attendees felt that the RIS functions limited what they could enter and display on their profile pages. Some also criticised the aesthetics or “look and feel” of RIS, for instance the position of buttons, etc. This led to discussion off topic about how RIS could be improved by so called “experts” from their respective fields. Once some attendees found out that there was an online help system, they left the training session comfortable that they could “teach themselves” with the use of this guide and make better use of their time.

6.7.1.13 Faculty of Science

Similar to the Informatics Faculty, the Science Faculty had a total of five training sessions. Each of these sessions was conducted in a hands-on tutorial style in the ITS training labs as previously described.

6.7.1.14 General Attitude towards technology

The general attitude of the staff towards technology was adequate. While one session was very productive, with most people being technology competent, in another session the majority of the participants had minimal computer skills.

6.7.1.15 Training issues

The training issues faced during the Science sessions were the same as those reported in the other three faculties.

6.7.1.16 Attitude towards system

The biggest concern that the staff had was that their publication system was completely different to all the other Faculties, specifically, that the author at the end of a list of authors was the most important one, not the one at the beginning as in the other faculties. This caused much concern as they all felt that it would not show correctly who had done the most work. This was something that was brought to the attention of the project co-ordinator as it was considered a major concern about RIS.

ISSUE 6# - Correct definition of scope/requirements will affect the amount of redevelopment/maintenance.

6.7.2 Summary

While there was a general agreement that RIS was needed, there was also widespread concern about it. The reason that RIS was “accepted” was because it was mandated by the senior executive. It was observed that, through the course of the training of the operating core, several issues with the RIS were identified which the trainers reported to the project coordinator. These were passed on to the development team and incorporated into the next several upgrades of RIS.

ISSUE 11# - The larger the project the more difficult it is to find all systems requirements before development starts.

6.8 System Help and Support Services

To assist with the complexity of the RIS system, it was decided that there was a need for a University support system to be in place to assist all intended users. An online help guide was developed to provide a walkthrough of RIS for anyone to use. It was discussed and decided that there would also be training session developed and offered through the University's internal staff development body. This section of the organisation was already offering courses in other systems used by the University and certain software packages that were available to staff and students. However, this was not enough to cater for the questions and help that staff needed. In the initial stage of use, the Research Services Office (RSO) answered questions about RIS but it was beginning to impact on their workload so a separate unit of the organisation was set up to deal with RIS help. This had staff unit operated both a phone help line for support and an email address of 'RIS help' to answer questions submitted by users.

6.9 Follow Up Phase

One of the most obvious differences between RIS and the previous systems (FMS and SITACS) is that RIS used a centralised approach and, as a result, RIS was far better resourced and the initial development was conducted in a more formal manner. These factors were also obvious in the follow up phase.

As a result of the release of further details on the RQF and the lessons learnt in the first part of the project, senior management decided that the ongoing development of RIS must fit the time constraints imposed by the introduction of the RQF. They also decided that some of the initial RIS features that had been planned would be put on hold and

new features would be incorporated to assist the Research Services Office in the RQF process. Some of these new features included:

- Implementation of RQF groups and associated membership
- Allowing the sorting of the top eight research outputs by individuals
- Linking of RIS to another system called Research Online (RO)

Because of senior management's involvement, the development of these new features were well resourced and achieved using formal methods.

Once the system was fully operational, the focus switched to maintaining the day to day running of RIS and the task of developing more features. This led to the decision by the University to replace the external consultant, who wished to finish with the project, with a full-time project leader to oversee the remainder of the RIS project. Once the new project leader had been brought up to date, the project entered its next phase. Part of this process included the project formally mapping and documenting several of the business processes undertaken by the University in regards to the RIS system. This included the processes that were not yet included in RIS, like the grants process shown in appendix B, but did not include processes like the publications process as it was already functioning under RIS. An outside observer would be puzzled by the fact that this was not done in the initial stage of the project. While the publications process was analysed there was no "formal" documents as shown in appendix B, but instead like Figure 6.7 and based on the existing FMS with the inclusion of "extra" features. The reason this was not done was eventually put down to the differing project management styles of the two project managers the second manager coming from an IT background and therefore relying on more formal documenting methods that he was "more use to" (Interview, 2007) than the more business orientated predecessor.

However, the course of the project had changed from the original plan because of the impending implementation of RQF by the government. In addition to the new project manager, the programming team were also well resourced to ensure on-time delivery of the next modules.

As shown below, unlike FMS and SITACS, which were developed in an evolutionary manner, RIS was developed using very formal requirement specifications and processes. Because of these new features the following road map was developed to guide the second phase of the project.

RQF Core 1

- Implementation of RQF groups and associated members
- Identification of esteem factors for the RQF group members
- Identification of top eight research outputs for RQF group members
- Include new “Manager” role within RIS
- Storing of top eight research outputs in RQF repository (i.e. RO)

RQF Core 2

- Extension of the RIS database to hold grant and research contract data
- Reporting on grant/contract income by RQF group
- Interim maintenance function for grant and contract data
- Provision of a facility to perform a “slice and dice” of grant/contract data and export to Excel for analysis

- Provision of functionality to support DEST publication reporting
- Cleansing and migration of grants data into the RIS database
- Cleansing and migration of contracts data into the RIS database

Stage 2 – RQF, Grants & Commercial Research

- Inclusion of remaining RQF data requirements (when clarified after the final RQF guidelines and Panel specific guidelines were announced). This would be processed as a variation to the stage two scope
- Include mandatory enhancements identified from stage one
- Provision of functionality to support internal and external grants processing
- Provision of functionality to support research contracts processing
- Provision of an interface to capture actual grants/contracts expenditure and store it within RIS
- Provision of end-user reporting functionality for grant and contract data
- Extension of the RIS database to hold commercial research and commercial agreements
- Provision of functionality to support Intellectual Property and Patent processing
- Cleansing and migration of Intellectual Property and Patent data into the RIS database.

This road map shows the more formal approach taken in the centralised development.

The RIS project team identified the following potential problems or concerns

- While faculties have similar organizational structures, the highly diverse nature of what they do makes it difficult to build a system that caters to everyone's needs.

It is interesting to note that the project team identified one of the issues reported earlier in this study, namely, issue #9.

ISSUE 9# -. The more varied the needs of the constituent groups, the more elaborate the system will become.

ISSUE 10# -. The more elaborate the system will become the less likely it is to be used by the operating core.

The project team did not, however, expect the resistance implied in the last part of issue #9, namely “the less likely it is to be used by the operating core”. This phenomenon has since been observed repeatedly as many academic staff try to get clerical staff (Technostructure) to do their data entry for them.

Other concerns or problems included:

- That faculties need to manage and use their research data as much as the University as a whole.
- With the introduction of the Research Quality Framework, the University has a real need to have tools and processes in place to best leverage data about their research outputs.
- The processes that were in place were not capturing all the data the University needed.

- Allowing the faculties to have more control over their data has meant an increase in data quality
- Data quality is essential due to the introduction of the RQF
- Knowledge management techniques used in RIS can greatly assist in the processes needed to gather data for the RQF.

As discussed in section 6.9, the centralized RIS project was conducted with far more formality than the FMS or SITACS projects. This was confirmed by the inclusion of a formal usability testing process performed as part of the RIS project. It was conducted after the initial roll out of the system and it was hoped that this would help address some of the issues being experienced by users. A copy of the usability report and its findings can be found in appendix C.

6.10 Follow Up Phase

An interesting phenomenon was observed after the complete deployment of RIS. Some academics started to use the Research Online (RO) tool, mentioned in the final point of RQF core one specifications. RO is a commercially available tool which allows academics to upload complete publications, rather than just bibliographical details. RO also reports periodically to each academic how often each of his or her publications are downloaded. RO can be searched through a web interface open to the general public and many academics have found it an excellent way to publicise or distribute their work to their research communities. In many ways, RO provides the sort of motivation for academics which FMS and SITACS originally did but which seems to be lacking in

RIS. Consequently academics want to be able to upload publications to RO and transfer the bibliographic details from RO into RIS, thus reducing double handling.

This final case study reports the development of a suite of KM tools using a centralised approach. It has confirmed many of the issues observed in the previous case studies and given rise to a number of new issues. Perhaps the most significant difference between this case study and the previous two is the level of complexity in the centralised system. The RIS took several years to develop, was far more costly than either of the previous two suites of tools and required a coordinated training program and help desk for hundreds of staff. One advantage of the centralised system was that it was able to upload data from a number of existing corporate databases. On the other hand, populating RIS with necessary historical data was a mammoth task. Somewhat surprisingly, unlike the two other systems, RIS was not well accepted by academics (operating core) and much of the data entry into RIS was delegated to clerical staff, thereby increasing their workload significantly.

The following chapter will attempt to bring together the observations of all three case studies and will analyse the issues identified.

Chapter 7: Discussion, Conclusions, Limitations and Future Research

7.1 Introduction

The previous three chapters have presented detailed descriptions of three attempts to build a similar suite of KM tools in a single professional organisation, namely, a university. These 3 accounts represent a remarkable opportunity, as no previous KM study in any field has been able to describe such remarkably similar projects using such remarkably different approaches (i.e. Decentralised, Hybrid and Centralised). For this alone, the current research has made a unique contribution to the field of KM.

However, the case study data still needs to be synthesised, so that common issues can be identified, and guidelines can be developed for KM practitioners and researchers, particularly those working in or studying professional organisations like universities, legal firms, medical practices and so on.

As stated in chapter 3, the research has three objectives, namely:

- To identify an appropriate professional organisation where KM is being developed using a variety of approaches
- To compare and contrast the effectiveness of these approaches
- To provide guidelines for the selection of appropriate approaches to KM development and deployment in professional organisations

The first of these objectives was achieved by the selection of the organisation in which the research would be conducted. In selecting the organisation, many types of professional organisations were considered including medical, legal and academic. It was decided that a regional university would best suit this particular research as it was large enough to cater for the research, but was still small enough that it would be easier to see the effects of the projects on all parts of the organisation. A university was also considered to be appropriate because the academics within the organisation would come from a variety of backgrounds e.g. arts, science, law, medicine etc, and would have a variety of roles e.g. lecturers, researchers, deans etc. which would require different levels and types of organisations. A university was also thought to be appropriate due to the large amounts of data that are captured and used in their operation, and therefore would be a prime candidate to use and develop KM systems. Once a suitable university had been chosen, the research set about finding projects within that university that could be monitored and analysed. This resulted in the identification of three projects: EDUC, SITACS and RIS, which were all solving a similar problem within the university but using different approaches (Decentralised, Hybrid and Centralised).

The second and third objectives of the research are partially achieved in the preceding three chapters. The final steps in achieving these last 2 objectives are presented in this chapter by analysing the issues which were observed in the 3 case studies and by providing guidelines based on that issue analysis.

7.2 Initial Issues Discovered in the Case Studies

The following is a list of all 33 of the issues that were initially identified in the case studies.

- 1: Depending on who instigates the project, some approaches (centralised, decentralised and hybrid) may be better suited to the task than others
- 2: The competence of the Technostructure will affect the decision to build or buy the system.
- 3: The build/buy decision will affect ongoing maintenance and the role of the Technostructure.
- 4: The approach taken may affect compliance with organisational standards or policies e.g. standard look and feel of web pages.
- 5: The more that the Operating Core supports a KM system the less “push” will be required from the strategic apex.
- 6: Correct definition of scope/requirements will affect the amount of redevelopment/maintenance.
- 7: Different approaches (centralised, decentralised, hybrid) will enable different levels of customisation.
- 8: Changing Operating Core work practices will affect other work practices in the organisation for other organisational units such as the support staff.
- 9: The more varied the needs of the constituent groups, the more elaborate the system will become and the less likely it is to be used by the operating core.
- 10: As the system becomes more complex and diverse, the documentation and training that accompanies the system will grow proportionally.
- 11: Making the system simple for the Operating Core through simple functionality will increase adoption.
- 12: As the system becomes more complex Support Staff will require more training.

- 13: To get the most out of a KM system you need to have as much data as possible. As the amount of data entry or data modification increases, the cost and workload of support staff will increase.
- 14: New KM systems may create a need for staff to have access to data considered private or sensitive that they previously did not have.
- 15: The KM system may directly increase the performance of the Operating Core and hence the funding / income of the organisational unit.
- 16: Regardless of the approach taken to KM, there is always a possibility that a centralised approach will dominate.
- 17: When similar KM solutions are developed by more than one organisational division it may indicate a need for an organisation-wide system.
- 18: A Knowledge Management initiative is an ongoing process that requires constant revision and maintenance.
- 19: KM tools may have related overlapping functions so some tools may be better developed in parallel.
- 20: KM tools can be developed by end users at a very low cost but the quality and integration with existing systems will be better with professional developers.
- 21: Hybrid and Centralised approaches rely more on organisational data being correct but this is not always the case.
- 22: Some approaches (Centralised, Decentralised, Hybrid) result in functionality that is useful at more levels in the organisation.
- 23: The scale of the project is directly proportional to the approach taken.
- 24: Increasing the scale of the project may increase the likelihood that organisational politics, culture and power will impact the project.
- 25: Organisational politics, culture and power will impact the project at different stages of development in different ways.

26: Fundamental Entities of the organisation may differ in structure or detail depending on what organisational level they are viewed from.

27: Users' first impressions of the new KM system may greatly impact their overall opinion of the system in the end.

28: More complex KM systems will require more complex and ongoing help desk functions.

29: A Centralised approach is bound by organisational procedures and standards more so than Hybrid and Decentralised approaches.

30: The more of the professional organisation a system covers, the more complex the system becomes due to the complex structure of the organisation.

31: The Operating Core will need to be trained in a relatively complex KM system.

32: The larger the project, the more difficult it is to find all systems requirements before development starts.

33: Making the system simple will increase the workload of the Technostructure.

These issues were remarkably common, with 20 of them appearing to occur in every case study. However, the situation was a little more complex, as explained in the following section.

7.3 Redaction of Issues

Once all the issues from the three case studies were recorded, an analysis was undertaken to look into the recurrence of these issues and any relationships they may have had with one another. Each of the 33 issues was analysed to check for overlap with other issues and to make sure that each issue was in fact a single issue and that it had not been reported elsewhere, in the course of data gathering over a long period of time. The purpose of this process was to ensure that no issues were duplicated incorrectly and

that all issues that occurred in a case study had actually been recorded. The first step in this redactive process was to produce Table 7.1, a simple list of the issues as they appeared in each of the case studies.

Table 7.1 Initial issues numbers by case study

EDUC	1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,33
SITACS	1,2,3,4,4,6,6,8,8,9,10,11,11,12,13,13,14,14,15,16,18,18,19,20,21,22,33,33
RIS	2,6,6,8,9,9,9,10,10,11,11,12,13,14,14,14,14,14,14,15,15,17,21,21,22,23,24 ,25,25,26,27,28,29,30,30,30,32,33,33

7.3.1 Analysis of Issues

The first stage of the redaction was to create a summary of the issues and to describe those issues in terms of a subject, an object and the relationship that existed between them e.g. A depends on B. This summary is shown in Table 7.2.

Table 7.2 Summary of Issues Analysis

	Primary Entity	Relation	Secondary Entity	Duplicate
1	Approach	depends on	Initiation	
2	Buy/Build	depends on	IT skills	
3	System maintenance	depends on	Buy/Build	
4	Level of Compliance	depends on	Approach	29
5	Management push	depends on	Core support	
6	Maintenance	depends on	Requirement definition	
7	Customization	depends on	Approach	
8	Support staff work	depends on	Core work practices	
9	System complexity	depends on	Requirement complexity	30 & 32
9a	System uptake	depends on	System complexity for core	
10	Convergent requirements	suggest	A Central approach	17
11	System uptake	depends on	System complexity for core	
12	Training/support	depends on	System complexity	28 & 31
13	Value of system	depends on	Amount of data	
13a	Cost	depends on	Amount of data	
14	Privacy	is an	Issue with +ve & -ve	
15	Core performance	depends on	KM (quality and use)	
16	A central approach	may	Dominate	
17	Convergent requirements	suggest	Central approach	10
18	System maintenance	is a	Feature of KM	
19	Overlapping functions	suggest	Parallel tool development	
20	System quality	depends on	IT skills	
20a	System Integration	depends on	IT skills	
21	Hybrid/Central approaches	depends on	Quality of central data	
22	Multi-level functionality	depends on	Central/Hybrid approaches	
23	System scope/scale	depends on	Approach	
24	Politics/power/culture	depends on	System scope/scale	
25	System scope/scale	affects	Development/deployment/use	
26	Content of fundamental entities	depends on	Organizational context	
27	System uptake	depends on	User experience of system	
28	Training/support	depends on	System complexity	12 & 31
29	Level of Compliance	depends on	Central approach	4
30	System complexity	depends on	System scope	9 & 32
31	Training/support	depends on	System complexity	12 & 28
32	Requirement complexity	depends on	System scope	9 & 30
33	Development workload	depends on	Ease of use of system	11

This view allowed the identification of multiple dependencies e.g. issue 9: “The more varied the needs of the constituent groups, the more elaborate the system will become and the less likely it is to be used by the operating core” actually describes two dependencies:

- i) the complexity of the system depends on the complexity of user needs and
- ii) the likelihood of use of the system depends on the complexity of the system.

Such multiple dependencies were initially split into two and labelled 9a and 9b, for example. It was later decided that, for consistency throughout the thesis, these would be numbered sequentially e.g. as 9 and 10, and that all instances of the original issue 9, would be replaced by the two separate issues, now numbered 9 and 10. This, of course meant that all successive issues now had the “wrong” number, as there were two issues numbered 10, for example. So, all later issues were renumbered sequentially, throughout all of the case study descriptions.

This meant that there were now more issues than the 33 issues initially identified. However on closer inspection of Table 7.2, some issues appear to be duplicated. For example, both issues 4 and 29 appear to say that “the level of compliance with organizational rules etc. depends on the approach taken”. If 2 issues appeared to describe the same fundamental problem or phenomenon, the case study material relating to these apparent duplications was reviewed and a decision was made about whether or not there were actually two issues or only one. In every case, it transpired that the issues were in fact duplicates, so one of the two issues was removed and replaced with the

remaining issue in the remainder of the analysis. This replacement was carried out throughout all of the case studies. Once the full set of reviewed issues was renumbered, the list was then inspected for redundancy again.

When no cases of redundant issues were found in the new list i.e. all issues appeared to describe a unique situation, the case studies were then checked for omissions i.e. had an issue identified in a later case study been inadvertently omitted from a previous case study, where it had actually occurred. This analysis revealed that some issues which were reported for the first time in a later case study e.g. the Centralised case study, had actually occurred in earlier case studies but had not been reported during those cases. The reason for their omission seemed to be that the issue was not as obvious in those earlier case studies as it was in the later case studies. For example, issue 27 – “A user’s first impression of the new KM system may greatly impact their overall opinion on the system in the end” may actually occur in both case studies 1 & 2 but in so mild a form that they were not noticed during the reporting of the first 2 case studies. These omissions have been addressed in this chapter by including the omitted issues in the overall analysis as if they had been recorded during the earlier case study analysis.

Finally, several of the issues did not fit the “depends on” relationship pattern that had appeared in Table 7.2. While it was not necessary that all issues should have exactly the same relationship between subject and object, it was interesting that so many did fit this pattern, and only a very few did not. Each of these “atypical” relationships were explored further. For example, issue 25 - “Organisational politics, culture and power will impact the project at different stages of development in different ways” could actually be a “depends on” relationship but it was necessary to reword it to make that

clear. Thus it became, “Increasing the scale of the project may increase the likelihood that organisational politics, culture and power will impact the project”.

After minor changes in wording to clarify the “depends on” relationship, there were only 4 issues that were not “depends on” relationships and could not sensibly be changed into “depends on” relationships without losing the original sense of the issue. These 4 were left in their original atypical form because, as observed above, there is no reason why all the relationships in the issues should be the same. One final observation that was made about the issues that had these “atypical” relationships was that they concerned the centralised approach; this will be discussed later in the chapter.

7.4 Final Issues Presented in the Case Studies

The following is a list of the revised issues.

- 1: Depending on who instigates the project, some approaches (Decentralised, Hybrid and Centralised) may be better suited to the task than others.
- 2: The competence of the Technostructure will affect the decision to build or buy the system.
- 3: The build/buy decision will affect ongoing maintenance and the role of the Technostructure.
- 4: The approach taken may affect compliance with organisational standards or policies e.g. standard look and feel of web pages.
- 5: The more that the Operating Core supports a KM system the less “push” will be required from the strategic apex.
- 6: Correct definition of scope/requirements will affect the amount of redevelopment/maintenance.

- 7: Different approaches (Decentralised, Hybrid and Centralised) will enable different levels of customization.
- 8: Changing Operating Core work practices will affect other work practices in the organisation for other organisational units such as the support staff.
- 9: The more varied the needs of the constituent groups, the more elaborate the system will become.
- 10: The more elaborate the system will become the less likely it is to be used by the Operating Core.
- 11: The larger the project the more difficult it is to find all systems requirements before development starts.
- 12: As the system becomes more complex and diverse, the documentation and training that accompanies the system will grow proportionally.
- 13: Making the system simple for the Operating Core through simple functionality will increase adoption.
- 14: Making the system simple will increase the workload of the Technostructure.
- 15: As the KM system becomes more complex the Support Staff and Operating Core will require more training.
- 16: More complex KM systems will require more complex and ongoing help desk functions.
- 17: To get the most out of a KM system you need to have as much data as possible.
- 18: As the amount of data entry or data modification increases, the cost and workload of Support Staff will increase.
- 19: New KM systems may create a need for staff to have access to private or sensitive information that they previously did not have.
- 20: The KM system may directly increase the performance of the Operating Core and hence the funding / income of the organisational unit.

- 21: Regardless of the approach taken to KM, there is always a possibility that a centralised approach will dominate.
- 22: When similar KM solutions are developed by more than one organisational division it may indicate a need for an organisation-wide system.
- 23: A Knowledge Management initiative is an ongoing process that requires constant revision and maintenance.
- 24: KM tools may have related overlapping functions so some tools may be better developed in parallel.
- 25: KM tools can be developed by end users at a very low cost but this will affect the quality and integration with existing systems.
- 26: A KM tool's quality and integration with existing systems will be better with professional developers at the helm of the project.
- 27: Hybrid and Centralised approaches rely more on organisational data being correct but this is not always the case.
- 28: Some approaches (Decentralised, Hybrid and Centralised) result in functionality that is useful at more levels in the organisation.
- 29: The scale of the project is directly proportional to the approach taken.
- 30: Increasing the scale of the project may increase the likelihood that organisational politics, culture and power will impact the project.
- 31: Organisational politics, culture and power will impact the project at different stages of development in different ways.
- 32: Fundamental Entities of the organisation may differ in structure or detail depending on what organisational level they are viewed from.
- 33: A user's first impression of the new KM system may greatly impact their overall opinion of the system.

7.4.1 Final Issues By Case Study

Table 7.3 presents the issues as they were found to occur in the case studies, after renumbering and redaction.

Table 7.3 Instances in which issues were observed in each case study

Project	List of Issues	Type	Instances
EDUC	1,2,3,4,5,6,7,8,9,10,12,13,14,15,17,18,19,20,21,22	20	20
SITACS	1,2,3,4,4,6,6,8,8,9,10,12,13,13,14,14,15,17,17,18,18,19 ,19,20,21,23,23,24,25,26,27,28	23	32
RIS	2,4,6,6,8,9,9,9,9,10,10,10,11,12,12,13,14,15,16,17,18 ,19,19,19,19,19,20,20,22,27,27,28,29,30,31,31,32,33	24	39

There are many interesting things that can be taken from the identification of these issues in the investigation of this professional organisation. Looking at the individual approaches and issues that arose across several of the case studies will allow some guidelines to be developed to help other professional organisations to know when to use the different approaches and when certain approaches should be avoided. This will be accomplished by first looking at similar issues across all approaches and issues that were specific to each individual approach.

7.4.2 Recurring and Repeating Issues

For the purposes of this analysis, a recurring issue is one which occurs in more than one of the 3 case studies, while a repeating issue is one that occurs more than once in a single case study.

A total of 14 recurring issues were identified in every case study; these were issues 2, 4, 6, 8, 9, 10, 12, 13, 14, 15, 17, 18, 19 and 20. (Non-recurring issues i.e. those which were found in one and only one case study, were issues 11, 16, 29, 30, 31, 32, 33, which occurred only in the centralised approach; issues 23, 24, 25, 26, which occurred only in the hybrid approach; and issues 5 and 7, which only occurred in the decentralised approach.

It might be expected that both the number of different types of issues and the number of instances of issues would be related to the size of the projects and therefore the centralised approach, which was by far the largest project in the case studies, would obviously have more types of issues and instances of issues.

This was, in fact the case, with 24 different types of issue and 39 instances of those issues occurring in the centralised approach, compared to the decentralised approach, which had only 20 issues and 20 instances of those issues. Logically, this makes sense if you look more closely at the way the approaches are typically employed and who would use them; a centralised approach would typically produce bigger projects, while the decentralised approach would typically be used on smaller projects. Similarly, the hybrid approach might be expected to lie between the decentralised and centralised approaches because it has the additional challenge of fitting in to organisational requirements. Table 7.3 confirms that expectation with the hybrid approach having 23 types of issue and 32 instances of issues. Obviously, there will be occasions where this may not be true because some hybrid or decentralised projects are as large as centralised projects.

It is also worthwhile examining the number of times each type of issue occurred in a case study or in total, as shown in Table 7.4.

Table 7.4 Frequency Distribution of Issues Type by Case Study

ISSUE	EDUC	SISAT	RIS	TOTAL
1	1	1		2
2		1	1	2
3	1	1		2
4	1	2	1	4
5	1			1
6	1	2	2	5
7	1			1
8	1	2	1	4
9	1	1	5	7
10	1	1	3	5
11			1	1
12	1	1	2	4
13	1	2	1	4
14	1	2	1	4
15	1	1	1	3
16			1	1
17	1	2	1	4
18	1	2	1	4
19	1	2	5	8
20	1	1	2	4
21	1	1		2
22	1	1	1	3
23		2		2
24		1		1
25		1		1
26		1		1
27		1	2	3
28		1	1	2
29			1	1
30			1	1
31			2	2
32			1	1
33			1	1

As can be seen in Table 7.4, issue 19 – “New KM systems may create a need for staff to have access to private or sensitive information that they previously did not have”, was the most frequently identified issue. This negative issue is a corollary of issue 17 - “To get the most out of a KM system you need to have as much data as possible” (which

was observed 4 times). Doing this, however, opens up the project to many problems. In many organisations, data, information and knowledge can be seen as power. Therefore in order to achieve the most out of the KM system the strategic apex needs to find a way to get people to give these things up, which they are frequently reluctant to do. This is where having excellent management will make or break a KM system. Project leaders must find a way to change the culture in the organisation if the existing one is more inclined to hoard data instead of sharing it. It must be made clear to the Operating Core what the benefits are of giving up control of data rather than keeping it. This is where the problem of organisational politics comes in. It was seen in the centralised case study that internal politics can affect a project, by slowing, bringing to a standstill or even possibly destroying the project, and that successful negotiation on behalf of the project team and an ability to navigate through the complicated internal political and power structures can be the difference in whether the project is a success or a massive failure.

Issue 9 – “The more varied the needs of the constituent groups, the more elaborate the system will become”, was a significant issue as it demonstrated how complex the development can get in a centralised approach. The two other approaches were able to develop systems in significantly less time compared to the centralised approach because they did not have to meet requirements applicable to the whole organisation. Due to the complex structure of a professional organisation, the requirements gathering process in the centralised approach was significantly lengthened and required many iterations to gather all the necessary functions for every different unit.

Issue 4 - “A Centralised approach is bound by organisational procedures and standards more so than Hybrid and Decentralised approaches”, highlighted the formal nature that

a centralised approach takes compared to the hybrid and decentralised approaches. Due to all the organisational standards, a centralised approach will be slower to develop and deploy than the other approaches. However, following all the organisational standards does result in a significantly more detailed and capable system. It also makes it easier to incorporate data from the organisation, as the system is either built to the same specifications as existing systems or bought to comply with existing standards. This increases the portability of data within the organisation and any new information that is created with the new system and practices can be passed back through to existing systems for reporting or accounting. As explained earlier, a hybrid approach aims to comply with as many organisation standards and practices as it can, but ‘leaving out’ certain standards or practices can affect its compatibility with organisation-wide systems. Certain standards or practices may be ‘left out’ because there may be certain development skills that are not available in the unit, or the standards are too complicated to implement which would slow development and so they are excluded (e.g. audit trails in the SITACS case study). So, while the hybrid approach is more flexible for the development of KM systems it can result in a less well-integrated system than would be produced by a centralised approach.

Issue 6 - “Correct definition of scope/requirements will affect the amount of redevelopment/maintenance” could be seen best in the way this issue affected the centralised case study. Had the full scope of the requirements been met at the beginning of the project (like in the decentralised case study) then the project may have been more successful than it was. However, instead there was requirements creep, which lead to delays in the project and also when it was deployed, the Operating Core identified several things they would have liked the system to do, and as the system did not have

those functions or abilities, it altered their views of the system in a negative way. This resulted in significant redevelopment of the system to incorporate all desired functions by the Operating Core and in turn impacted the success of the system. In the decentralised case study, all the requirements were met from the beginning and consequently the Operating Core had favourable views of the system, and only minimal maintenance was needed.

Issue 10 - “The more elaborate the system will become the less likely it is to be used by the Operating Core” was also shown to be a significant factor in the centralised case study. The decentralised and hybrid systems were simpler because they only catered to one specific unit of the organisation, so it was easier to simplify their functionality. However, the complexity of catering to several specialised units, as happened in a centralised approach, meant that the system became much more complex to use than those produced by the other approaches. As the system became more elaborate and complex, the Operating Core’s attitude to the system deteriorated markedly, which resulted in slow system adoption, and problems in training the Operating Core.

7.4.3 Singular Issues Specific to a Single Case Study

While an analysis of the issues that were common across all 3 case studies tells us about the problems of KM in general, a discussion of the cases that were unique to specific approaches helps us understand those approaches better.

The two issues that were specific to the decentralised approach were issues 5 and 7. Issue 5 states “The more that the operating core supports a KM system the less “push” will be required from the strategic apex”. This showed how, with the full support of the operating core a new system and a new organisational practice can be implemented

quite successfully. This is highlighted more in the decentralised case study than in the hybrid or centralised case study, which showed that, without the support of the Operating Core, the “push” required from the Strategic Apex can have negative repercussions on the success and adoption of the newly developed system. Another possible reason why this issue is evident in this particular case study is the minimal involvement in the conceptualisation of the project, and minimal involvement in the initial stages of the project by the Strategic Apex. In the decentralised case study, the Strategic Apex only became involved after the system had been developed and was running successfully. They actually only were involved after the Operating Core had engineered an organisational practice for themselves that could benefit the entire organisational unit, and only after this had become evident did the Strategic Apex become involved by putting the resources and support behind the system to make it available to everyone.

With issue 7 - “Different approaches (Decentralised, Hybrid and Centralised) will enable different levels of customization”, was obvious in the decentralised case study because it was here that customisation was achieved most easily. With a fully decentralised approach, no organisational practices need to be catered to, allowing quicker turn around times from conceptualisation to development and implementation. In comparison, the centralised approach did offer customisation but customisation was only provided for components or functions that were crucial to the units requesting the change. Customisation of look and feel or of optional features and functions was never provided. When customisation was provided, users experienced long delays. Both the lack of some types of customisation and these delays created the sense that the system was NOT customisable and produced resentment among the Operating Core.

The four issues that were specific to the hybrid approach were issues 23, 24, 25 and 26. The most significant of these is Issue 24 - “KM tools may have related overlapping functions so some tools may be better developed in parallel”. The significance of this issue was shown in the hybrid case study as they used several different programming teams to develop different functions of the system at the same time. It showed that, with a good architecture to the system and some planning foresight, it was possible to have several separate teams build different functions using the same data sets. Thus, the hybrid model allowed several functions to be developed simultaneously, which would have not been possible under the decentralised or centralised approach.

However, the use of multiple teams to develop tools in parallel led to issues 25 - “KM tools can be developed by end users at a very low cost but this will affect the quality and integration with existing systems”, and 26 - “A KM tool’s quality and integration with existing systems will be better with professional developers at the helm of the project”. The use of students as developers allowed the hybrid approach to develop tools at a significantly reduced cost compared to the other two approaches but it was dependant on the level of ability of the students. This was fine for the first group, who proved to be very capable, however, the two other groups of student developers were less capable and it did show in the quality of tools that were produced.

Issue 23 - “A Knowledge Management initiative is an ongoing process that requires constant revision and maintenance” was first observed in the cyclic nature of the framework chosen by the SITACS group. There was a clear need to revise and maintain the tools developed. Issue 23 was confirmed when the original project was abandoned

because of the introduction of RIS, which made the SITACS system redundant. However, this did not stop the KM process within that business unit, which went back to the start again and produced a new suite of KM Tools called SIMS. This ongoing cycle of KM development is an important point for any KM initiative in a professional organisation, and developers and managers must appreciate that the initiative may span many cycles, no matter which development approach is taken. This case study showed how it can be of great benefit to the organisation or the unit to go back and address projects once they come to a close, as new systems and better processes can be developed from continually revisiting KM projects.

The centralised approach gave rise to the largest number of specific issues with a total of 7 (Issues 11, 16, 29, 30, 31, 32, 33). The first of these, Issue 11 - “The scale of the project is directly proportional to the approach taken”, highlighted one of the main problems with the centralised approach, project creep. Even trying to replicate the existing decentralised tool became a mammoth task. This was due to the highly diverse and complex nature of the professional organisation. While producing a system for a small section of the organisation can be easy, with few requirements and only one set of specifications to comply with, producing an organisation-wide system often meant catering to sections of the organisation that have conflicting or polarising requirements. Now, if the Strategic Apex wished, it could try to change the organisational practices of one of the groups, however, this is not always possible in a professional organisation because of the diverse nature of the Operating Core, and the fact that processes may conflict because they are required to be that way by certain professional specialists. Trying to change Operating Core practices also brings up ISSUE 5 again – “The more that the Operating Core supports a KM system the less “push” will be required from the

strategic apex”. Trying to change what the Operating Core do, can cause a backlash to system adoption, as discussed in chapter 6.

Issues 30 – “Increasing the scale of the project may increase the likelihood that organisational politics, culture and power will impact the project”, and 31 - “Organisational politics, culture and power will impact the project at different stages of development in different ways”, highlight the true nature of what happens in a centralised approach. The two issues have a major bearing not only on the success of any KM project undertaken using the centralised approach, but can effect what is actually produced. While the problems associated with politics, culture and power can appear in the decentralised and hybrid approaches, they do not have anywhere near the impact on the process that they do in the centralised approach. The decentralised approach is actually the best when it come to controlling these issues as, usually, the project is small and controlled by few people, so it is much easier to either exclude those staff causing problems or to ‘push’ the project along with minimal input from others. This is why decentralised projects are usually highly specific to a small part of the organisation and are usually of little or no benefit to the rest of the organisation unless given major redevelopment.

Politics and power plays are always going to be a problem in KM projects in professional organisations because the Operating Core are professionals who are often protective of their standing or rank, and who may guard the data that assures them of that standing or rank. How the project team handles the politics will determine the success or failure of the project. Due to the power that the Operating Core has in a professional organisation, their inclusion in the project is essential. However, this is

much harder to do in a centralised approach, as the Operating Core will all have separate requirements and opinions about how the system will best serve their departments. How these requirements are included or excluded is important, as it may be seen as favouring one department over another. Since KM systems are dependent on information and data, the more data included in the system the more beneficial to the organisation the system will be, as discussed in chapter 2. By moving to capture and record the data for the impending RQF process, the University captured more data than they had before. However, not only did they record more publications but they began to record data, like music performances, that they had never documented before. Capturing this gave the BI department rich new information streams to mine, and increased organisational value. This point alone shows the value in combining knowledge management and business intelligence initiatives within the organisation, as outlined in chapter 2. This is where a good project manager with excellent people skills will greatly benefit the project. To get the most information and data into a centralised system will require departments to give up some of the data that they control and they will have to give others access to it. This can cause problems as many middle line and Operating Core personnel will not wish to release control of the data without gaining something in return, such as equal access to other departments' data. This is where a good project manager and a good Strategic Apex will increase the likelihood of project success. They must demonstrate to the rest of the organisation the benefits or 'greater good' that can be achieved by relinquishing control over data.

Issue 32 – “Fundamental Entities of the organisation may differ in structure or detail depending on what organisational level they are viewed from”, was also very evident in the centralised approach. As described in the case studies, when the same fundamental

entity (e.g. a publication) was viewed from different perspectives its attributes changed. For example, from the perspective of the Strategic Apex, RFCD codes were of great significance, but from a school level they were not seen to be of importance at all. Conversely, from a school level, certain types of fundamental entity (e.g. a piece of composed music) were of great import but had been previously overlooked by the Strategic Apex, as they were not considered fundamental to the organisation. What this showed was that, different views of the same fundamental entity will directly influence what type of system is built and at what level it will meet the organisation's needs. One thing is certain, if the organisation includes views from both the Strategic Apex and the Operating Core, it can increase the amount of data it captures about fundamental entities and increase the overall effectiveness of its KM and BI systems, as explained in chapter 2.

Issue 33 - "A user's first impression of the new KM system may greatly impact their overall opinion on the system in the end", showed how much the Operating Core can affect the success of a centralised approach. As discussed in chapter 6, the training was the first experience that the Operating Core had of the new system. If this first experience with the system was negative, it resulted in significant problems during the training and afterwards getting the Operating Core to use the system. Much of the time it was not even due to system functionality but instead due to little things like incorrect data, such as job title or a user's name being spelled wrongly. These 'little' problems would significantly affect users' attitudes to the system, so it is important to ensure that the data is as correct as possible before showing the system to the Operating Core, to minimise possible resistance.

When looking at issue 16 - “More complex KM systems will require more complex and ongoing help desk functions”, the centralised approach showed that, as the system becomes more complex, it will require the organisation to formally train staff and put into place a full time organisational support system. These were found to be unnecessary in approaches such as the hybrid and decentralised approach, as the system could be tailored to the specific needs of one organisational unit and therefore only minimal training was needed; this could often be done by peers giving informal training to each other. However, as previously discussed, a centralised approach frequently results in many unnecessary functions for specific business units, so formal training is needed so that all of the Operating Core can navigate through the system successfully. Also, the introduction of new functions within a KM system may actually change existing business processes for some of parts of the Operating Core; such new business processes may create a need for formal training both in the processes themselves and in how to carry out those process within the KM system.

7.5 Selecting An Approach

This section discusses the question of how to select an approach to KM implementation for a professional organisation undertaking a KM project.

7.5.1 Initial Questions

When undertaking a KM project within a professional organisation there are many things that must be considered, starting with the initiation of the project. The first thing you should ask yourself is “who is initiating this project and what is its scope?” Typically the answer should be one of the following:

- i) The project is part of an ongoing, organisation-wide KM program

- ii) The project is a single organisation-wide KM project
- iii) The project is a single unit-based KM project

The second question is, “how complex is your professional organisation?” The answer again would be one of the following:

- a) Complex (lots of independent units doing their own thing),
- b) Large but simple (lots of units but all doing very similar things),
- c) Simple (one or two very similar units)

The third thing to ask is “what level of integration into the organisation will the new system have?” and responses could be grouped as:

- 1) High
- 2) Medium
- 3) Low

The final variable is, “what is the level of system development skills in your IT department?” and answers might be:

- 1) Weak
- 2) Medium
- 3) Strong

By asking these four simple questions an organisation can begin to decide which of the three approaches (Decentralised, Hybrid or Centralised) would best suit your KM project and whether it is better to build or buy a KM system. The answers to these questions allow you to use the decision trees shown in Figure 7-1 and Figure 7-2. Figure 7-1 shows how an approach to KM might be chosen.

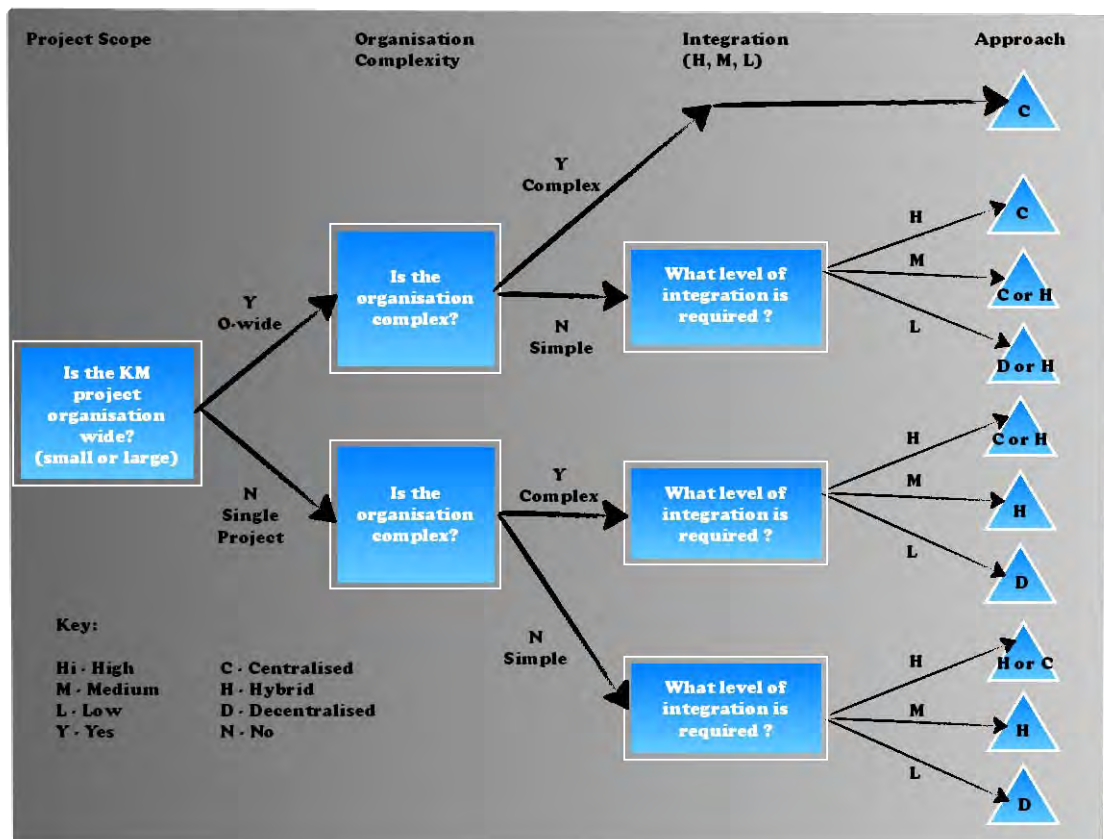


Figure 7-1 Approach Decision Tree

Using the responses to the first three questions about project scope, organisational complexity and the level of integration, the decision tree provides a recommended approach on the right hand side. It should be stressed an approach to KM is only recommended, and, although it is represented here as a decision tree, the decision making process is not really deterministic. This will be explained further in section 7.5.2.

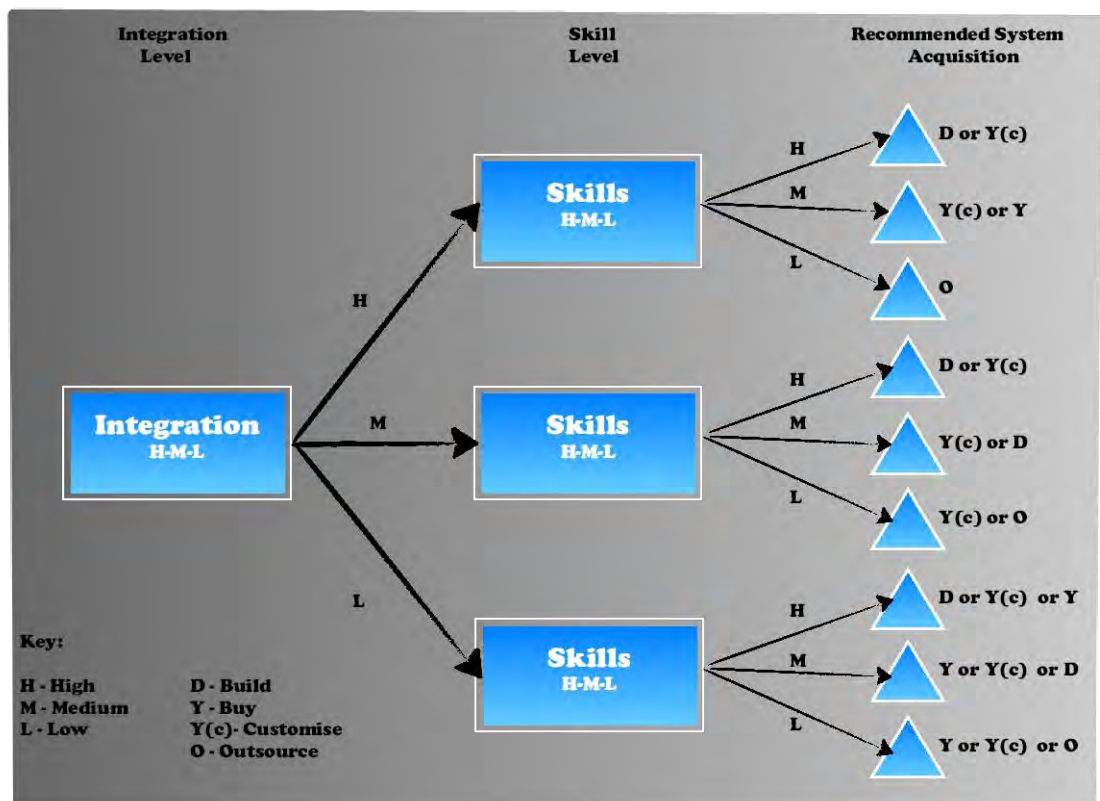


Figure 7-2 Systems Acquisition Decision Tree

Using the responses to the two questions about the level of integration and the skill level of internal IT staff, the decision tree provides a recommended system acquisition approach. Once again, this is not a fully deterministic process, as will be explained further in section 7.5.2.

7.5.2 Considerations Before Navigating The Decision Trees

Before attempting to use either of the decision trees, an organisation should take some time to consider the responses to the highlighted questions below because answers to these questions may give rise to some additional considerations.

Question 2 may identify an organisation that is “Complex (lots of independent units doing their own thing)”, in which case the KM project may also become large and

complex. Consideration should be given to the scope of the project. Can the project be split up into smaller more manageable projects? Are there parts of the project that are not actually necessary? Will this project actually benefit the whole organisation? Responses to these questions would indicate if the project scope should be changed or, if not, that greater planning and definition of the scope will be required.

If the answer to question 2 indicated that the organisation was “Large but simple (lots of units but all doing very similar things)”, the resulting project should be a little easier. If most or all units are doing the same thing, then one system can be rolled out across the whole organisation with little need to customise it for different units. Additional considerations might then include the switchover mechanism i.e. will all units adopt the new system at the same time or will there be a staged roll out , one unit after another. If the organisation is “Simple (one or two very similar units)”, then the KM project can be managed much like any other small project with the understanding that political issues may be more heightened because of the need to share data and knowledge that were once considered private.

The third question seeks to determine the “Degree of Integration” the system will have with existing systems and practices in the organisation. This will depend on 4 key factors:

- Data Integration
- Platform Integration
- Look and Feel
- Development Environment

Data integration refers to the level of integration that the new system will have with existing data in the organisation. Will the system share current data with other systems? Will it access “Gold Level” data as described in the case studies? Will it be using copies of data from other systems? Will it be able to change data that other systems use? The answers to these sub-questions are politically charged and it would be wise to get support from the Strategic Apex, the IT unit, and any units involved with the project before proceeding any further. If these issues cannot be resolved, the project will almost certainly fail.

Platform integration refers to the system’s ability to work on the organisation’s existing hardware and software infrastructure. Does the system need to work with or on a specific technology? Does new technology need to be purchased in order for the system to work? Answers to these questions may reveal hidden costs that would make the project infeasible, or may reveal negative impacts on the performance of existing systems that could be a problem. Once again, these issues need to be resolved before proceeding with acquisition and deployment of the KM system

Look and Feel refers to the system’s need to appear as if it is one of the organisation’s existing systems. Does the organisation have specific design requirements? Does the organisation have specific standards that need to be followed? If the answer is yes, then it should be understood that development of the system will probably be more complex, although it may be more acceptable in the long run.

Finally, the Development Environment; does the system need to be written using a specific language? Does the system need to operate on a specific operating system or

does it have to be multi-platform? If the organisation has a standard development environment, then developing the system in that environment will probably be easier, as the organisation is almost certainly familiar with the standard environment. If the KM system must be developed in an atypical environment, consideration must be given as to whether the IT unit has sufficient expertise in this other environment, and will the use of a non-standard environment cause problems with the ongoing maintenance of the KM system

The fourth question is most relevant in the decision to “Build” or “Buy”, and so influences decisions made in the ‘Systems Acquisition Decision Tree’ (Figure 7-2). This question asks about the strengths and weaknesses of an organisation’s IT department. In determining whether the unit is “Weak”, “Medium” or “Strong” the organisation must realistically assess the skill sets of each member, the availability of the IT department to work on this project, the resources they have at their disposal and their past performances on other organisational projects. This classification must be done properly because the SITACS case study showed that if the task is given to a group that are not capable, then the resulting system will be inadequate to the tasks it must perform. Similarly, the EDUC showed that having staff moving in and out of the project all the time will significantly slow down the development. The RIS case study showed the negative impacts of having a change in project manager on such projects. So, there are more issues to be considered here than just the technical skills of the IT unit.

7.5.3 Navigating The Decision Trees

With the information gained after considering the questions posed in section 7.5.2, the task of using the decision trees (Figure 7-1 and Figure 7-2) should be much simpler. Firstly we will discuss Figure 7-1, the Approach Decision Tree. However, it should be noted again that, although Figure 7-1 and Figure 7-2 are described as ‘decision trees’ the final nodes or leaves on the trees are not always definitive ‘yes’ or ‘no’ answers, as normally found when using decision trees. It is also of note that the 2 decision trees are not entirely independent of one another, and so a decision made on one tree may influence decisions in the other.

7.5.3.1 The Approach Decision Tree (Figure 7-1)

The first task when navigating the Approach Decision Tree is defining the scope of the project. It should be asked ‘Is the KM project organisation wide?’ It does not matter the size of the project (it could be small or large), just whether it encompasses the entire organisation or not. If it does, then you should proceed along the yes path, to the next question; if it does not then you should follow the no, or single project path. It should be noted here that a single project does not always mean a single unit in the organisation. Several units may need a system supplied for them but it may only cover a fraction of the organisation and not all of it. With this decision we are only concerned as to whether it will encompass the entire organisation or not.

Once this decision has been made, you must determine the level of organisational complexity; in other words, is the organisation highly complex or simple in nature? If the organisation has many different units and/or the units are significantly different in their make up then you would answer yes to this question. However, if the units are

similar or not very specialised then you would answer no. If you have answered yes to this question and you are performing an organisation wide project then you skip straight past the next question in the tree as you should be using a centralised approach. With an organisation-wide project in a very complex organisation a centralised approach is the only sensible way to undertake the project.

The next step is to determine the level of integration in the organisation that the project is required to have. High integration indicates that the new system will integrate with many if not all of the current organisational systems and data. It could be replacing some existing systems, work practices and introducing new data to the organisation, or it could be simply using data from many different sources. Overall its impacts will be far reaching throughout the organisation. Medium integration indicates that the new system will be integrating with several of the organisational systems and practices but not all. This could refer to a system that stretches through the whole organisation but only uses data from a certain section of the organisation (e.g. customer data) or a system that is using data from a vast cross section of the organisation but not having a major impact on the organisational data flow (e.g. it draws in data from across the organisation, but only alters a small amount of it). Low integration refers to a system that will have little or no impact on the data in the organisation. It can be a system that only uses data from a small section of the organisation (e.g. from one particular unit, or even a small part of a unit), or a system that only draws data into it and does not make any alterations to it (e.g. a read-only system). So answering this question of integration will allow you to determine your approach to use for the project.

As discussed earlier if the scope is organisation-wide and the organisation is complex you do not need to determine the level of integration required, you should just adopt the centralised approach for the project. This approach in this situation will give you the best chance for success for you project.

The next option is if your scope is organisation-wide but the complexity level is simple, from here determining your integration level will determine your adopted approach. If the integration is High, then you should adopt the centralised approach. If the level of integration is Medium then you have the choice of either a centralised approach or a hybrid approach. The approach you use may be determined by how you answer the Systems Acquisition decision tree (Figure 7-2), and how strong your Technostructure is. Overall the centralised approach is probably a better fit than the hybrid approach, since the project is an organisation-wide system. Finally if the integration level is low, you have the choice of a decentralised approach or a hybrid approach. A decentralised approach is probably best as it will be quicker and have less impact on the organisation, however the hybrid approach would probably give you a more robust system that fits with more organisational norms. These are the options you have if you are conducting an organisation-wide project. Next the approach options for single projects will be discussed.

If the scope of the project falls into the 'single project' decision and the organisation is complex then the level of integration will give you several options for the approach to take. If a High level of integration is required by the project then there is the choice between a centralised or hybrid approach. It is probable that the centralised approach in this instance is best as it will make it easier when integrating with other organisational

systems, however a hybrid approach will also get the job done. Again the decision between these 2 options way be determined by your place on the Systems Acquisition decision tree (Figure 7-2), i.e. if you decide to ‘buy’ a system, a hybrid approach may be easier and impact the organisation less. If the level of integration is Medium then you should adopt the hybrid approach. This will allow you to meet organisational standards with minimal impact on the organisational culture. Finally if the required integration level is Low, then a decentralised approach should be adopted, as it will allow for simple quick development and deployment of the system in the organisation with minimal impact on the Operating Core.

Lastly are the options to the project manager when the scope is a ‘single project’ and the organisation is not complex. If the required integration level is still high, there is a choice between a hybrid and centralised approach. The hybrid approach is probably better suited here, as shown by the problems encountered with a centralised approach in this research, However, once again the answer will be determined by how the Systems Acquisition decision tree (Figure 7-2) factors into the decision. If the required level of integration is Medium, then the hybrid approach should be adopted, again allowing you to meet some of the required organisational standards to integrate with other organisational data, while still allowing for simpler development. Finally if the integration level is Low, then the decentralised approach should be adopted. This will allow for quick development and implementation with little or no impact on the rest of the organisation which is not required to use the new system.

Next, section 7.5.3.2 will discuss ‘The Systems Acquisition Decision Tree’ (Figure 7-2).

7.5.3.2 The Systems Acquisition Decision Tree (Figure 7-2)

The first step in determining the recommended way to acquire your system is to determine the level of integration required with other systems and practices in the organisation. This answer will be the same as the one given in the previous section (7.5.3.1) when determining the level of integration in the Approach Decision Tree (Figure 7-1). You have the same three options when determining the answer to the question ‘What level of integration is required?’; it can be either High, Medium and Low. High integration indicates that the new system will integrate with many if not all of the current organisational systems and data. Medium integration indicates that the new system will be integrating with several of the organisational systems and practices but not all. Low integration refers to a system that will have little or no impact on the data in the organisation. Answering this question of integration will allow you to progress to the ‘Skill Level’ section, where you determine the skill level of your IT workers or Technostructure.

As with the integration level you have three choices when determining the competence of the IT personnel of the organisation: High, Medium or Low. A skill level of High would mean that the IT personnel are highly skilled people with programming and development skills that can meet the needs of the organisation. If required they can develop systems for the organisation “from scratch”, and can maintain current systems, and are up to date on new technologies and technological issues. A skill base of Medium should mean that the organisational IT personnel are competent in their jobs and will have some form of development skills. Some people may have specialities in certain areas and that others do not, however they are the only ones who can do jobs

requiring that specific skill set, and, if they are unavailable, the KM project would be delayed. A skill base of Low means that there are personnel in the organisation who have some competence with IT but are not properly trained IT specialists, and probably only maintain current systems. Low skill set can also mean that there is no formal IT person working in the organisation. Once this skill base has been determined the method by which the system will be acquired can be determined.

There are 4 ways in which a system can be acquired: Build, Buy, Buy and Customise or Outsource. 'Build' refers to the IT unit within the organisation developing and building the system from scratch. 'Buy' refers to purchasing a software package that is purposely built to cater to this specific organisational need (e.g. buying a new accounting package like MYOB to fix accounting shortcomings in the organisation). 'Buy and Customise' refers to buying more open packages like 'Lotus Notes' and customising the package to suit the organisational needs. Lastly 'Outsourcing' simply refers to outsourcing the project to an external software development company which comes in to develop a system to meet organisational needs.

If the system is to have high integration in the organisation and the IT skills are also high then it is recommended that either you develop your own system from scratch or purchase a system and have it customised to suit your needs. This way the system will tie in properly with existing systems and can be tailored to fit in where needed. The decision to build or buy will be determined probably by the availability of software packages in the marketplace, and their ability to meet the needs of the project, however you are most likely to build as this will give the greatest opportunity to meet the high level of integration needed. Some form of benchmarking should be performed by the

project group to determine which is the best commercial package on offer. Any number of benchmarking techniques to be used can be found in IT literature and an example of what this process produces can be found in chapter 6. If the IT skills are Medium then it is best to either buy a package and customise it to suit the organisations needs or purchase a more robust package that has been commercially developed to accomplish this task. Finally if there is a Low skill level in the organisation then it is recommended that you outsource the project to a more qualified external organisation.

If the project has Medium integration and there is a High skill level within the organisation then, once again, you can either build from scratch or buy and customise a package for the organisation. While it is more likely that you will build, a comparison of available commercial packages may identify one that closely meets the needs of the organisation, in which case you might buy. If there is a Medium level of skills in the organisation then you will either buy and customise (most likely) or build (depending on available skills needed). Finally if the skill set is Low you are most likely to buy and customise, but the other option open to you is to outsource the project.

Finally if the project requires Low integration in the organisation and there is a high level of skills then the option is to build (most likely), buy and customise or buy a robust package. The decision as to which will come down to benchmarking, availability of the IT personnel needed, the budget and possibly the approach chosen. If there is a Medium skill set then you would most likely buy a robust package, however the other options of buy and customise or develop are also available, again depending on the factors previously discussed. Finally if there is a Low skill level with Low integration then the most likely case is to purchase software to solve the problem. The options to

buy and customise and outsource are also available, however, with the low level of integration into the organisation it would be simple to buy a fully developed piece of software that meets the needs of the project.

Now that an approach has been chosen and a method of system acquisition has been determined, the following is a brief guide on the issues to watch for in regards to the specific approach you have taken.

7.6 Summaries On Individual Approaches

The following highlights some of the issues that will be encountered in each of the 3 approaches.

7.6.1 Decentralised Approach

The analysis of the EDU decentralised approach demonstrated that the approach can work in an Australian professional organisation. The ability of a decentralised approach to build to any standards and specifications means that this approach is the fastest way for the organisation to develop a new KM system. It does not require any formal method to work but if it is the desire of the project team to do so the option is there. This is why systems developed under the decentralised approach would be very successful in most circumstances as the approach is high adaptable to any circumstances and will cater to all manner of projects.

However the strengths of the decentralised approach reflect its weaknesses. Due to the highly specific characteristics of decentralised projects and their ability to cater to specific organisational practices without regard to organisational standards, makes the

likelihood of their adoption throughout the organisation unlikely. This will be because of incompatibility with other organisational units' systems, missing skill sets required in other units and system functions specific to that unit that are not required in any other unit.

7.6.2 Hybrid Approach

The analysis of the SITACS hybrid approach demonstrated that the approach can also work in an Australian professional organisation. The fact that the hybrid approach shares the benefits of both the centralised and decentralised approaches makes it an appealing approach for a professional organisation. The case study demonstrated that complying with organisational standards allowed the production of systems that appeared to fit the organisational model, while excluding some of the more rigorous and complicated processes required for a centralised system. It also made it easier to draw data from centralised systems, which in turn could increase the capabilities of the system with the inclusion of richer data. It also means that, by complying with organisational standards, data can be easily passed back to centralised systems allowing for better information flow between administrative and planning units and Operating Core. If the tool is deemed a success it is also easier to deploy organisation-wide, as it will be compliant with many of the existing standards and may only require minor changes, or extra features.

This last point, however, demonstrates two of the weaknesses of the hybrid approach. Firstly, if a KM system developed using a hybrid approach is later to be deployed organisation-wide, the system will still require modifications to get it to meet all the organisational standards. Secondly, because the hybrid approach attempts to meet some

of the organisational standards, system development will be a much more complicated process than would have been the case in a decentralised approach. Meeting organisational standards will sometimes require skill sets that need to be obtained before development and deployment can be achieved. The hybrid approach would be seen by the Strategic Apex as the preferred approach for units to develop individual systems because, if the systems are successful, they can be expanded more easily to an organisation-wide system than a system developed using a decentralised approach; this would require less rework by the organisational IT unit. However, from the perspective of an individual business unit, the decentralised approach may be the preferred option because the business unit can just concentrate on what they want and ignore the rest of the organisation, getting their system in a much faster timeframe.

7.6.3 Centralised Approach

The analysis of the RIS centralised approach demonstrated that the approach can also work in an Australian professional organisation. The centralised approach will provide the most comprehensive system of any of the approaches. It will achieve this through the ability to tap into all the knowledge and skills available within the organisation, and have all organisational resources at its disposal. It will also be the most comprehensive as it will have access to the most data and therefore have the ability to achieve the best results in turning that data into information and knowledge that will benefit the organisation.

However, there are several problems with the centralised approach, the most important of these being its size and complexity. Due to the structure of professional organisations, building or deploying a system over the entire organisation requires a significant amount of specialisation that may not be necessary in other types of

organisations. The highly specialised nature of organisational units will require the inclusion of some functions which may only be used by very few members of the Operating Core. However few these users may be, those specialised functions are still a necessity for the success of the system. The need to meet such varying requirements will take a significant amount of time in planning the project and gathering those requirements. Moreover, as shown in the case study, this will be an ongoing process and the need to continually revisit functions and make modifications on the fly will again greatly slow down the development and deployment processes compared to the decentralised or hybrid approaches.

The introduction of centralised systems will also create the need for new training and help functions as well as the possibility of changing business processes. Even if these processes are beneficial to the organisation, they may be met with resistance from the Operating Core for any number of reasons including organisational culture, organisational power and organisational politics. These are issues that must be addressed by the Strategic Apex if a centralised project is to succeed.

7.7 Summary of Findings

As stated at the beginning of this chapter and in chapter 3 this research had three main objectives:

- Identify an appropriate professional organisation where KM is being developed using a variety of approaches
- Compare and contrast the effectiveness of these approaches

- Provide guidelines for the selection of appropriate approaches to KM development and deployment in professional organisations

This research has met each of the objectives. The first of these was met with the selection of an appropriate professional organisation in which to conduct the research. The university was selected and produced three detailed case studies in which issues could be identified.

The second of the objectives was met with the observation and analysis of the three case studies. The analysis compared three different approaches to similar KM projects in a single professional organisation, thereby removing many of possible confounding variables such as different projects or different organisational contexts. Thus the research has been able to focus almost exclusively on differences brought about by the use of decentralised, hybrid and centralised approaches to the development of KM systems in a professional organisation. It appears from the literature that this is the first time such a comparison has ever been conducted and it is certainly the first time it has been conducted in a professional organisation. The analysis used issues analysis to identify those issues that are likely to occur in any KM project, regardless of which approach is used. At the same time, it allowed the identification of issues that appear to be specific to one or other of the three approaches.

The final objective was to provide guidelines for the selection of an appropriate approach in a professional organisation. This has been met in the early parts of this chapter which provide two decision trees, one for the selection of a KM approach and another for the Buy/Build decision for a KM system. These decision trees are explained,

and additional considerations are presented to correspond to the decisions that are being made as an organisation traverses the decision trees. The research has demonstrated that, while all three approaches will work in a professional organisation, there are some instances when specific approaches will work better for the organisation, and that the selection of certain approaches will be dependent on the time, resources and staffing that the organisation is willing to dedicate to the project and the speed with which the project needs to become operational.

If this research has shown anything it is that as long as the professional organisation takes the time to plan and manage their KM initiatives they can be of great influence. They should also understand that the KM process is cyclic, and that once an initiative is finished the process should be started again to see how the new practices are affecting the organisation and any new ways in which the organisation can be improved for the better.

7.8 Significance of Research

This research has shown three different approaches to the development of KM within a professional organisation. Although these three approaches may have been previously applied in practice, this is the first comparison of these three approaches in a professional organisation. The research has identified the issues that are encountered with each of these approaches and developed ways in which to determine when to use each of the three approaches. Two decision trees were developed to assist practitioners in determining the approach they should use when undertaking a KM project in a professional organisation and what method should be used in the system's acquisition. This research has also highlighted the benefits of combining the business intelligence

and knowledge management practices in an organisation allowing for a more robust knowledge environment in the organisation, assisting with better data capture and consolidation practices that can increase the effectiveness of KM techniques by increasing the data available and supplementing with previously uncaptured data, which in turn increases the effectiveness of the KM systems in the organisation by making more and better information available to the Operating Core.

This research can be seen to benefit several groups. The first of these would be KM researchers who can benefit from this research by seeing the 3 approaches tried within a single organisation. The research provides them with insight into the appropriateness of each of the three approaches, their complexities during their application, and the role in KM of the concept of “fundamental entities”, not previously found in the literature. This is also the first comprehensive study of KM in a professional organisation to date.

This research is also of benefit to KM practitioners. This research has introduced KM practitioners to the 3 approaches, identified a comprehensive but not exhaustive list of issues that need to be considered. It has provided decision trees for the selection of an approach to be used and for the acquisition process of the system. These would be invaluable to all KM practitioners. However, the scope of the findings does relate specifically to professional organisations so they are most useful to KM practitioners in those organisational configurations, or consultants who deal with professional organisations.

With the rise of globalisation and its effect on professional organisations, this research shows the benefits which KM projects can have on such organisations. With

professional organisations like universities no longer just competing with other universities in their country of origin but with all universities on a global scale, KM can help increase efficiency and quality of the university's outputs. It allows universities to work smarter, not harder to produce more relevant degrees and capitalise on shifting market trends, allowing universities and other professional organisation to be proactive not reactive.

Lastly it can be of benefit to organisational theorists. The research confirms that understanding organisational structure helps us to understand that different organisational structures adopt technologies in different ways. It provides a basis for further studies of the adoption of KM or other technologies in organisations with different organisational configurations.

7.9 Limitations

This research has several limitations. Firstly it is only focused on professional organisations, therefore the list of issues may not include issues found in other organisational configurations such as the political or machine configuration. The decision trees and other guidelines may also not be entirely applicable to other organisational configurations. Another limitation to the research is that it only looks at one type of professional organisation: a university. While the majority of the issues and guidelines would appear to apply to many other professional organisations (e.g. legal or medical firms, etc), it is possible that some issues pertinent to those types of organisations have not been observed in these case studies. For example, the level of privacy of data in legal and medical organisations would appear to be greater than in universities, so issues of privacy, security and access may be more prominent in those

professional organisations. Finally, the study was conducted entirely within Australia, which is a developed, liberal, democracy. It is possible that the results may have been different in other developed liberal democracies because of different legal codes, privacy regulations and so on. It is highly likely that additional issues would have been identified in countries which were not developed, liberal, democracies, such as those in the Middle East, South East Asia or South America. In such regions, both culture and legal structures may result in different issues being identified and the different approaches being more or less appropriate.

7.10 Future Directions

There are several future directions that can be taken from this research. The first of these is to conduct similar research in other kinds of professional organisations such as a law firm or medical practice. It would be beneficial to see if the decision trees are applicable in different types of professional organisation and to see how many of the issues identified in this research translate to other professional organisations. It would also be of benefit to test this research in different sized organisations and compare the results to this research.

It would also be beneficial to see how this research applies to other professional organisation outside of Australia, in both western and eastern countries (e.g. Japan, UK, USA). This would allow a comparison of the results to see how much the political, legal and cultural aspects affect the uses of the approaches in professional organisations in different countries. Similarly, it would also be of benefit to conduct research in developing nations in the west and east (e.g. countries in South East Asia, South

America or Africa) to see how that affects the application of the approaches to the corresponding organisations.

Finally it would be of benefit to analyse how the 3 approaches and the 2 decision trees perform in other organisational configurations such as machine, entrepreneurial or political configurations. Future research could determine the suitability of the approaches, issue and guidelines studied in this research to those other organisational configurations. This could include looking at other systems acquisition and systems development methodologies like Friedman and Sage (2004), Roberts (1999) or Baskerville and Pries-Heje (2001) and how they can be used to enhance the systems acquisition tree.

It would also be interesting to look at the organisational politics issues that arose during the case studies in more detail and how they affect the KM projects. Looking at works such as Fehse and Krabbendam (2004) or Iyamu (2011) and applying their theories to see how organisational politics affects the three approaches is also a possibility.

7.11 Conclusion

This thesis set out to compare and contrast 3 different approaches to the development and deployment of KM in professional organisations. This was done by conducting 3 case studies each using one of the proposed approaches.

As explained in section 7.7, the research has fully met its objectives and has provided valuable insights into the development and deployment of KM in professional organisations in countries like Australia. It is the first in-depth study of KM in this style

of organisation and so establishes a basis for much future research as described in section 7.10.

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Appendix A

Screen Shots from the OPAS system


Online Publication Auditing System

[Logout](#)
[Menu](#)
[Back](#)
[Help](#)

Logged in as: Academic

Configure Publications for Online Viewing

Selecting a publication will allow the bibliographical details to be viewed online
(only those selected for online viewing will be available through the search option)

2003				
Publication Type	Publication Title	Publisher Name	Place Published	View Online
Book	HCI102 - Proper use of colours	Horstmann Inc	Canberra	<input checked="" type="checkbox"/>
Audio Visual	HCI106 - Appropriate use of sound - Part 2	Whitehead Pty Ltd	Perth	<input checked="" type="checkbox"/>
Audio Visual	HCI105 - Appropriate use of sound - Part 1	Text Publishers Pty Ltd	Sydney	<input checked="" type="checkbox"/>
Book Chapter	HCI04 - HTML Basics	Cornell Inc	Melbourne	<input checked="" type="checkbox"/>


2002				
Publication Type	Publication Title	Publisher Name	Place Published	View Online
Patent	Rubber band	Cornell Inc	Melbourne	<input checked="" type="checkbox"/>
Book Chapter	HCI103 - Keeping it Simple	Text Publishers Pty Ltd	Sydney	<input type="checkbox"/>
Patent	Ball point pen	Whitehead Pty Ltd	Perth	<input checked="" type="checkbox"/>
Book	HCI101 - Screen Layout	Whitehead Pty Ltd	Perth	<input type="checkbox"/>

2001				
Publication Type	Publication Title	Publisher Name	Place Published	View Online
Creative Work	Statue of Liberty	Horstmann Inc	Canberra	<input type="checkbox"/>
Creative Work	Opera House	Prentice-Hall Inc	Sydney	<input checked="" type="checkbox"/>

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Figure 8-1 Online Viewing Configuration Screen



FACULTY OF INFORMATICS
OPAS

[Logout](#)
[Menu](#)
[Back](#)
[Help](#)

[Home](#)
[General Search](#)
[Academic Staff](#)
[School Research Officer](#)
[Library Copyright Officer](#)
[Rchhni Administrator](#)
[Administrator](#)

Logged in as: Academic

Add new Grant Application

Please complete the form below

Step 1: Select the number of parameters

Number of Partners:

Number of Internal Investigators:

Number of External Investigators:

Number of award years:

Add

Step 2: Fill in the form

GrantBody:

Project Title:

Keyword:

Apply Year:

Category:

Faculty:

Partner 1:

Internal Investigator 1:

External Investigator 1:

Award Year 1:

Start Date :

End Date :

CHIEF ☐
CHIEF ☐

Amount:


Summary of the project:

Visible To Public? YES ☒ NO ☐

Submit

Reset

Figure 8-2 Submit New Grant Screen



**FACULTY OF INFORMATICS
OPAS**

[Home](#)
[General Search](#)
[Academic Staff](#)
[School Research Officer](#)
[Library Copyright Officer](#)
[School Administrator](#)
[Administrator](#)

[Logout](#) | [Menu](#) | [Back](#) | [Help](#)

Logged in as: Academic

Display Grant Application

ID:APP001
APPROVED

Grant Body:	APIC Discovery Projects	Year.:	2005
Project Title:	Multi-resolution phase measuring profilometry for dynamic 3D digital imaging		
Category:	2917-COMMUNICATIONS TECHNOLOGIES		
Faculty:	Faculty of Informatics		
Partner:			
Partner 1:	BHP Flat Products		
Partner 2:	State Emergency Service		

Summary:

UOW Investigator:		External Investigator:	
Investigator1:	Mr. Daniel Staffioti	Investigator1:	Kelvin TUNG
Investigator2:	Dr. Koren Ward	Investigator2:	Philip David
Investigator3:	Dr. Peter Hyland		
Investigator4:	Mr. Ping Yu		
	CHIEF		

Yearly Award:			
Award Year:	2005	2006	2007
Award Amount:	\$5000	\$5000	\$5000
Project Start Date:	27/05/2005	Project End Date:	27/05/2007

Figure 8-3 Display Grant Screen



Online Publication Auditing System

[Logout](#) | [Menu](#) | [Back](#) | [Help](#)

Logged in as: School Research Officer

Verification System

The Software Publication is **SUBMITTED**.

Please complete form below

Reference No: INF013	Publication Type: G	Publication Status: SUBMITTED	Date: 10/10/2003
1) Has the form been fill out correctly:	<input type="checkbox"/>	2) Has a printout been provided:	<input type="checkbox"/>
3) Has supporting documents been provided:	<input type="checkbox"/>	4) Does the nominated category suit the Publication:	<input type="checkbox"/>
5) Is the record ok for submission to library Copyright Officer:	<input type="checkbox"/>	When check box 1 to 5 are checked, document is VERIFIED	

If Pubication Status is Verified, Pending Audit or Audited, no action is required from SRO

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Figure 8-4 Publication Verification Screen

OPAS Online Publication Auditing System

Logout Menu Back Help

Logged in as: School Research Officer

Create a Report

Please complete the form below

General Report - Annual
 The report generated consists of all academic works submitted in a year. Select a year and press the Report button. The report will be saved to your A:\ drive. Simply double click the saved file and it will open in Excel.

Year... Report

Individual Report - Single Record
 The report generated consists of a single academic work. Enter a Reference No and press the Report button. The report will be saved to your A:\ drive. Simply double click the saved file and it will open in Excel.

Report

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 Feedback: webmasters@uow.edu.au

Figure 8-5 Create a report Screen

OPAS Online Publication Auditing System

Logout Back Help

Logged in as: Library Copyright Officer

Library Audit System

The Journal Article Publication is **VERIFIED**.

Please complete form below

Reference No: INF005	Publication Type: C	Publication Status: VERIFIED	Date: 10/10/2003
1) Has the form been fill out correctly by the School Research Officer:	<input type="checkbox"/>	2) Has a printout been provided by the School Research Officer:	<input type="checkbox"/>
3) Has the School Research Officer supplied supporting documents:	<input type="checkbox"/>	4) Does the nominated category suit the Publication:	<input type="checkbox"/>
5) Does the nominated publication suit DEST criteria:	<input type="checkbox"/>	When check box 1 to 5 are checked, document is AUDITED	
6) Do you wish to REJECT this item for Audit status:	<input type="checkbox"/>	Check box 6 is check only if submission is rejected. Do not check any others.	

If Pubication Status is Audited, no action is required from LCO

Submit Reset

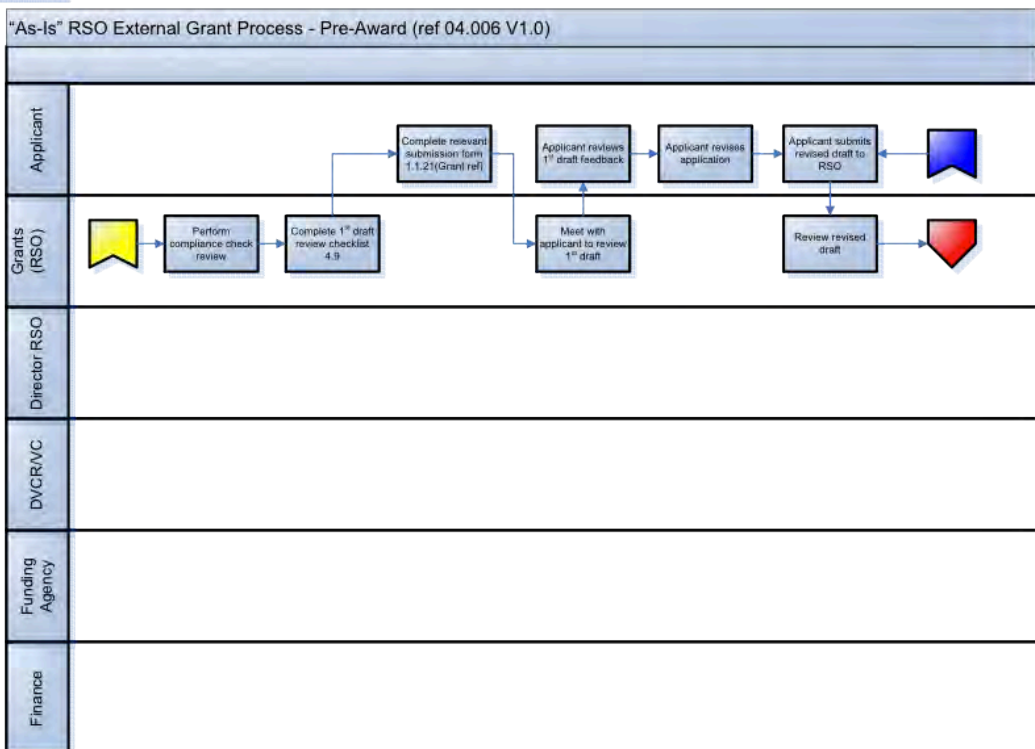
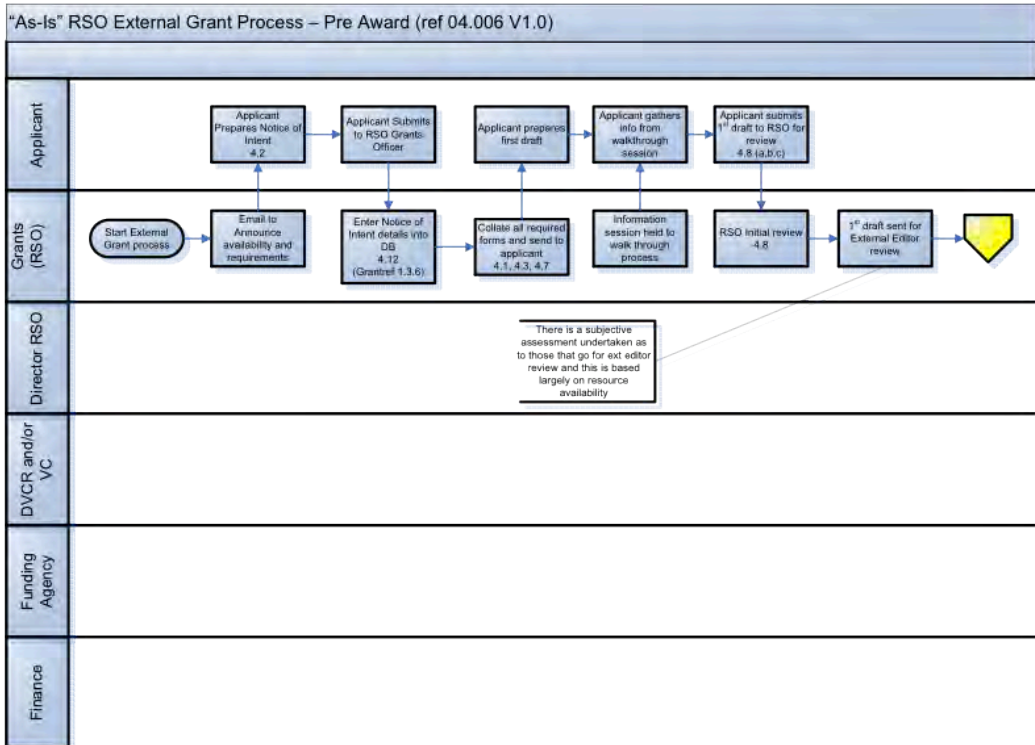
University of Wollongong
 Wollongong NSW 2525 Australia
 Telephone: +61 2 4221 3555

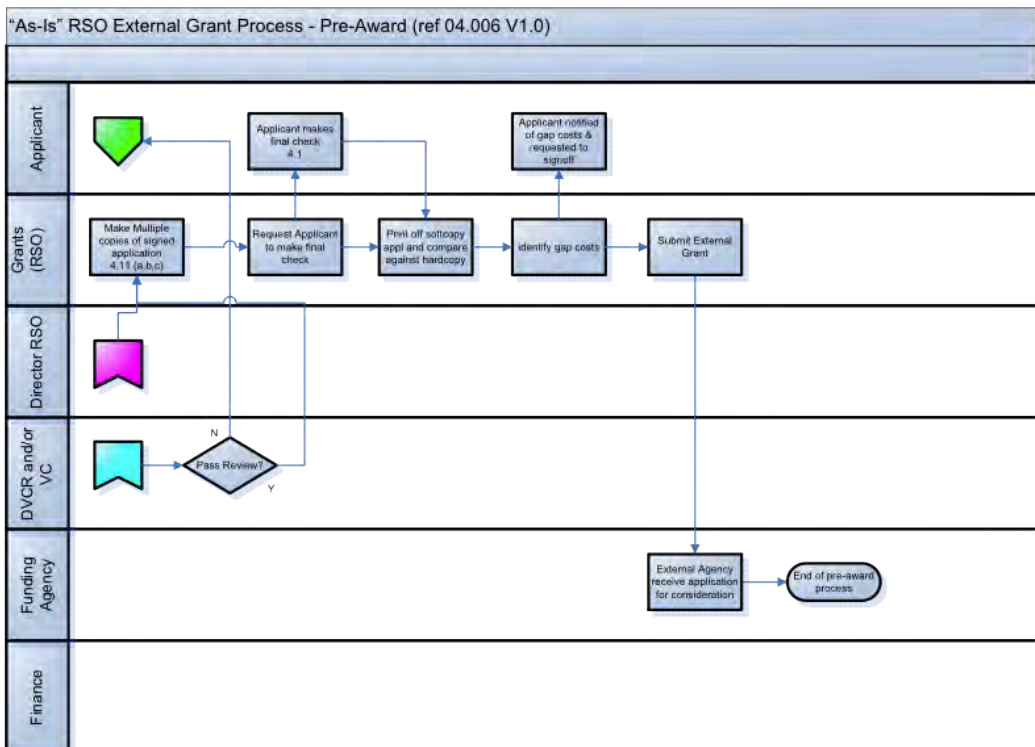
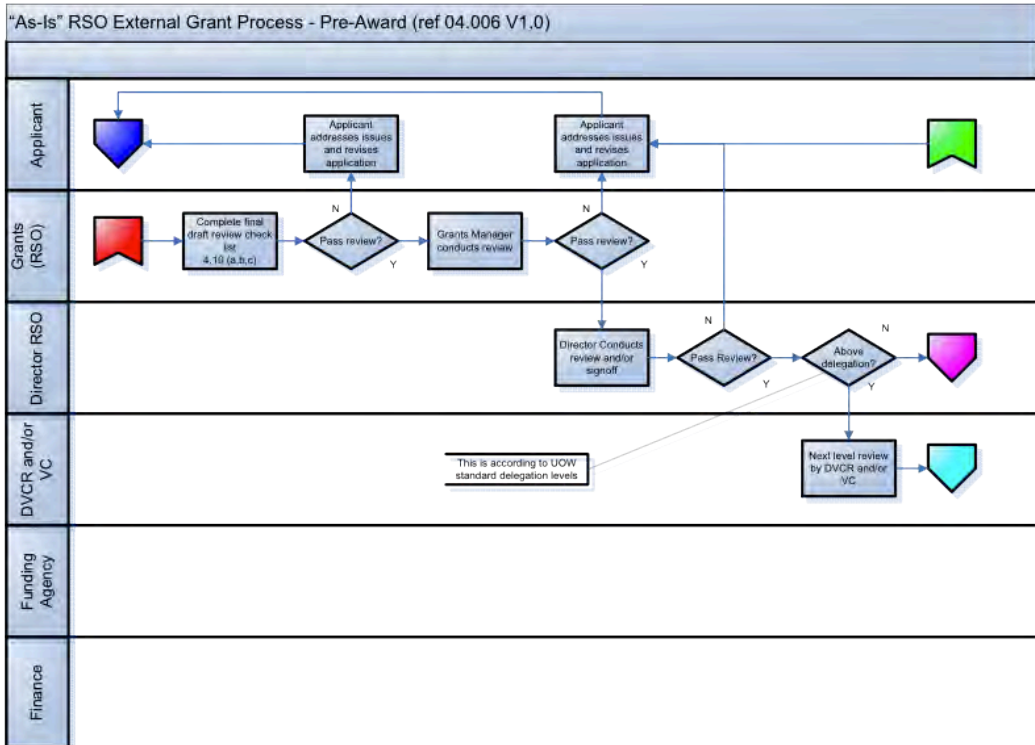
OPAS © 2003
 Privacy, Disclaimer and Copyright Info
 Feedback: webmasters@uow.edu.au

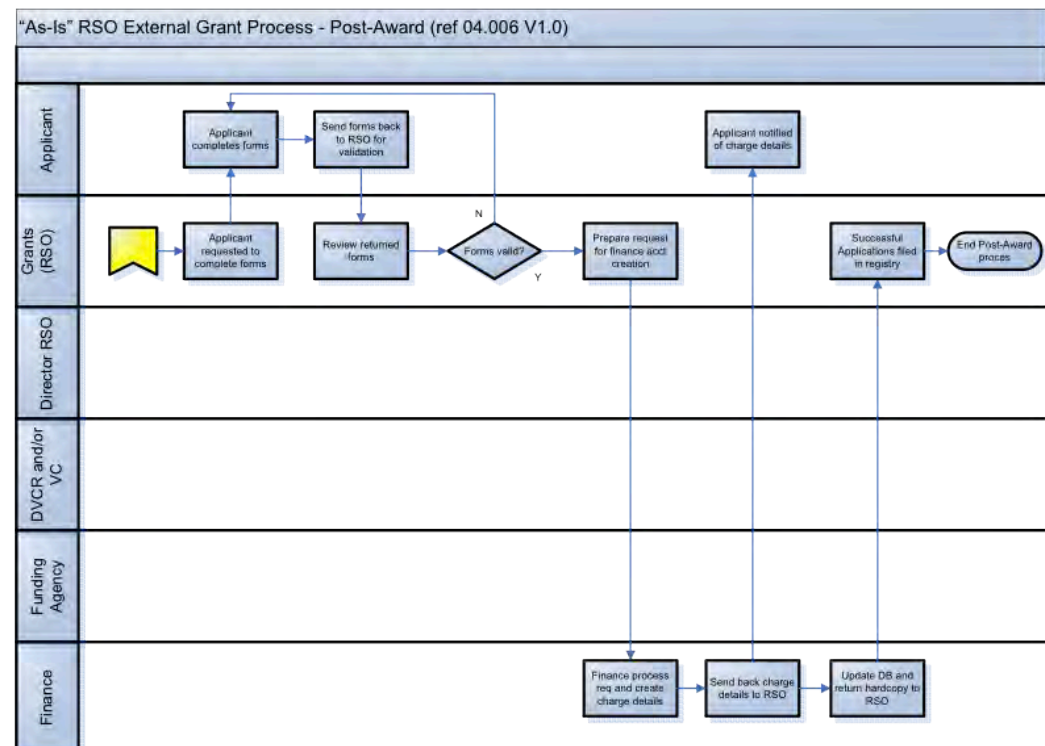
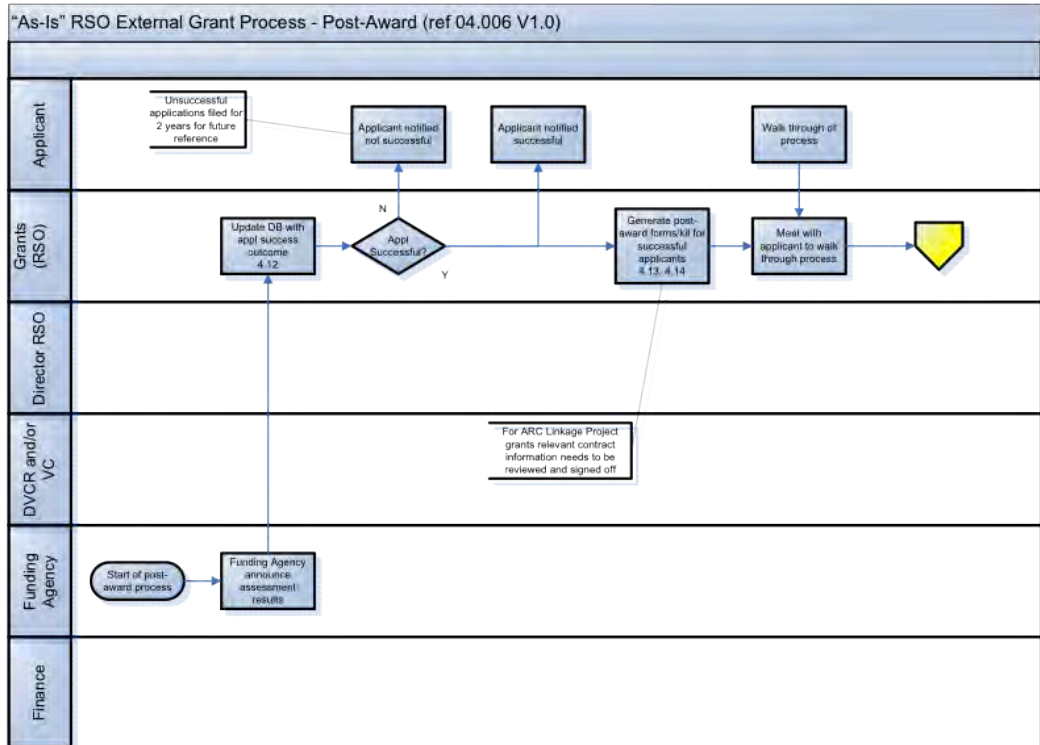
Figure 8-6 Library Officer Verificaion Screen

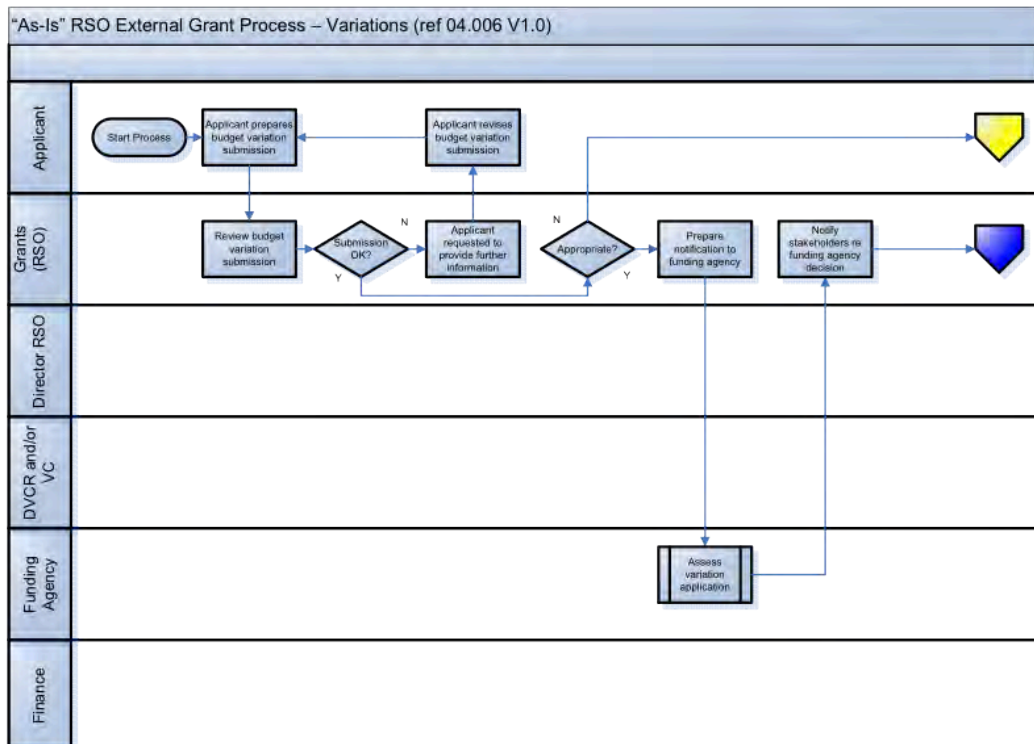
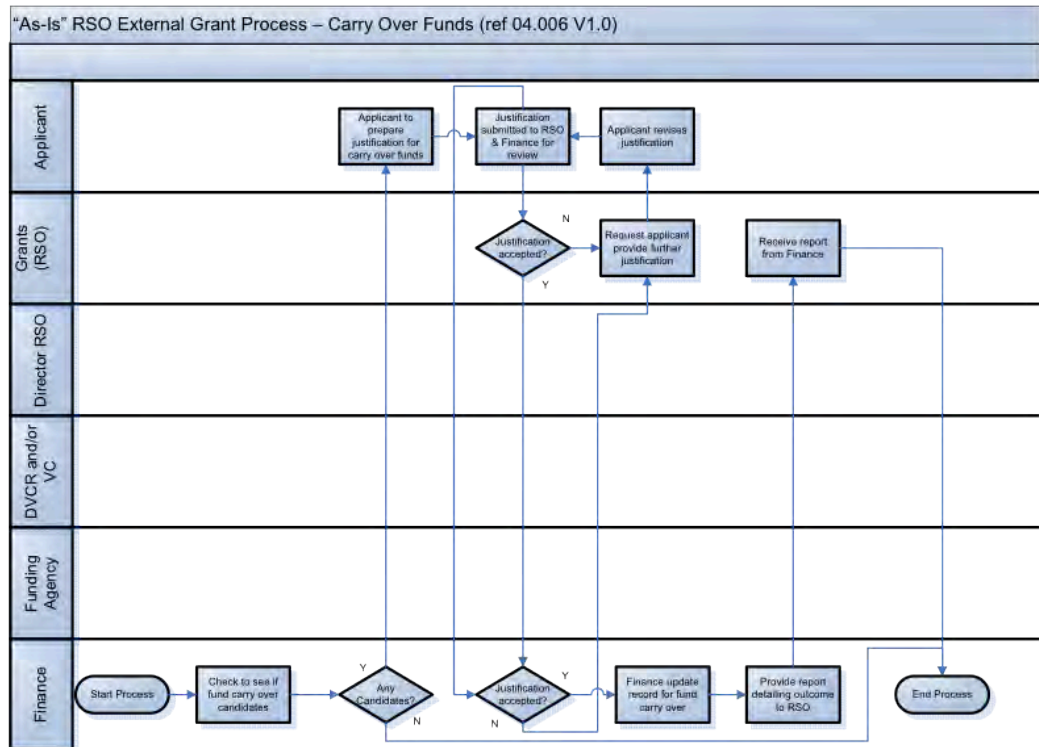
Appendix B

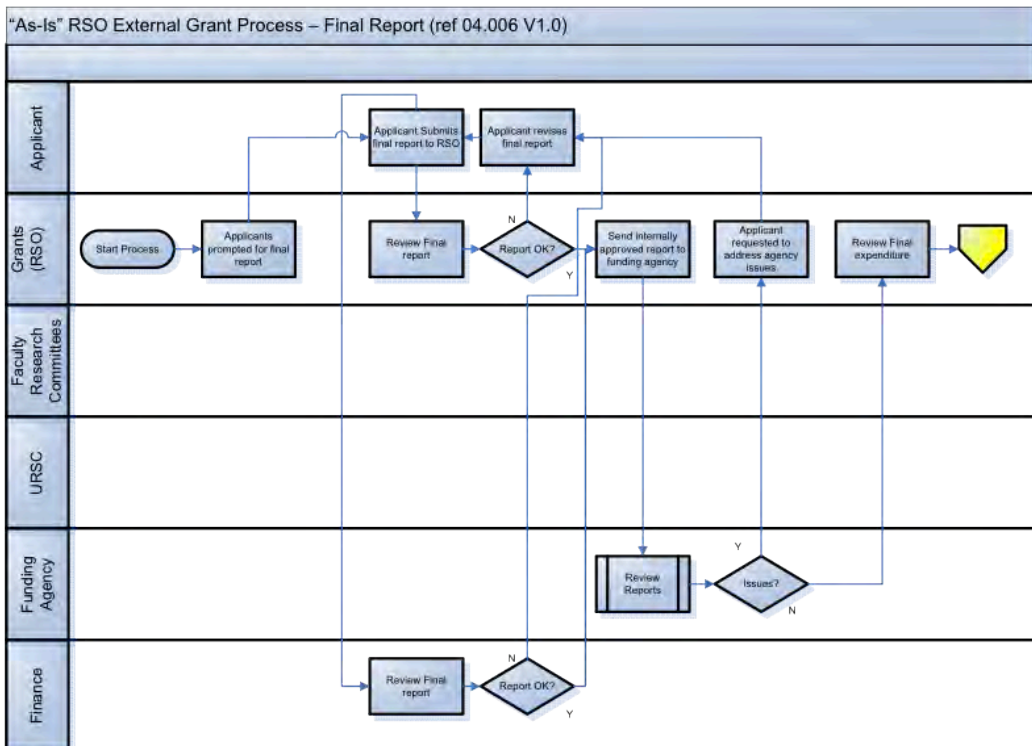
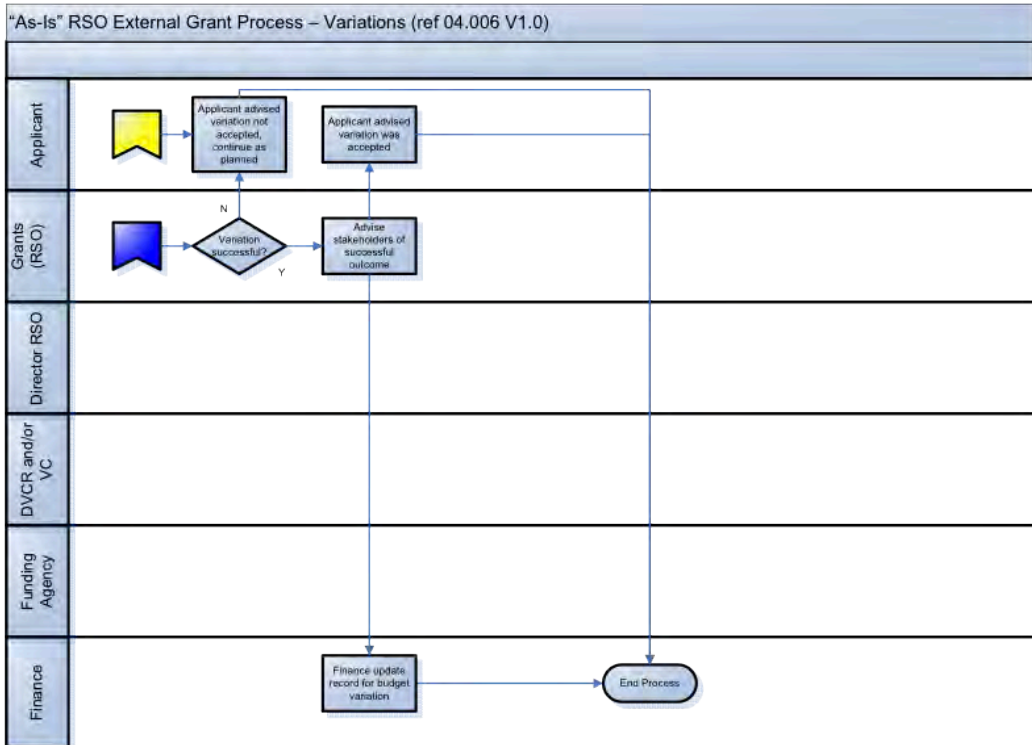
RSO Grants Workflow



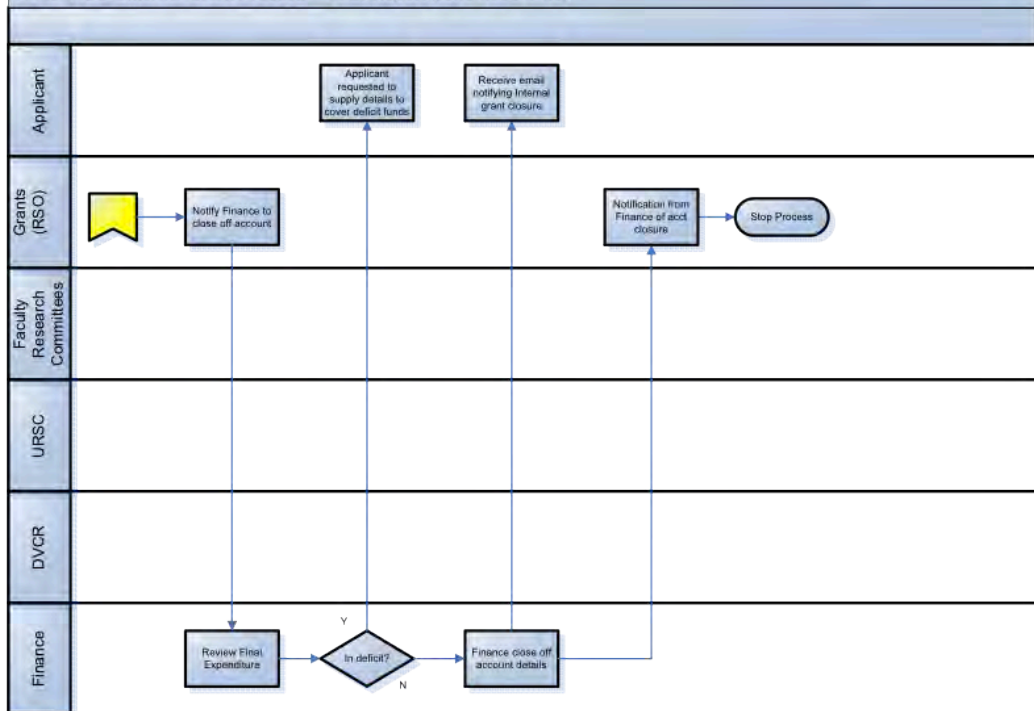




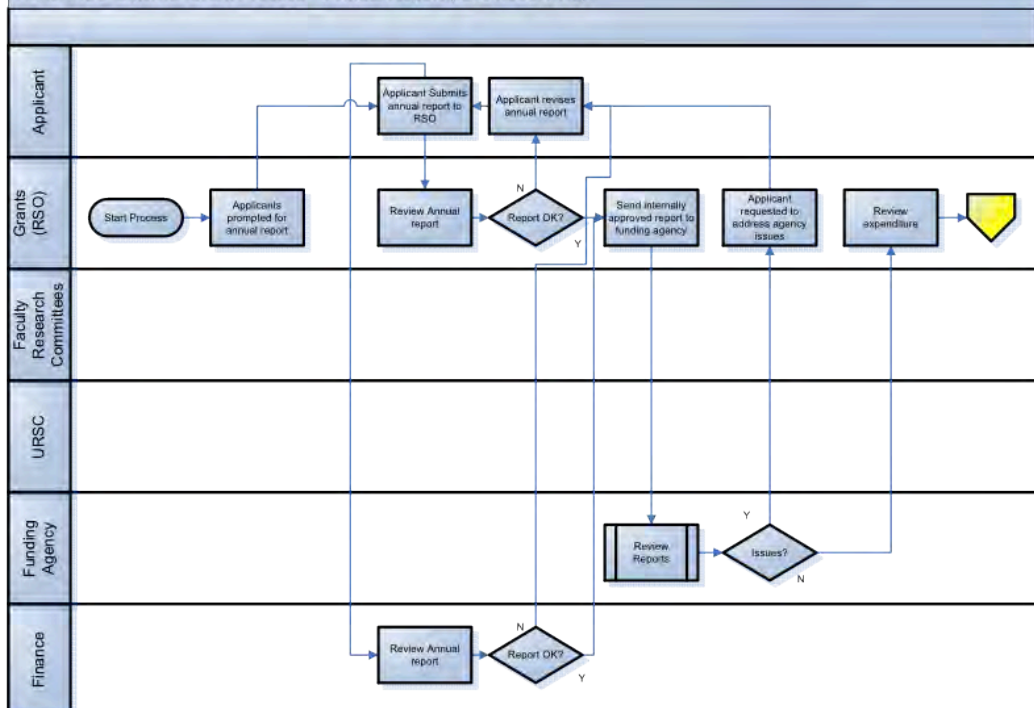


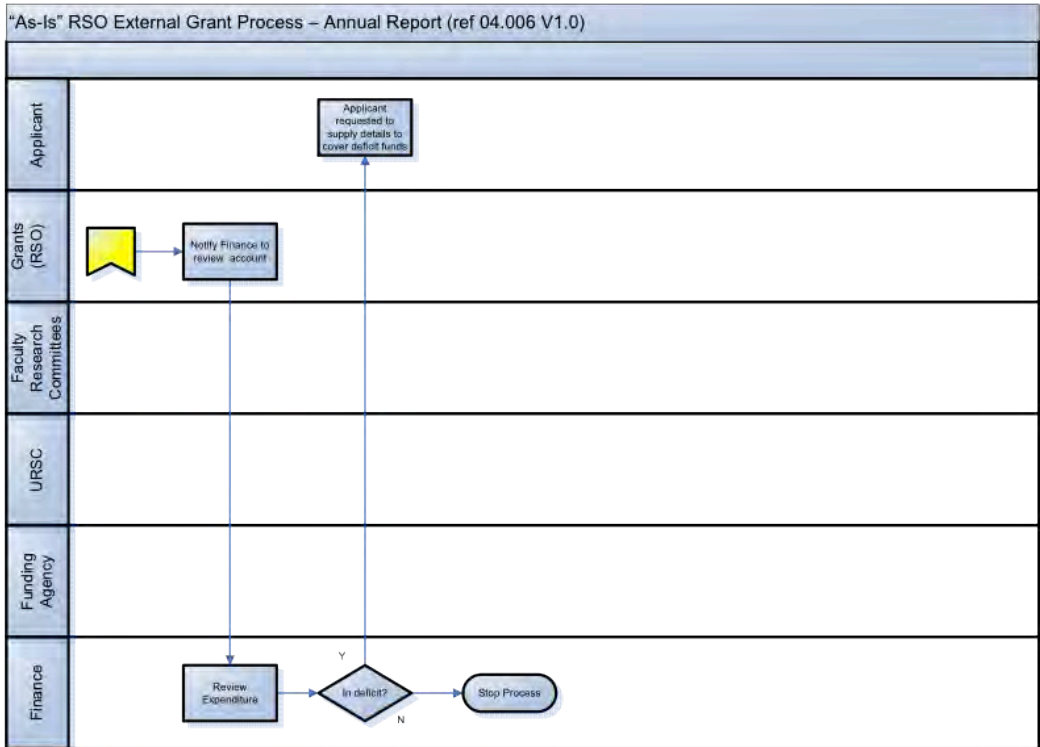


"As-Is" RSO External Grant Process – Final Report (ref 04.006 V1.0)



"As-Is" RSO External Grant Process – Annual Report (ref 04.006 V1.0)





Appendix C

Freeman M, 2007, *RIS Review: Final Report*, Research Office, University of Wollongong.



RIS Review: Final Report

University of Wollongong; Research Office

Completed by Mark Freeman

30th July 2007.

Executive Summary

This report documents the findings of a usability evaluation of the University of Wollongong's Research Information System (RIS).

The report present issues and possible solutions from three different sections of the system:

- ❖ General issues that impact on all RIS users.
- ❖ Issues faced by users when entering publications.
- ❖ Issues faced by Publication Officers when reviewing publications before they are sent to the University of Wollongong Library.

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Introduction

This report was prepared to assist the Research Information Systems Manager in the review and possible alterations of the Research Information System (RIS). The report presents the results of two separate approaches to the assessment of RIS. These were:

1. A usability evaluation of the existing system.
2. Interviews conducted with users of the RIS system, with a focus on Publication Officers.

Formal usability testing with typical users of RIS was outside the scope of this review, based on the requirements supplied by the RIS Manager. It is possible to conduct such testing in the future, if deemed necessary by the University of Wollongong and the RIS Manager.

This evaluation was conducted on Test System version 1.6.

Details of the approaches used

In 2006, the University of Wollongong implemented the Research Information System (RIS) for academic and research staff to enter their outputs for collection and for DEST. All staff had the opportunity to attend training on RIS and during these training sessions initial concerns were raised about the lack of intuitive design in the system.

Since the implementation of RIS across the University, concerns have been brought to the attention of the RIS group in the Research Office through the RIS help facility. Numerous concerns regarding the entering of publications have been identified. Issues have also been raised by Faculty Publication Officers about the process of review and approval of publications to be sent to the library for DEST final approval.

This review focused on the review of the following two areas:

1. Publications entry by academic and research staff
2. Review of publications by Publication Officers

The RIS Manager has identified these two areas for evaluation, as they are the two areas where interaction with RIS occurs most frequently and they are essential for system success.

The evaluation has reviewed all feedback from the system users to date, including information gathered through RIS help and system logs. A series of interviews were conducted with University of Wollongong staff. The interviews sought to determine issues and concerns with using RIS.

An expert review of the system was used to evaluate RIS against guidelines and heuristics of effective online systems. Based on the results of the user feedback and expert review, this report will:

- ❖ explain identified issues with the current RIS interface and
- ❖ provide recommendations to improve the system and increase the user experience.

Nielsen's Ten Usability Heuristics (Nielsen 1994)¹ were used as the basis of the expert review. These heuristics were designed to be used as 'rules of thumb' rather than specific guidelines. Therefore, issues identified will be discussed and recommendations provided, however no quantitative analysis will be conducted.

¹ Refer Table 1 in Appendix for details.

Issues




The following sections of this report present a range of issues that exist in the RIS system. Some of these issues are quite simple to resolve, while others are issues that may need to be considered for future versions of the RIS system. These issues may require a rethink of the way that the system is designed. After attending a meeting with Library and faculty representatives of the 2006 publications collection, it was stated that the system was used successfully for the capture of the publications for DEST. Despite this success, the system has not efficiently met its initial goals in some cases.

The issues are categorised into three sections:

- ❖ General issues
- ❖ Entering of publication issues
- ❖ Publications officer task issues


Possible solutions to overcome the issues are presented below.


It is likely that some of the issues identified in this report will not directly cause errors visible to a user. It is also possible for users to make errors that are not the fault of the system. Three states of action are identified when discussing errors caused by human behaviour. The desired state involves a user performing actions that are normal behaviour. The second state, inefficient behaviour, involves a user performing a behaviour that is not the most desirable action but that results in a correct action being performed. Erroneous behaviour is the third state, where the user does not achieve their goal. These states will be discussed in conjunction with the relevant issues.


Type	Description
	This is a major issue within the system; usually this type of issue results in erroneous behaviour by the user.
	This is a minor issue within the system; usually this type of issue results in inefficient behaviour by the user.
	This is an issue within the system; usually this type of issue does not affect the user's operation within the system.


General Issues

The following issues impact on all RIS users. These issues address the general operation of the system, but do not impact on the entering of publication details. Some of these issues relate to navigation throughout the system.

	The menu structure only appears on the homepage. A consistent menu should be available from all pages within RIS. (See Figure 1 vs. Figure 2)
Description	When users are at the main page there are two menus that they can access. The menu on the left is for publications, while the menu on the right is for personal options and the inbuilt message system. The menus are only displayed on the main page, forcing users to return to the main page if they require access to the menu at any stage.
Type	Inefficient behaviour
Solution	Combining the two existing menus into one menu would allow users more control of the system. This menu could contain all of the elements of both the current menus. It is suggested that this menu be on the left and accessible from all pages in the system. It is common practice to provide users with access to a menu at all times.

	The word ToDo on 'Publications ToDo' should be two separate words. (See Figure 1)
Description	ToDo is not a word, and its usage has been raised by a number of staff members as a minor annoyance that they have when working with the system.
Type	No change in the user's behaviour.
Solution	It is suggested that this should be changed to two words.

	<p>The light grey bars used throughout the system to delineate sections that can be expanded/ contracted are hard to read. (They do become darker when they are expanded.) (See Figure 4)</p>
Description	<p>The expanding bars allow a large amount to content to be presented on a webpage 'above the fold' (on the first visible screen), while allowing users to manipulate the amount of content detail available so they are only looking at the content detail that they are currently using. However, the light grey expandable bars are hard to read and are therefore sometimes not seen by users.</p>
Type	<p>This issue could potentially lead to users not entering all information for a publication, requiring multiple accesses to the system for the full entry of all details.</p>
Solution	<p>It is suggested that darker colours are used. Another suggestion is that the icon on the right, which shows the user that the section can be expanded/contracted, be moved to the left side. A similar approach is used in the eLearning system that the University of Wollongong has purchased. Changing the colours and moving the icon to the left-hand side will make use of the expandable bars more intuitive.</p>

	<p>Settings are not remembered on the 'Search' page.</p>
Description	<p>When a user is working on the 'Search' page, and then leaves the page to conduct a related activity (e.g. when limiting search results to a specific individual), some of the settings e.g. publications status are not remembered on the 'Search' page when the user returns.</p>
Type	<p>Inefficient behaviour</p>
Solution	<p>It is suggested that when a user returns to a page after being directed away from the page <i>by the system</i> that all entered content/settings are still the same on return to the page.</p>



The system is still running slowly (in the live system).

Description	One problem that has plagued the system since its inception is the delay in the time that it takes for content to be returned from the system.
Type	Inefficient behaviour
Solution	Attempts to reduce the delays should be of a high priority.



Searches are case sensitive.

Description	Finding a publication within the system is one of the most difficult tasks to conduct in the system, because currently the search is case sensitive. Due to the lack of consistency in the capitalisation of publication details, this is problematic for users.
Type	Erroneous behaviour
Solution	Having an easy-to-use and efficient search feature is a must for any web application. This issue should be of high priority.




Inaccurate display when alphabetical listing is used to locate items.


Description	When using the alphabetical listing section to move through a large number of pages of data, the page that is displayed does not always correlate directly with the selected letter. For example, if the user chooses 'F' and the first 'F' item is <i>not</i> the first item on a page, 'E' items are displayed above the 'F' items. Users are forced to scroll through unrequested and unnecessary information to locate the desired results.
Type	Inefficient behaviour
Solution	It is suggested that only the letter that the user has requested is displayed. The user should also be given the option of returning to view all items.


Entering a Publication


Publication entry is the major feature of the system that is used by the majority of users. Therefore, the process of capturing all necessary information in the system should be as simple as possible. The process of entering a publication has two major steps. In the first step, the user must give details about the overall publication type, the group to which the publication is assigned, and the number of authors/editors that the publication has. The system then checks to confirm that the publication has not previously been entered into the system. Once this is confirmed, the user supplies the specific details of the publication. If there are publications with a similar name, then a list of those publications is displayed, and the user can say whether the publication has been previously entered or if this is actually a new publication.


The following issues have been raised about the process described above.

	The number of authors or editors is set by default to zero.
Description	The number of authors or editors is set by default to zero. There is the option on the publication details page to alter the number of editors and authors. A message appears stating that there must be at least one author if the user does not change this value.
Type	Inefficient behaviour
Solution	If a user does not select a number of authors, then the number of authors for that publication should be set by default to one. By adding this feature the warning message will be removed when users attempt to add a publication and don't add the number of authors.

	When an author or editor is added or deleted, the percentage does not change.
Description	<p>Initially, if more than one author is added to a publication, the percentage is divided up equally amongst authors/editors. However, if an author/editor is added on the publication details page, their percentage of contribution is set to 0%. Users then have to remember to adjust all of the percentages for the authors/editors.</p> <p>Although some groups within the university have the percentages assigned based on the actual contributions of authors, the system (under usual operation) sets the percentage to be equal for all authors on the first page. The system should also set all percentage contributions to be equal when another author/editor is added through the publications detail page.</p>
Type	Inefficient behaviour
Solution	Set the percentage to be equal when new authors/editors are added.

	The user must always search for himself as an author. The author should have the option be entered by default based on the RIS logon.
Description	<p>The system has been designed so that any member of staff can enter a publication on behalf of another member. Although this is a positive feature of the system, most system users are entering their own publications. It is inefficient behaviour for users to have to search for themselves every time they enter a publication.</p>
Type	Inefficient behaviour
Solution	<p>To solve this issue it is suggested that a checkbox is placed on the first page (somewhere near the number of authors) that asks whether the user is an author of this publication. If the user checks the box, then they should be listed as the primary author. Otherwise the current process is conducted on the publication details page.</p> <p>It could also be possible for an option to be provided on the 'Change Personal Details' page to automatically default a user to be the primary author for publications that they enter into the system.</p>

	There is no 'back' or 'cancel' button available on the 'Publication details' page. The only options are 'save' or 'delete'. (See Figure 4)
Description	Users should have clear exit points when interacting with a system. Having a 'back' or 'cancel' button next to the 'save' and 'delete' buttons on the 'Publication details' page would allow a user to abort the entering of a publication. Currently the only options that the user has to abort entering a publication are to logout of the system or use the breadcrumb trail to navigate back to a previous page.
Type	Inefficient behaviour
Solution	Providing a 'back' or 'cancel' option on the 'Publication details' page would create an official exit point if the user did not want to continue entering a publication.

	No warning message given before a publication is deleted.
Description	When a user clicks 'Delete publication', no warning message is provided before the publication is deleted.
Type	Possible erroneous behaviour
Solution	A warning message should be included to minimize accidental deletion of publications.




The system requires users to choose a 'type of publication' prior to entering details and choosing a DEST category.


Description	The system requires users to choose a 'type of publication' prior to entering details and choosing a DEST category. While this has been done to simplify the process, users have stated that it is difficult to know which 'type of publication' they should choose as the starting point in some cases, especially in Creative Arts, and they have to use a trial-and-error approach. (See Figure 3) This is a major concern to users, and can result in a number of erroneous actions performed by users.
Type	Major issue that can result in erroneous behaviour
Solution	<p>This change may require a major rethink of the way that publications are entered into the RIS system. One possible solution is to allow users to choose to use an exact DEST category <i>or</i> to use the current 'type of publication' system (if they do not know the exact DEST category). Another solution is to provide a list of associated DEST categories (to the right of the screen) when the user selects the 'type of publication'.</p> <p>A temporary solution to this problem requires a link to the page in the help guide that explains the DEST categories in each 'type of publication'.</p>





Only some publication types have editors.


Description	Only some publication types have editors. However, no matter which type of publication is selected from the dropdown box, the user still has the ability to type in a number for both authors and editors. This is an issue when users do not know what information that they need or could need when entering a publication.
Type	N/A
Solution	The ability to enter the number of editors should only appear when that publication allows editors on the next page. This suggestion may not be currently possible and will depend on what kind of programming language is used for the system, however it should be considered for future versions.


	RFCD codes are confusing staff.
Description	Staff are still having issues with RFCD codes. Some staff do not fully understand their use. Those staff who understand their use feel that by capturing the RFCD codes at a high level (as is currently the case) their research is not classified appropriately.
Type	This is not an issue with the RIS system itself. It is concerned with the data recorded by the system.
Solution	A link could be placed directing users to more details about the RFCD recording process. Changes to the recording of RFCD codes are likely to raise further issues.

	When tabbing through the fields in 'Publication details', the cursor can become 'lost' if it disappears into a section which has not been expanded.
Description	The disappearing cursor is an issue for users that use the keyboard to tab throughout the system, rather than relying on the mouse.
Type	Inefficient behaviour
Solution	<p>There are two potential solutions to this issue.</p> <ul style="list-style-type: none"> - When the cursor moves over an unexpanded section of the page, this section is skipped, and the cursor moves to the next expanded section. - When the cursor moves over an unexpanded section of the page, this section is automatically expanded. <p>Both of these solutions may not be possible depending on the programming language that the system uses.</p>

	Compulsory sections of the 'Publication details' page are not expanded upon entry to the page.
Description	All sections of the publication details which have compulsory fields (Specific Information, Authors, Group Information, Supplementary Information, Status) should be expanded (visible) when the 'Publication details' page is opened. (See Figure 4) When a user enters the system, the system displays the pages in the same way as the last login. Sections previously expanded are again expanded; sections previously unexpanded are again unexpanded.
Type	Inefficient behaviour
Solution	As different publication types have different compulsory fields, all areas that have compulsory fields should be automatically expanded.


	The system does not return the user to the point at which they left, when moving between pages within the system.
Description	When a user is editing a publication on the 'Publication details' page, and goes to a new screen (e.g. to add an author or editor), then returns to the 'Publication details' page, the user is not returned to the same place on the 'Publication details' page (i.e. the user goes to the top of the publication details). The same thing happens when checking publication details.
Type	Inefficient behaviour
Solution	It is suggested that the user is returned to the same location on the page as they leave the page.


	Sections not expanded when user links to them.
Description	In the top section of the 'Publication details' page there are links to each of the sections on the page. When a user clicks on one of these links, the current page is moved to display the chosen section. However, that section is not automatically expanded.
Type	Inefficient behaviour
Solution	When the user links to one of these sections, the user should be directed to that section of the page and the section should be automatically expanded.


	The size of the text boxes should be increased.
Description	The text boxes used to enter information should be larger. For example, the title of a publication box has the ability to store only approximately 65 characters.
Type	N/A
Solution	It is suggested that the size of some of the text boxes are increased to accommodate larger content.


Publications Officer Tasks


The following list of issues with the system are experienced by Publication Officers while they are completing their unique tasks within the system. Some of the provided solutions are designed to make the process simpler during the approval process of publications.


	When searching as a Publications Officer, the searching default should be 'Anyone', rather than the current default of the Publications Officer's name.
Description	Every time that a Publications Officer conducts a search after they logon to the system, the search defaults to their own user. However, the majority of searches conducted by Publications Officers are broader searches.
Type	Inefficient behaviour
Solution	As the system is able to determine the type of user interacting with it, Publications Officers could have their default set to 'Anyone'.

	Publications Officers would like the ability to automatically generate a cover page for taking paperwork across to the Library and for their records.
Description	Currently it is suggested by the Library that the Publications Officer prints off the 'Publication details' page and attaches it to the other paper-based documentation when sending an item to the library.
Type	N/A
Solution	It is suggested that this print version of the 'Publication details' page have the publication number at the top, as it is the unique identifier for each publication entered into the RIS system. Other relevant details should also be displayed, and the page should be designed to fit on one A4 page, instead of the current three pages that that the 'Publication details' page takes to print.

	Publications Officers would like the ability to change the order of the Publications To Do.
Description	The Publications ToDo is automatically ordered by the system. Publications Officers believe the ability to sort and reorder the items would increase their efficiency.
Type	Inefficient behaviour
Solution	The Publications ToDo should be able to be sorted by name, date, and status, and preferable should be able to be manually reordered.

	Publications Officers would like the ability to spell-check all details.
Description	Most systems that users interact with have the ability for the spelling to be checked and suggestions provided when the word is not in the system's dictionary. One issue with this for the RIS system is that a number of the publications in the system contain words that are not usually in dictionaries. This is especially true for science and engineering publications.
Type	N/A
Solution	This issue was raised by a Publications Officer, who stated that users don't check the information for correct spelling after it has been entered. This issue may increase in importance with newer versions of the system having the ability for users to enter an abstract for their publication.

	Publications Officers have had to chase up numerous publications because staff have left the status of the publication as 'new'.
Description	Staff did not understand that they had to change the status to 'Seeking Faculty verification'; they believed 'new' was the correct status because they were entering a new publication. This has been a major issue with the system since its inception, and caused some publications not to be recorded in the DEST collection for 2006.
Type	Possible erroneous behaviour
Solution	One solution that has been raised is to change 'new' to something similar to 'draft'. Another suggestion made by Publications Officers is to send an email to the user after a specified period of time stating that they have publications in the 'new' status that need attention.

	Searching still does not seem to work properly when dealing with the parent/child relationship.
Description	For example, when searching at faculty level for Creative Arts publications with the status as 'Challenged', zero results were returned. At this time, one result should have been returned because SARN had one publication up for challenge. The Publications Officer was under the impression that parents had the total of all their children. This is a major problem that may lead to erroneous report being created by the publications officers for their faculty.
Type	Possible erroneous behaviour
Solution	This is an issue that needs to be addressed as a high priority, as the Publications Officer in this instance felt that it was inefficient to check each child for issues with publications. The parent-child relationship, and resulting information for each parent, should be consistent in all sections of the system.

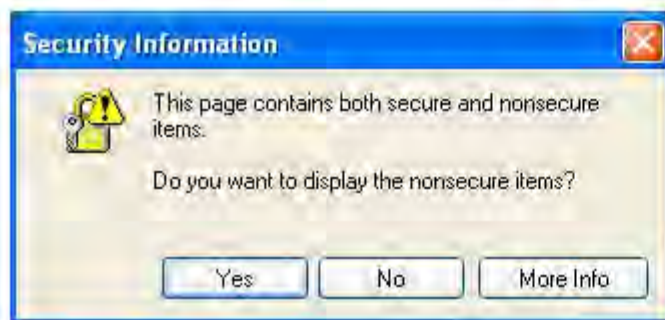
Miscellaneous

While beyond the scope of this review, it should be noted that numerous staff have identified issues with the output templates.

In Version 1.6, there is now the ability to export publications to Excel. The ability to also export publication details to EndNote, and import from EndNote, would be highly useful.

Users suggested the introduction of periodic emails sent from the system (every two months) to tell users the state of their account within RIS. This could be especially helpful for the number of publications that are currently in the system as 'new'.

When using the help feature the following pop-up box appears on every page.



The help feature needs updating as it does not address all of the features that are available within the system, for example 'Publications Search' is not listed. The help feature should also have the headings in the same order as they are visible within the system.

Conclusion

This report has presented several issues that have been identified within the RIS system. Potential solutions to these issues have also been presented.

Some of these suggestions that have been made in this report are issues that need to be addressed for the next version release of the RIS system, such as changing the size of the text box for the publication name. Others are issue or suggestions that will require significant thought and planning, and it is likely to be more feasible to implement these in future versions of the RIS system.

Appendix

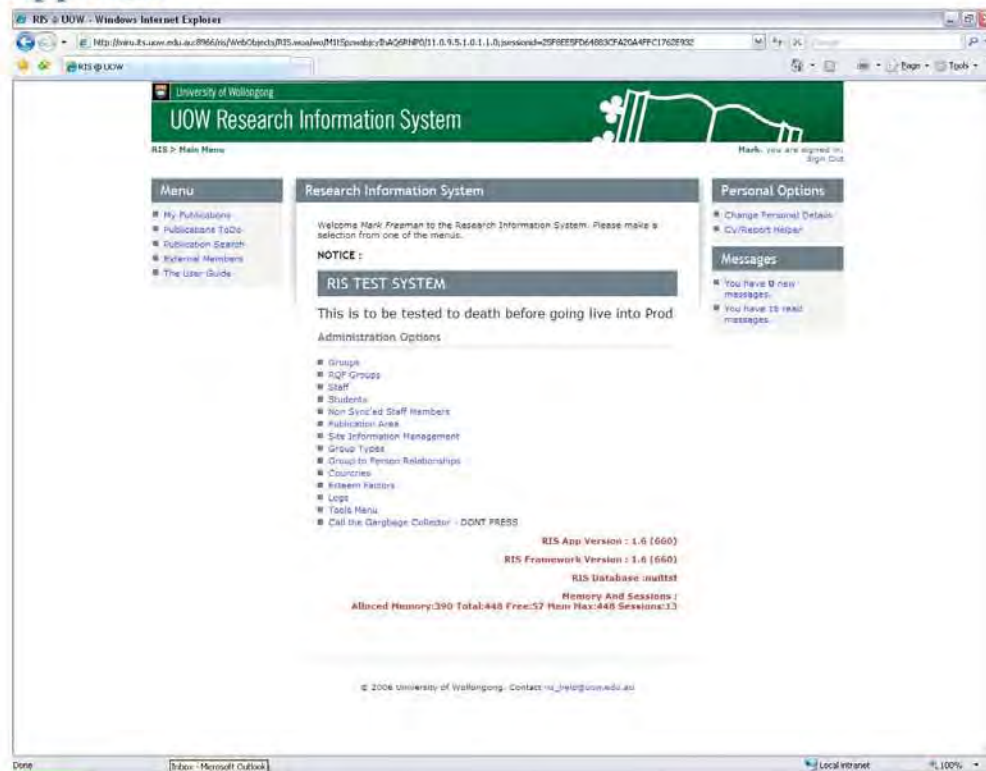


Figure 1: Homepage

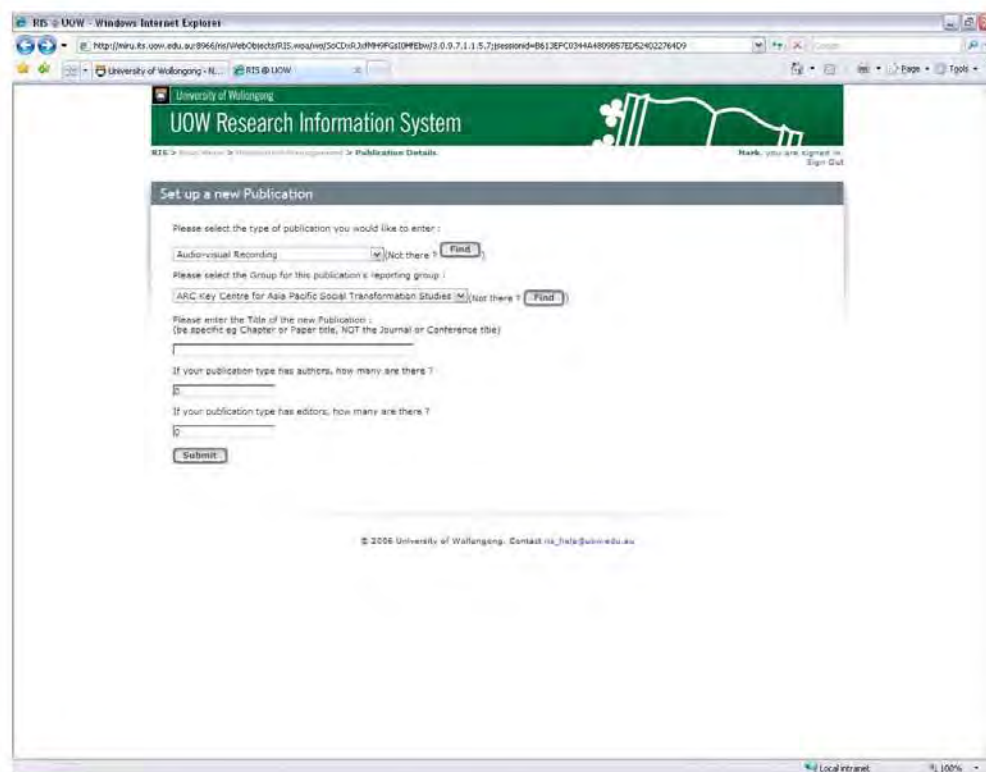


Figure 2: Create a Publication page

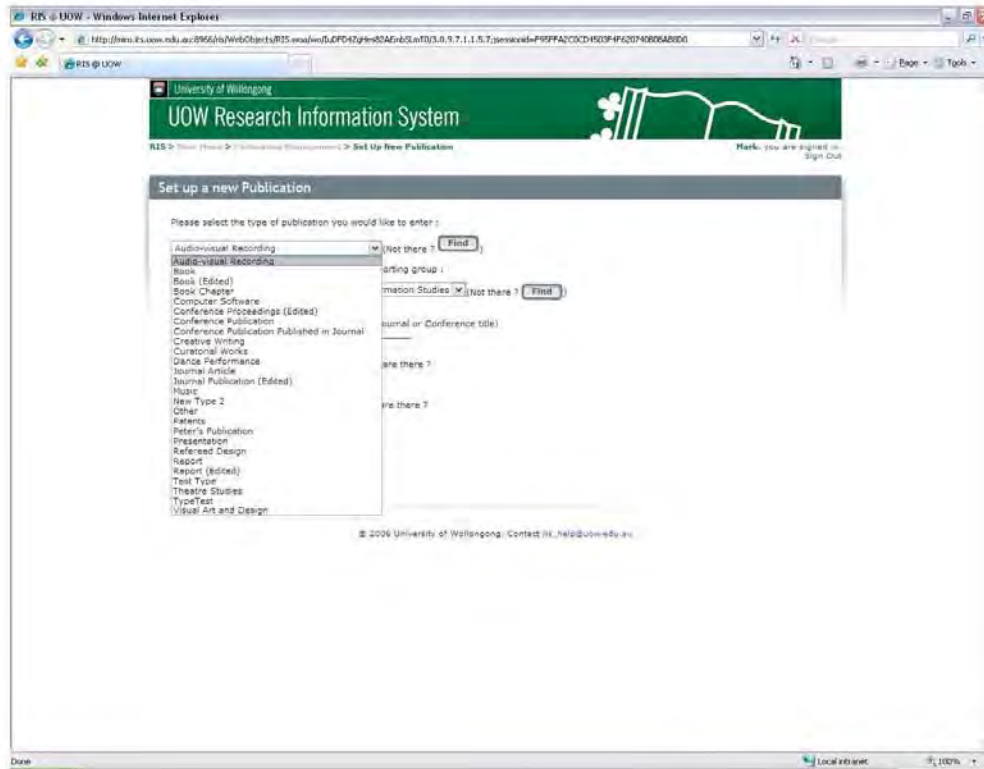


Figure 3: Create a Publication page with 'Type of Publication' displayed

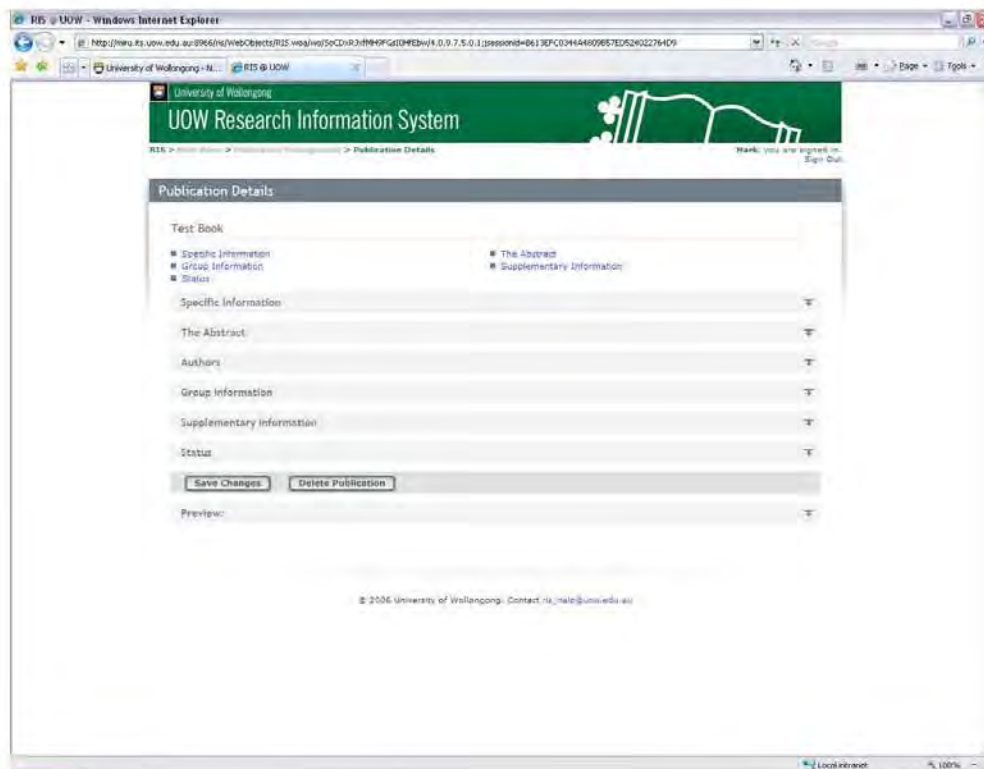


Figure 4: Publication Details page

Table 1: Nielsen's Evaluation Heuristics

1. Visibility of system status
The system should always keep users informed about what is going on, through appropriate feedback within reasonable time.
2. Match between system and the real world
The system should speak the user's language, with words, phrases and concepts familiar to the user, rather than system-oriented terms. Follow real-world conventions, making information appear in a natural and logical order.
3. User control and freedom
Users often choose system functions by mistake and will need a clearly marked "emergency exit" to leave the unwanted state without having to go through an extended dialogue. Support undo and redo.
4. Consistency and standards
Users should not have to wonder whether different words, situations, or actions mean the same thing. Follow platform conventions.
5. Error prevention
Even better than good error messages is a careful design which prevents a problem from occurring in the first place. Either eliminate error-prone conditions or check for them and present users with a confirmation option before they commit to the action.
6. Recognition rather than recall
Minimize the user's memory load by making objects, actions, and options visible. The user should not have to remember information from one part of the dialogue to another. Instructions for use of the system should be visible or easily retrievable whenever appropriate.
7. Flexibility and efficiency of use
Accelerators -- unseen by the novice user -- may often speed up the interaction for the expert user such that the system can cater to both inexperienced and experienced users. Allow users to tailor frequent actions.
8. Aesthetic and minimalist design
Dialogues should not contain information which is irrelevant or rarely needed. Every extra unit of information in a dialogue competes with the relevant units of information and diminishes their relative visibility.
9. Help users recognize, diagnose, and recover from errors
Error messages should be expressed in plain language (no codes), precisely indicate the problem, and constructively suggest a solution.
10. Help and documentation
Even though it is better if the system can be used without documentation, it may be necessary to provide help and documentation. Any such information should be easy to search, focused on the user's task, list concrete steps to be carried out, and not be too large.

Appendix D

List of Final Issues From the Case Studies

- 1: Depending on who instigates the project, some approaches (Decentralised, Hybrid and Centralised) may be better suited to the task than others.
- 2: The competence of the Technostructure will affect the decision to build or buy the system.
- 3: The build/buy decision will affect ongoing maintenance and the role of the Technostructure.
- 4: The approach taken may affect compliance with organisational standards or policies e.g. standard look and feel of web pages.
- 5: The more that the Operating Core supports a KM system the less “push” will be required from the strategic apex.
- 6: Correct definition of scope/requirements will affect the amount of redevelopment/maintenance.
- 7: Different approaches (Decentralised, Hybrid and Centralised) will enable different levels of customization.
- 8: Changing Operating Core work practices will affect other work practices in the organisation for other organisational units such as the support staff.
- 9: The more varied the needs of the constituent groups, the more elaborate the system will become.
- 10: The more elaborate the system will become the less likely it is to be used by the Operating Core.
- 11: The larger the project the more difficult it is to find all systems requirements before development starts.
- 12: As the system becomes more complex and diverse, the documentation and training that accompanies the system will grow proportionally.
- 13: Making the system simple for the Operating Core through simple functionality will increase adoption.

- 14: Making the system simple will increase the workload of the Technostructure.
- 15: As the KM system becomes more complex the Support Staff and Operating Core will require more training.
- 16: More complex KM systems will require more complex and ongoing help desk functions.
- 17: To get the most out of a KM system you need to have as much data as possible.
- 18: As the amount of data entry or data modification increases, the cost and workload of Support Staff will increase.
- 19: New KM systems may create a need for staff to have access to private or sensitive information that they previously did not have.
- 20: The KM system may directly increase the performance of the Operating Core and hence the funding / income of the organisational unit.
- 21: Regardless of the approach taken to KM, there is always a possibility that a centralised approach will dominate.
- 22: When similar KM solutions are developed by more than one organisational division it may indicate a need for an organisation-wide system.
- 23: A Knowledge Management initiative is an ongoing process that requires constant revision and maintenance.
- 24: KM tools may have related overlapping functions so some tools may be better developed in parallel.
- 25: KM tools can be developed by end users at a very low cost but this will affect the quality and integration with existing systems.
- 26: A KM tool's quality and integration with existing systems will be better with professional developers at the helm of the project.
- 27: Hybrid and Centralised approaches rely more on organisational data being correct but this is not always the case.

28: Some approaches (Decentralised, Hybrid and Centralised) result in functionality that is useful at more levels in the organisation.

29: The scale of the project is directly proportional to the approach taken.

30: Increasing the scale of the project may increase the likelihood that organisational politics, culture and power will impact the project.

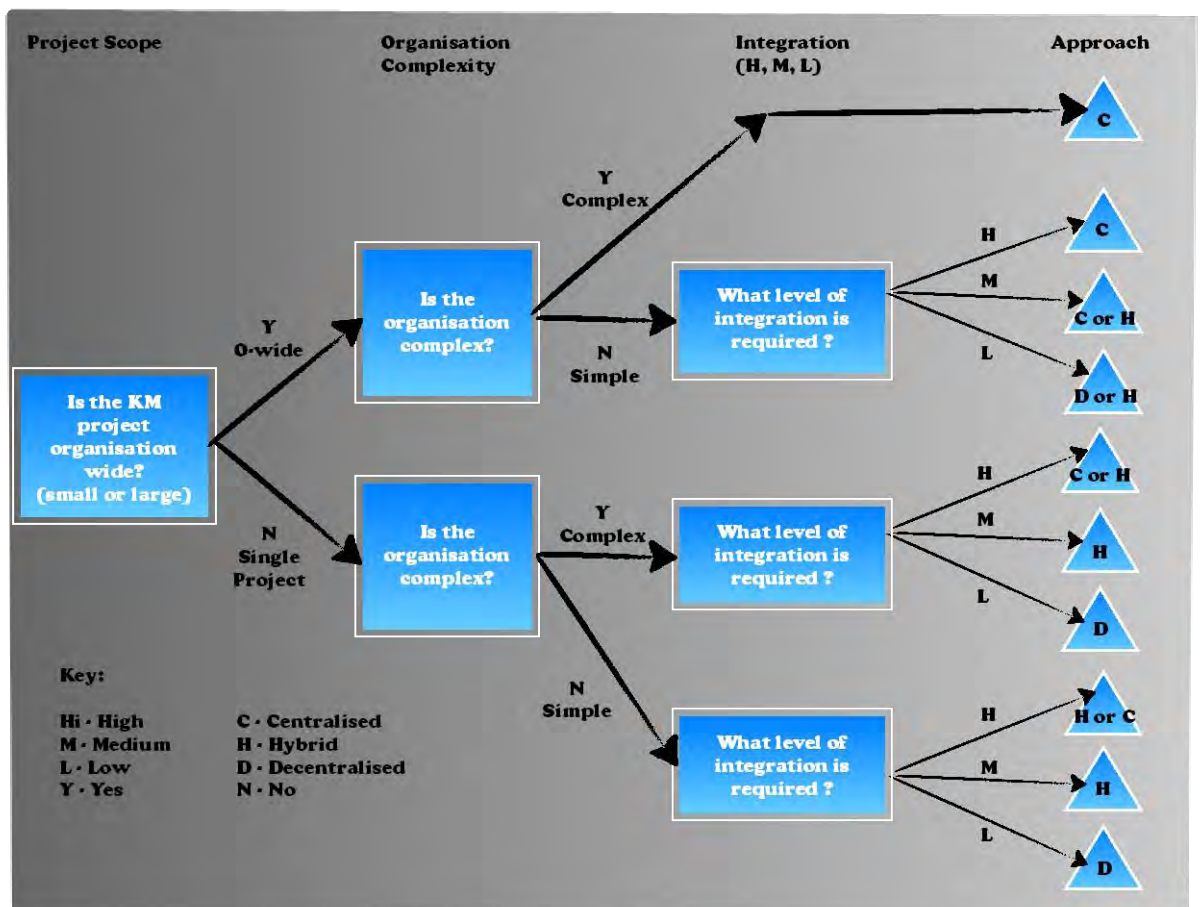
31: Organisational politics, culture and power will impact the project at different stages of development in different ways.

32: Fundamental Entities of the organisation may differ in structure or detail depending on what organisational level they are viewed from.

33: A user's first impression of the new KM system may greatly impact their overall opinion of the system.

Appendix E

Approach Decision Tree



Appendix F

System Acquisition Decision Tree

