

**Devising a common vocabulary for a
Knowledge Management
University Intranet**

Devising a common vocabulary for a Knowledge Management University Intranet

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Abstract

For the past few years, the University of Natal has been using an HTML-driven InnerWeb as its intranet system. The advantages of database driven intranet technologies over static HTML pages are now well established. It was felt that the University should change to a database driven intranet system which would better serve the needs of the University community. The first part of this study was conducted to establish user perceptions and requirements of such an intranet. Results from this study suggested that the functionalities and needs expressed by participants are synonymous with functionalities offered by database driven intranets. The second part of this study was therefore to follow up and prioritise the identified requirements for the main intranet interface to establish a controlled vocabulary and investigate current debate on the possibilities and limitations of intranets as a knowledge management tool. Part of the study took cognisance of Stoke's use inspired research premise by adapting constructivist research philosophy as well as Van den Akker's development research strategy to guide the study. Eclectic mixed methodology as suggested by Reeves guided the research design for this study. Thus data gathering methods which included group and on-line card sorting, semi-structured interviews, category membership expectation tests and prototype validation were used to validate each stage of the development process. Data analysis procedures included using Microsoft Excel to calculate the total score assigned to each item for possible inclusion on the intranet, cluster analysis using IBM EZSort software, analysing interview transcripts using QSR NVivo software as well as simple eye balling of the category membership expectation data. The initial 93 items for possible inclusion, which were identified at the first part of the study were reduced to 60 items. Some distinct themes, which were identified, include research activities, library, social notices, corporate notices, learning activities, University Policies and Procedures, student activities, staff activities and on-line collaboration. The results of this study suggest that it is challenging to establish vocabulary which is common to the majority of prospective users. Thus, some of the suggested vocabulary for category labels did not have majority consensus. This study also suggests that participants expect a process driven intranet, which offers multi-dimensional access points and multiple ways to navigate. This implies analysing same data from different viewpoints. Participants want more from an intranet than simple document publishing though a few can not see the intranet beyond a document retrieval tool. The

study suggests that users have different needs which could be better addressed by offering customisation and personalisation functionalities to suit users' individual needs. Participants expect to use the intranet as a reliable institutional memory which offers seamless remote access to synchronous and asynchronous communicating tools, access to various forms of digital media, interactive on-line administration functionalities as well as access to on-line academic related activities.

DECLARATION

I declare that Devising a common vocabulary for a knowledge management University Intranet is my own work, that it has not been submitted before any degree or examination in any other university and that all the sources I have used or quoted have been acknowledged as references.

Signed: 

Saru Mahomva

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KEYWORDS

controlled vocabulary

intranet portal

knowledge management

database driven intranets

intranet design

card sorting

on-line card sorting

information taxonomy

wire frame prototype

user-centric design

Like a rain forest that grows so densely it chokes itself to death or a city that springs up so fast its neighborhoods don't connect, corporate intranets are getting so big so fast that users can't find anything on them.
Cate T.C. (1997)

Chapter 1 – Introduction

1.1. Introduction

The intranet is commonly regarded by some as an institutional communication tool or as a document dump centre by others. Some authors such as Damsgaard and Scheepers (2000) claim that an intranet is an effective knowledge management tool whilst other authors such as Galliers and Newell (2000) argue that there is no such thing as “knowledge management” but “information or data management.” The University of Natal’s intranet has primarily been used for publishing institutional documents such as minutes, as a software and template library and for providing links to support divisions. It could be argued that the University of Natal requires a more interactive intranet from where community members can access all resources from a single entry point. This requirement is synonymous with functionalities offered by intranet portals.

This study will investigate some of the key features of intranet portals and review current literature on the possibilities and limitations of intranets as knowledge management tools. The aim is to find interdisciplinary creative ways to develop a portal which stimulates seamless learning, communication and collaboration within the University of Natal. The use of such an intranet will allow students and staff to search, retrieve and critically assess information which is available on the University databases.

Organisational culture can not be ignored as it is one of the driving forces of knowledge creation and dissemination. In the heart of “culture” lays common language which serves as a thread amongst a community of practice. Identifying this vocabulary simplifies information seeking and retrieval. Some users at the University of Natal pointed out that menu labels used on the current intranet are ambiguous. In summary, this study will contribute to the scope of ICT support to educational processes at the University of Natal and other institutions who wish to implement an intranet portal.

1.2. Structure

This dissertation is structured as follows:

Chapter one provides the background to this study, which will include a statement of the problem, rationale for the study as well as declare the research questions.

Chapter two explains the theoretical framework and attempts to locate this study in an appropriate research paradigm which will guide the research design of the study.

Chapter three discusses current literature, theories and practices of knowledge management, which will inform the actual design and development of the artefact i.e. an intranet portal.

Chapter four is a discussion on web technologies which enable intranets. This includes discussion on databases, information architecture as well as an overview of how content management relates to these concepts. It is necessary to clarify how everything fits in because all the concepts are interdependent in the design and development of an intranet portal.

Chapter five explains the methodology, methods and materials used for each of the development phases.

Chapter six discusses the data analysis for the different phases.

Chapter seven is a discussion of the results.

Chapter eight provides a general discussion and conclusion of this report.

1.3. Background

It is good practice to continuously improve and redesign systems to suit current and future organisational and user needs. A study was conducted in 2002, to investigate user perceptions of the current University of Natal intranet, known as the InnerWeb. The study suggests that there is room for improvement of the functionality, web content management as well as aesthetic features of the current InnerWeb. Some of the short-comings expressed by users include ambiguous menu labels, navigational problems, bad document organization, out-dated information, duplication, little consistency, limited on-line functionality and what one could term a lack of "strong brand presence". Some participants indicated that they had never used the InnerWeb whilst in reality they were making use of it but were unaware of this fact. Further, students, academics and administrative/support staff suggested a need for a dynamic interactive "single-point entry" site, which can be remotely accessed in order to perform various administrative and academic related tasks. The functionality requested by users is synonymous with the functionality offered by database driven websites. Addendum 9 illustrates the interface and menu labels used of the current intranet.

There is also a growing consensus that at the heart of data-base driven intranet portals there lies a knowledge hub in the form of personal and organizational memory. Some authors such as Martin (1998) have referred to this phenomenon as an "organizational memory information system" (OMIS) whilst others such as Galliers and Newell (2000) have argued that "knowledge" is not an entity which can be "managed" and have even expressed misgivings with the term "knowledge management". Liebowitz and Beckman (1998) defined knowledge management as "the formalization of and access to experience, knowledge and expertise that create new capabilities, enable superior performance, encourage innovation, and enhance customer value." If indeed web technologies can enable the sharing of knowledge, it makes sense to leverage and exploit available information technologies, some of which are already available, at the University of Natal, to address some of the challenges mentioned above.

Whilst this project forms part of the early development phase in response to an identified need of an improved intranet at the University of Natal, the study will explore current knowledge management literature to establish theories and suggestions on the possibilities and limitations of integrating knowledge management technologies into the proposed portal. The main thrust would be to establish common vocabulary for use on the proposed intranet. The project will utilize current educational ICT theories to guide the research design.

1.4. Statement of Problem

One of the major problems with the current intranet at the University of Natal is that of information design. Users expressed that current menu labels are ambiguous and inconsistent and that there is ineffective document publishing standards which result in redundant information and duplication. It has been documented that the intranet has been sparingly utilized in many organisations (Waddington, 1997 and Damsgaard and Scheepers 2000). Schneider and Davis (2002) point out that "... despite many successes, particularly in cost and time-saving, many sponsors of corporate intranets are dissatisfied...why? While critics often point to technological glitches, the real problems may lie in information design." However, Stenmark (2002a) believes that the problem does not entirely lie in the information design but other factors such as an institution's management approach whereby standardisation and bureaucratic control of the intranet stifles enthusiasm and creativity. Detlor (2000), Davenport and Prusak (1997) and Malhotra (2002) suggest that a lack of understanding of an institution's knowledge ecology could contribute to some of the common intranet challenges. Others such as Ciborra (2000a) suggest that under-management could be part of the problem of limited intranet use in most organization.

The University of Natal's problem might not necessarily be one of under utilization of the intranet or bureaucratic control. It is still important to take cognisance of these different view points and make informed decisions on the opportunities and limitations of intranet portals in furthering the activities synonymous with an institution of higher learning. It is necessary to approach the revamping of the intranet empirically in order to avoid developing a "white elephant" when in fact, other alternatives might suffice. Some of the opposing viewpoints, which were mentioned earlier, will be discussed in the literature review (Section 2) of this dissertation.

1.5. Rationale

The rationale of this study is two fold. The first exposition relates to the technical nature of the artifact (an intranet portal), whilst the second relates to its social nature. The technical aspect stems from the premise that although systems designers have a fair knowledge of what users require, this knowledge is not enough to give them a "ticket" to go ahead and design a system, which is aimed to support and benefit a diverse audience. Nielsen (1993) stated that "...your best guess is not good enough" is good advice to designers. Further, designers have to be very conscious of designing systems, which are a result of "knee jerk reaction" to sporadic "pressure" from various spheres of influence in an institution. This knee jerk reaction to design, not only wastes valuable resources but results in a fragmented system which might be functional, but full of inefficient "patches". A system of this nature functions at a very rudimentary level and does not take full advantage of the benefits, which could be derived from leveraging and exploiting emerging web technologies. For this reason, it was necessary to follow up on the intranet requirements gathered in the 2002 study, in order to become more intimate with the expressed user preferences, and identify vocabulary, which is common to the University community (controlled vocabulary). Although human needs and not technological needs should be the driving force for this study, it is still necessary to have an understanding of the web technologies, which contribute to the efficient functioning of the desired product.

Further, while it is important to meet organisational as well as user needs, the idea is to conduct proactive, on-going requirements audits which should always be very visible in an institution. Others have suggested conducting intranet usability audits once every quarter. Being "in touch" with the users, from an early stage of systems design, motivates users to participate and influence the development process and will no doubt, minimise the need for "quick-fix" solutions and unexpected "surprises" at a later stage. It is hoped that user involvement and acceptance of the proposed intranet portal, will maximise the return on investment (ROI) at various levels that include an increase in use, pleasant navigation experience, time saved via retrieval precision, and reduction of duplication and resource redundancy.

Second exposition

However, looking at the bigger picture, the reality is that institutions of learning, amongst other things, must provide the labour market with well-informed learners who have been exposed to current technologies. This will give learners the "edge" to confidently participate on the global market using various ICTs. Parson's theory of social systems as cited in Haralambos (1992) clearly shows the inter-relatedness of society's structures and how activities in one structure influence the rest, namely economy, education, religion and polity. Thus, the use of intranet portal technologies by institutions of learning such as the University of Natal, at a simplistic level, will benefit the immediate university community but will also have greater ramification on society by producing graduates who have been exposed to modern technologies and can apply their knowledge for related economic and developmental activities.

As suggested by Reeves and Reeves (1997), the World Wide Web (WWW) can be used as a cognitive development tool. Jonassen and Reeves (1996) and Reeves (1999) use the term "cognitive tools" to refer to technologies that enhance an individual's cognitive powers during thinking, problem-solving, and learning. With this assumption in mind, the ultimate goal should be to provide an efficient easy-to-use, intuitive and dynamic intranet for the University of Natal. That intranet should emulate a carefully designed workspace to facilitate and enhance the cognitive powers of users during thinking and problem solving as they search for or contribute to the resources which they need to fulfil their work or student roles.

1.6. Research Questions

This study will address the following questions:

- What are the common themes and vocabulary which users want to see on the proposed intranet site?
- Where and how do users expect to find information on the proposed intranet?
- What will the information architecture look like?
- What are the possibilities and limitations of knowledge management via intranet portals?

Answers to these questions will contribute to the overall design structure, processes and functionality of the proposed intranet.

1.7. Targeted Audience for this project

There is need to build a critical mass of resources which contribute to the use of ICT technologies for educational purposes in South Africa. The main beneficiaries of this study would be end-users, system designers, organisational development professionals, information technology planners as well as educational bodies and administrators. Such literature is necessary to build local solutions which will contribute to the ICT activities in Southern Africa. Universities in South Africa need to pool resources and share best practice especially at this time in history when universities are under going quantum changes. Advantages of collaboration were demonstrated by overseas universities when they pulled together to develop the Java based U-Portal¹, which is an open source intranet portal, that is available to any institution of education free of charge. Participating universities are able to customise some of the features to suit their unique environment. Such cost effective solutions are crucial to a developing country where, instead of wasting money buying overseas software, we should be developing our own instead of being tied down by proprietary companies. If resources such as time, skills and money are going to be used for any ICT endeavours, it is imperative to ensure that research is conducted on how to get the most out of the resulting products. In the next chapter, the theoretical framework for this study will be discussed.

¹ U-Portal is available at <http://mis105.mis.udel.edu/ja-sig/uportal/index.html>

Chapter 2 - Theoretical Framework

2.1. Introduction

This section provides an overview of the nature of research on ICT in Education and locates the rationale of this study into an appropriate paradigm of inquiry. As the development of intranet portals specifically for institutions of learning is a relatively new phenomenon, there is lack of “substantial” literature (critical mass) focusing on this phenomenon as opposed to e-Commerce intranets where portals are now fairly established. However, because this study focuses specifically on an intranet for an institution of learning, the use of established theories and practices used in the field of educational ICT would be appropriate to contribute to the research design of this study, whilst theories of other disciplines such as Information Science, Information Technology, Social Science and Human Computer Interaction (HCI) would contribute to the development of the content and structure of the end product. For this reason, the purpose of this section is to discuss the theoretical framework and rationale for the research design whilst Chapter 3 will focus on the literature review of the concepts which contribute to the nature and development of the resultant end-product. These concepts are databases, content management, information architecture and portals as well as knowledge management.

The diagram Fig. 1, adapted from (Fritze, 2003), illustrates the research rationale and the inter-relationship of the elements for this study. It demonstrates the multi-dimensional nature of this project and encompasses the epistemological argument of this study. Although Fritze’s (2003) study focuses on the design and development of an online learning system for the University of Melbourne, the rationale for the research design is also appropriate for the design and development of an University portal. A brief discussion of this diagram is provided in the following paragraph.

Fig. 1 clarifies the fundamental philosophy of this research project. The research stance stems from a constructivist philosophy which advocates a collaborative co-construction of knowledge between the researcher and participants. This suggests that the research should use a variety of research approaches in order to identify user needs, expectations and experience of the phenomenon being explored. Development research which falls under the Action Research paradigm will guide the research process. The paradigm of inquiry used to guide this study, is the Reeves (1997) eclectic, mixed-methods paradigm.

Fundamental philosophy

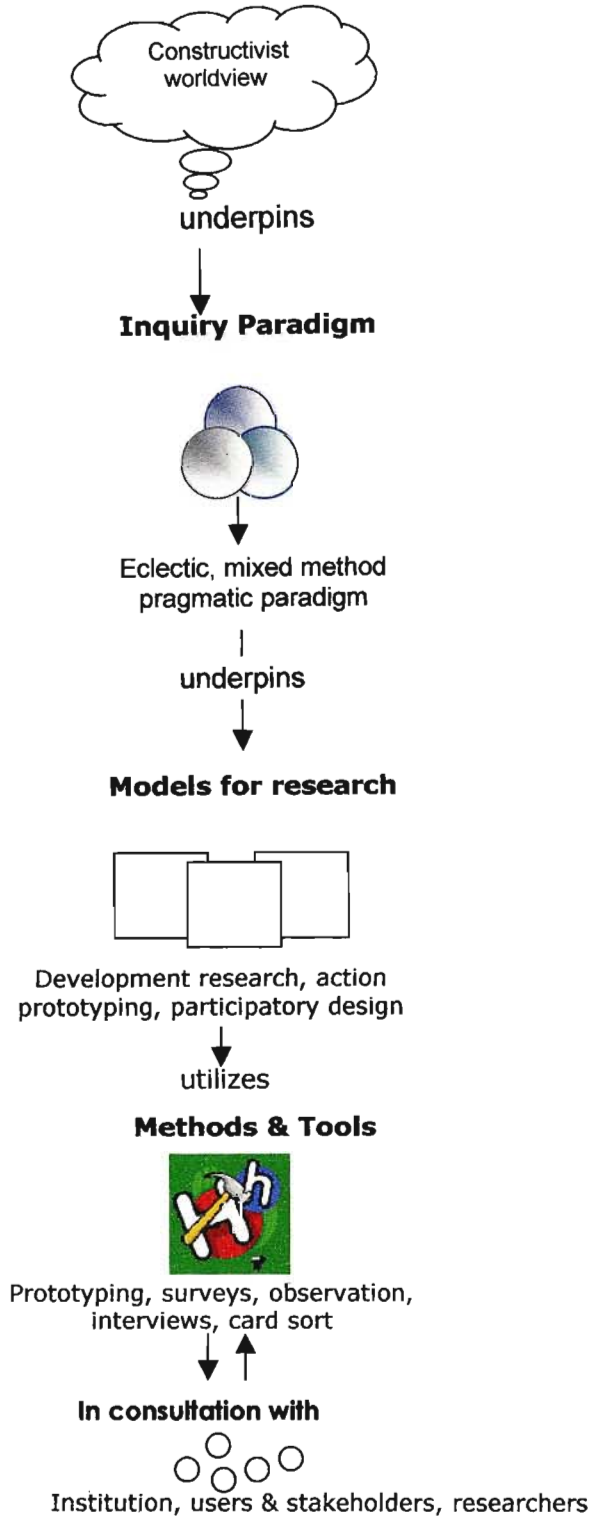


Figure 1: The epistemological argument of this study

(adaptation of Fritze, 2003)

2.2. Background of research practice in Educational Technology

Focus on ICT research methods is slowly gaining prominence amongst researchers.

Traditionally, social researchers have been guided by two research dimensions, which are commonly referred to as (1) basic research² and (2) applied research³. The aim of basic research is to gain and advance knowledge (theory), without any specific application in mind, whereas applied research focuses towards gaining in-depth knowledge and understanding in order to meet a specified need (application). On the other hand, with the rapid technological advances taking place in society, some researchers have challenged the effectiveness of basic as well as applied research in social science with specific reference to ICT in Education (Lee, Liebenau and DeGross, 1997 and Reeves, 2000b). They argue that these two approaches no longer provide a solid foundation for addressing the complex multi-dimensional nature of modern social phenomena where Information Technology is now firmly rooted. Nelson (2002) highlighted that as early as 1986, Apple expressed that "...we have also reached a point where digital information has become the basic unit of communication (supplanting the printing press), and technology is contributing to changes in nearly all aspects of society". (Apple cited by Nelson, 2002)

So if the current nature of research in educational technology is currently being debated, where and how would a study on an University intranet portal fit into an appropriate research dimension?

Perusing current literature clearly suggests that the implementation and use of intranet technologies is socially constructed. This suggests that mechanisms have to be put into place, not only to understand all the role players' perceptions and expectations but to consider the context and other external factors which influence an institution of learning in South Africa. One cannot ignore the fact that other researchers have called for a new research paradigm to address educational information technology research.

² basic research is also referred to as "pure or academic research" (Neuman, 1999)

³ applied research is also referred to as "problem-oriented" research

2.3. New research paradigm for educational technology research?

In response to this basic / applied research dichotomy, Stokes (1997) developed a four quadrant model (Fig. 2) that can be used to classify any research. This author called for “use inspired” or “strategic” research which is driven by, not only the purpose of gaining fundamental understanding of a given phenomenon (basic research), but also the degree to which use is considered in research (targeted research). Stokes (1997) suggests an interweaving of basic, applied and use-inspired basic research. Others have termed this type of research “development/al, formative inquiry, formative evaluation and design research” (van den Akker 1999 in Reeves 2000a). In this four-quadrant model, research by Pasteur is located in Quadrant 2, hence the model is also referred to as “Pasteur’s quadrant”. Other established research⁴ can be located on this quadrant.

		Considerations of use?	
		no	yes
Quest for understanding?	yes	Quadrant 1 (pure basic) Research & development to seek knowledge without concern for application	Quadrant 2 (use inspired) Research & development with a quest for (1) understanding and (2) consideration for use
	no	Quadrant 3 Research & development for the sake of research with no apparent goal of seeking knowledge nor consideration for use	Quadrant 4 (pure applied) Research for the sake of research with no apparent goal for furthering knowledge but considers use

Figure 2: Stoke’s (1997) typology of motivations for research.

⁴ Stokes (1997) located Niels Bohr’s research on atoms in quadrant 1 , Thomas Alva Edison’s research on light bulbs in quadrant 4

2.4. Where this study is located in the research arena

Although this study leans towards Stoke's Quadrant 2 (use-driven quadrant), the overall research also draws from quadrant 1 (basic research) as well as quadrant 4 (applied research).

This study leans towards use-driven research because, its main goal is to gather, reflect and produce findings on user's needs with specific reference to website vocabulary.

Recommendations made will be incorporated into the development of the end-product (in the next phase of this study) which is suitable to meet the University's unique context. The other goal is to understand and contribute to knowledge on the process of research and development of intranet portals in institutions of learning by evaluating the process used for this study.

In view of the fact that this study is "use-inspired", and that application of theory alone (basic research) can not possibly address its multi-dimensional nature, it stands to reason that the most appropriate philosophical approach for this study, should acknowledge and capitalise on users' viewpoints as well as their similarities and differences. Users as well as stakeholders' input in the development of the proposed intranet is critical as they are the beneficiaries of the proposed intranet. As suggested by van den Akker (1999 in Reeves, 2000a) "a more 'constructivist' development approach is preferable." Constructivist principals acknowledge the differences of needs and perceptions as people seek what is pertinent to them. The constructivist philosophy will be discussed in the following section.

2.4.1. Philosophical stance of this study

Constructivist research philosophy embodies the multiple meanings of individuals as well as communities. Thus, the overall position for this study leans towards a constructivist philosophy, in that the development and evaluation of the proposed intranet portal should be a contributory, consultative and evaluative process involving all stakeholders. Constructivist philosophy has been proposed by van den Akker (1999) in Reeves (2000a) as appropriate for educational design and development research. In this study an intranet portal serves the interests of an institution of higher education and it can be argued that it fits in within this

domain. Based on this assumption, knowledge, views and attitudes of staff, students and other stakeholders, in an institution of higher education should contribute to the on-going institutional development. Thus, when designing an artefact aimed for use, it stems to reason that users' input should be taken into account. Further, the artefact, in this case, an intranet portal, is intended to support the institution's and user's day-to-day on-line activities, thus a constructivist research philosophy would be appropriate.

In view of the fact that opportunities and limitations presented by information technology are changing the way business and institutions have traditionally been conducted, it becomes necessary to locate research in the appropriate philosophical framework in order to increase the level of construct validity or what van den Akker (1999) in Reeves (2000a) refers to as "successive approximation of the ideals". McNaughton, Beukelman and Dowden (1999) argue that if researchers fail to take heed of these realities, society could miss out on the real opportunities, as new inventions continue to flourish. As has been discussed by Coleman and Dyson (1997), Scheepers and Damsgaard (1997) and Romm and Wong (1998), intranets are evolving in sophistication over time. If this is indeed the case, how can we ensure that solutions offered are not based on "keeping up with the Jones" but are solutions, which are relevant to a particular context to address a genuine need?

2.4.2. Research premise and goals for this study

After exploring the different dimensions of research and reflecting on the nature of this study, development research seemed to offer an appropriate foundation from where this study could be based. The reason for this is that this study is use-driven which is in line with Stokes (1997) multi-dimensional "use-inspired" research as opposed to the traditional "one dimensional" basic or applied research. Cognisance of Reeves (1999) suggestion that the aim of developmental research is not necessarily to *prove* but to *improve* a phenomenon by seeking practical solutions for immediate use, informed the basis of this study. Further, after exploring current literature on the development of intranets for institutions of higher education, others such as Conceição, Sherry, Gibson and Amenta-Shin (1997) have reported that they used

developmental research as identified by Richey and Nelson (1996) to guide the design and development of their institutional intranet. Development research has been particularly embraced by educational technology researchers and developers.

Examples suggested by Hunt (2001) where development research is particularly appropriate are “production of useful materials, devices, systems, or methods, including the design and development of prototypes and processes.” Development research takes advantage of both basic and applied research, current literature by Reeves (2000a), Richey and Nelson (1996) and van den Akker (1999) in Reeves (2000a) has championed it as being particularly useful to Educational Information Technology research.

2.5. Key features of the development research model

The development research model is an interdisciplinary conceptual framework which is made up of four phases which include (1) Needs assessment, (2) Definition of the objectives for design solution using a theoretical framework, (3) On-going evaluation of the solution and (4) Production and summative evaluation of the artifact. In the case of intranet design, phase 1 would be exploratory in nature and utilizes methods such as card sorting, surveys, interviews and intranet usage log books. Phase 2 involves a thorough analysis of current literature and theoretical framework and other empirical research, whilst phases 3 and 4 are iterative in nature and involve the use of formative evaluative methods such as prototyping and interviews (Reeves 2000a).

Richey and Nelson (1996) identified two types of development research, type 1 and type 2. Type 1 research involves the development of prototypes whilst type 2 involves an analysis of the effectiveness of the design process for the purpose of contributing to design theory. This phase of the study will make use of type 1 development research. Type 2 would be realised at a later stage, after implementation.

An important characteristic of development research is that it is problem orientated with the central emphasis on formative evaluation of each phase which will then inform and provide new leads for the next phase. The researcher is in some cases, part of the phenomenon under study. Some common protocols for data gathering were summarised by Flagg (1990) (see Table 1). Flagg (1990) suggests that these common stages of evaluation research could be used for the development of television, software and video programmes. One phase which this illustration has not included is the summative evaluation phase which ideally, should be conducted upon implementation.

Table 1: Common development phases summarised by Flagg (1990) and the type of evaluation which is used for each phase.

Program Development	Evaluation
Planning	Needs Assessment
Design	Pre-production Formative Evaluation
Production	Production Formative Evaluation
Implementation	Implementation Formative Evaluation

2.6. Giddens structuration theory

Information Systems researchers have widely used Giddens (1984) structuration theory for the development of organizational information systems. Scheepers and Rose (2000) used the structuration theory when designing a case-study intranet. The key principal of structuration theory is that of duality of structure meaning that human action is enabled as well as constrained by structure. Giddens (1984) argues that researchers should initially identify the organisation structure of an organisation by investigating the type of communication taking place within that organisation. This study could not rely on traditional information systems theories because the intranet is a multi-purpose dynamic environment which is not driven by information systems alone (Lyytinen, Rose, and Welke, 1998; Damsgaard and Scheepers, 1999; Damsgaard and Scheepers, 2000 and Stenmark, 2002b). In support of Stenmark (2002b), the information systems approach is inadequate to use for an intranet environment because: (a) the web is hyperlinked, thus can support pull technologies, where users can request and extract what they want from the server; (b) the web is networked and the use of Universal Resource Locator (URL) reduce the need of knowing the physical location of a resource; (c) the web protocols required for an intranet allow for browsers to recognise multiple file formats and (d) the internal focus of intranets should ideally allow for open communication and knowledge sharing without fear.

Because intranets are internally focused, there is no "one-size-fits all" because each intranet must address the needs of a particular context. This means that research done by others could only serve as points for inference and cannot effectively be used as solutions for another institution. For this reason, one of the critical issues, which must be addressed at the research-planning phase, is to identify the goals of the research. But why should researchers concern themselves with clarifying research goals when planning their research?

2.7. Inquiry Goals for this study

Reeves (2000a) argues that most educational technology development projects fail because of a lack of clearly stated research goals. This author suggests that research goals not only reveal the researchers philosophical stance but also highlights accepted research paradigms within a field. Although the six inquiry goals provided by Reeves (2000a) are aimed for on-line learning research goals, the principals are relevant to research goals for the design and development of an intranet portal in an institution of higher learning. The six goals are:

- (1) **Interpretive** goals, with the aim of describing and interpreting phenomenon using qualitative methodology;
- (2) **Development** goals with the aim of developing solutions for immediate use and documenting the process of development for others to make contextual inferences;
- (3) **Action** goals with the aim of improving existing products with no intention of theory building;
- (4) **Post-modern** goals for the purpose of questioning the power relations and ideological agenda of product designers and developers;
- (5) **Empirical** goals for the purpose of testing theories and hypothesis on how education works; and
- (6) **Theoretical** goals for the purpose of advancing theory in the educational arena.

2.7.1. How Reeves' goals relate to intranet research study

After studying Reeves (2000a) view point on the importance of declaring research goals for educational research, it becomes clear that the literature on the design and development on intranets in higher education can indeed be roughly classified into one or more of the Reeve's (2000a) six research goals mentioned above. To illustrate this point, Stenmark's (2002a) study could be classified under the postmodernist goals because his study challenges the bureaucratic control of intranets (power relations). This author argues that organisational checks and balances put into place could in fact be one of the contributory factors of limited intranet use. Further, management control could also stifle creativity and discourage, instead of promote intranet use.

Although Duane and Finnegan's (2000) intranet study declared that their study was exploratory, focusing on discovery and theory building, it is clear that this study falls under Reeve's (2000) developmental research. These authors, not only developed an intranet for Hewlett Packard Ireland, but also focused on contributing to theory-building and suggesting what they termed a "stages for growth" model on the evolution of intranets. Their study could also be classified under Reeve's (2000) post-modernist umbrella, as they focused their study on what they termed "balancing management control and effects on user's perceptions of empowerment" in the evolution of an intranet. Duane and Finnegan (2000) used contextual and psychological constructs as empowerment measurement tools. To sum up Reeve's (2000) argument on why research goals are important, one should consider a statement by Ehrmann (2003), when referring to use of technology in Higher Education, that "... if you're headed in the wrong direction, technology won't help you get to the right place."

2.8. Framework for Methodology

A variety of inquiry paradigms such as the systems development approach or Nolan's (1973) "stage-hypothesis model" could have informed this study. However, because of the complex, multi-dimensional nature of this study, it is imperative to draw from different fields, which include information architecture, knowledge management, information technology and organisational behaviour. Thus, the most appropriate paradigm of inquiry to guide this study, was the Reeves *et al.* (1997) eclectic, mixed-methods paradigm.

Reeves *et al.* (1997) mixed methodology is characterised by open pragmatic inquiry which utilizes a variety of qualitative and quantitative models to solve practical problems. This strategy advocates a user-centric approach to design. The methods, tools and materials, which are synonymous with the mixed method paradigm, include interviews, use-cases, journals, scenarios, expert reviews and prototyping. The assumption is that mixed paradigms increase the "richness" of data whilst mixed tools address issues of triangulation. The mixed method approach will be discussed further in the methodology section.

2.9. Reflections on Development Research

At first glance one could get the impression that Stoke's (1997) development research is similar to the traditional applied research in that they both are problem-oriented. However, from reading current literature it becomes clear that Stoke's (1997) development research advocates for (1) understanding and (2) use as goals of research. This strategy is synonymous with Action Research strategy which is an established research strategy which has been used in other Social Science disciplines such as Sociology, Ethnomusicology and Community Development, for empowering people to identify their own needs and seeking their own solutions instead of adopting the traditional NGO or Government imposed "solutions". A limitation of adopting a developmental research strategy is that on-going formative evaluation is critical to ensure that the process is in line with the project goal. This is a time-consuming process which involves input from a variety of sources.

2.10. Conclusion of Theoretical Framework

As suggested by Jarvenpaa and Ives (1996) in Damsgaard and Scheepers (1999), the effectiveness and success of an intranet can not be measured by counting the "hit counts". As discussed in this section, this study encompasses development research and constructivist principals to re-evaluate and improve the University of Natal's intranet known as "InnerWeb". This will be done by initially aligning the research purpose with Stokes (1997) use-inspired research (which interweaves basic and applied research). An intranet should be a socially constructed artefact to support individual experiences⁵ and social interaction within an authentic environment which supports participatory relationships (constructivist principals). Thus, the research philosophy for the development of the intranet, should also be guided by the constructivist schools of thought. A well-designed intranet portal will provide a single entry point to a variety of University resources which are currently available on databases. Such an environment, which will be provided by an intranet portal, will no doubt encourage users to discover information, which could lead to new knowledge and communities of interest. A

⁵ In our case these would be students and staff who all have different needs and roles to play

further advantage is that the intranet environment will also allow users to perform some of their administrative tasks on-line. In line with constructivist principals, the issue is about how members of an institution can exploit technology for the purpose of advancing their daily activities whether work or play.

The process of achieving this is through a carefully orchestrated plan which leverages and capitalises on multi-disciplinary practices which include Educational Technology, Human Computer Interaction (HCI), Information Systems, Information Technology, Knowledge Management, Organisational Psychology, Industrial Sociology and Commerce. The ultimate goal would be to develop an intranet portal which would be used as, what others have referred to as a "virtual office," "pocket campus," "virtual desk-top" or a "mind-tool." Because of the multi-disciplinary nature of this study, this study has not exhausted all the possible opportunities from all the mentioned disciplines, but could create a base for further research. A development research strategy using Reeves *et al.* (1997) eclectic mixed methods research model would be appropriate to ensure that the multi-dimensional ontology of the study is fully explored.

The next chapter is a literature review on theories, possibilities and limitations of knowledge management with specific reference to intranets. The purpose is to explore the argument of what knowledge management is and whether intranet technologies do indeed assist the knowledge management process.

Chapter 3 – Literature Review on Knowledge Management

3.1. Introduction

It has been suggested that portal technologies create an opportunity for institutions to deploy knowledge management as a mixture of carefully planned activities which facilitate knowledge sharing and access to information in a complex social system such as a university. The majority of literature available on knowledge management is written for commercial environments. There is need to understand this concept within the unique context of a learning environment such as the University of Natal. The goal is to find creative ways to unleash and stimulate seamless learning, communication and collaboration within the University of Natal with the hope of sharing knowledge and producing students and staff who are able to search, retrieve, critically assess and make use of digital media and resources which are available on the University databases. Hopefully the knowledge gained from the use of the intranet portal will contribute to the economic development in South Africa.

This section will explore and integrate current debate on possibilities and limitations of the concept “knowledge management” in relation to intranets. Although knowledge management encapsulates a broad range of concepts, particular attention will be paid to the three main enablers of knowledge management which are people, business processes and technology. In order to understand knowledge management, a brief discussion on knowledge theories will be presented though the discussion will not venture into an extended philosophical debate on what knowledge is. This will be followed by a discussion on knowledge management with specific reference to universities.

3.2. Distinction between data, information and knowledge

As suggested by Wilson (2002), *"the task of the academic researcher is to clarify the use of terms so that the field of investigation has a clearly defined vocabulary. The present confusion over 'knowledge management' illustrates this need perfectly."* This suggestion makes it necessary to define the difference between data, information and knowledge as a starting point for this discussion. These three terms have been used extensively and sometimes interchangeably in the fields of Knowledge Management, Information Systems and Communication. A clear understanding of these terms helps clarify the nature of knowledge management.

Data could be described as text or code which has no meaning unless its context has been understood by a user. Once a user has made sense of the data, the data becomes information. However, when a user reflects on the information and makes decisions which will affect their attitude or action, that information will become knowledge. To illustrate this dichotomy, Oettinger (1999) asserts that, "one person's knowledge is another's raw data," whereas Sveiby (1997) defines knowledge as the "ability to act".

3.2.1. What is knowledge?

Although most researchers have been influenced by the work of Polanyi (1962), debate on the nature of knowledge continues. Some authors claim that there are two distinct types of knowledge (tacit and explicit) whilst others argue that the two types of knowledge work in collaboration thus should not be viewed as two separate types. This will be discussed in the next section. Grover and Davenport (2001) argue that knowledge is the most valuable form of content in a continuum beginning with data. Human action is what distinguishes knowledge from information. So is it data, information or knowledge which is shared via an intranet portal? If indeed it is knowledge, could an intranet portal support the knowledge creation process? Why are there such opposing views on terms which are commonly used so loosely in daily conversations?

A definition of knowledge is relative to a researcher's ontological and epistemological stance. Some researchers have argued that knowledge can not "live" in computers or databases. They argue that tacit knowledge is of a cognitive nature which resides in a person's head, whereas explicit knowledge has been described as being codified knowledge such as documents, graphs and spreadsheets, which can be captured onto databases and libraries. Examples of explicit knowledge include operational manuals, written procedures and research findings. Explicit knowledge can either be structured into categories or unstructured, such as work in progress or e-mail. Nonaka and Konno (1998) suggest that the interaction of tacit and explicit knowledge leads to new knowledge (see section 3.5.1). However, others have argued that as long as knowledge resides in a person's head it is of no value to any one else.

It is clear from the literature that there are two main schools of thought on what knowledge is. The first one stems from a positivist, natural science perspective whilst the other one is a socially constructed view of knowledge (McAdam and McCreedy, 1999). Malhotra (2002) explains that these two epistemological view points on knowledge impact on knowledge management in the sense that the former implies an "inputs-oriented mechanistic view of static knowledge" whilst the latter is what the author calls "intelligence in action." How knowledge is managed (if indeed it can be managed) would vary from institution to institution. To understand the assumptions of knowledge management, it is important to briefly discuss the dichotomy on how epistemological paradigms clarify the term "knowledge". The two schools of thought are positivist and constructivist paradigms.

3.2.2. Positivist definition of knowledge

The definitions of knowledge in various literatures can be traced to Plato's (circa 427-347 B.C.) theory of knowledge. Plato adhered to rationalist positivist paradigm where knowledge is treated as "truth" which can be separated from the individual and scientifically observed and predictions made. This concept of knowledge was pursued by Taylor (1947) with the "scientific time and motion" study. The positivist assumption is that if something cannot be observed and measured objectively, then it is of no value. McLean and Blackie (1999) describe this type of knowledge as "hierarchical and defined" thus the term "knowledge is power." Users of this type

of knowledge attest to knowledge management systems where knowledge is treated as “facts” which can be codified from person to document (McLean and Blackie, 1999).

3.2.3. Social constructivist definition of knowledge

Another definition of knowledge stems from researchers who are aligned to the interpretivist paradigm with a social constructivist view of knowledge. The social constructivist assumption is that knowledge is “shared meaning,” which is based on experiences of everyday life amongst a group of people. Researchers who adhere to this interpretivist paradigm believe that knowledge is dependent on social conditioning and interaction could bring about social cohesion within a small group (community of practice). This is because knowledge is constructed both individually and socially. The Socialisation, Externalisation, Combination and Internalisation (SECI) model suggested by Nonaka (1991) is located under this constructivist paradigm. This model has been widely used and modified to guide the development of intranets as will be discussed in this section. Social constructivist models of knowledge emphasize the importance of organisational members having a platform to participate in the social construction of shared reality.

Some researchers, influenced by Choo (1998), have extended this view point by adding cultural knowledge as one of the main factors of a social constructivist definition of knowledge. Other constructivist theorists include Hawkins (1994) in Burgoyne, Pedler and Boydell (2001) and Senge (1990) whose main focus is on establishing a “learning culture” within an organisation to create a “learning organisation”. Organisational learning is purported to be the process which an organisation re/constructs its knowledge to increase problem solving capacity through teamwork, participation and other group behaviour. Senge (1990) defines a learning organization as one *“where people continually expand their capacity to create the results they truly desire, where new and expansive patterns of thinking are nurtured, where collective aspiration is set free and where people are continually learning how to learn together.”* Although Hawkins (1994) in Burgoyne, Pedler and Boydell (2001) and Senge (1990; 1994) do not make reference to intranets, some of their concepts on “learning organisations” provide an overview on organisational learning behaviour which is applicable to intranets.

3.2.4. Cognitive flexibility theory definition of knowledge

The third theory is a relatively new theory which has been applied to educational technology research. It stems from the constructivist paradigm and describes knowledge from a cognitive perspective. This theory, known as cognitive flexibility theory, was developed by Spiro and Jehng (1990) on the premise that knowledge is non-linear. They state:

"By cognitive flexibility, we mean the ability to spontaneously restructure one's knowledge, in many ways, in adaptive response to radically changing situational demands...This is a function of both the way knowledge is represented (e.g. , along multiple rather single conceptual dimensions) and the processes that operate on those mental representations (e.g., processes of schema assembly rather than intact schema retrieval)".

Their argument suggests that simple hierarchical organization could actually hinder the assimilation and transfer of complex knowledge. This type of knowledge is purported to be dynamic unlike the static type of knowledge described by the positivist. Some researchers refer to this type of knowledge as "information with meaning" as the context under which this knowledge construction takes place, plays an important role. The main premise of this theory is that information can be transferred beyond its initial purpose, thus the challenge is in presenting the information from multiple sources and perspectives. The emphasis is on knowledge construction through exploration and discovery and not information transfer, thus the sources of knowledge have to be interconnected (in a web-like manner) rather than compartmentalized (Spiro, Feltovitch and Coulson, undated).

Other authors such as Sveiby (1997) define knowledge as the ability to act. Individuals are viewed as "reflecting" human beings, who can decide on a course of action based on their learning style and multiple intelligence, thus in this regard, Drucker (1992) suggests that knowledge can not be managed. Dretske (1981) takes the argument further by suggesting that a user's choice of response is relative to their prior knowledge. Cognitive models for intranet design include Choo, Detlor and Turnbull (2000) Behavioural-Ecological framework for intranet design which was originally proposed by Detlor (2000). This model will be expanded in the latter part of this section.

3.3. Reflections on the definitions of knowledge

It is clear that there are two schools of thought regarding the concept of knowledge. The first one adheres to a scientific positivist paradigm where knowledge is viewed as a scientific entity whereas the other paradigm views knowledge as socially constructed. Based on the unique context of the University of Natal, adopting a constructivist approach to knowledge could yield better insight than a mechanistic positivist approach. It is worthwhile exploring the Behavioural-Ecology model suggested by Choo *et al.* (2000). The next section will discuss the origins and various forms of knowledge management.

3.4. Origins of knowledge management

Although most researchers acknowledge Polanyi's (1962) view-point that knowledge is either tacit or explicit, there is disagreement amongst researchers on how tacit knowledge can become shared knowledge which can be stored in a database. Further, the origin and goals of knowledge management are also under debate. Whilst research on knowledge management stems from a positivist epistemology, current literature clearly suggests that researchers are embracing the human aspect of "knowledge", thus there is no universally accepted definition of knowledge management. Others argue that it is a discipline, which stemmed from the information revolution of the 1900s (Stenmark, 2002b). Others argue that knowledge management is a relatively old discipline which stems from expert systems and artificial intelligence disciplines (Liebowitz and Beckman 1998), whilst others refer to it as an emerging new discipline (Kidwell, Vander Linde and Johnson, 2000).

3.5. Models of knowledge management

McAdam and McCreedy (1999) identify three types of knowledge management models (1) Intellectual Capital models; (2) Knowledge Category models and (3) Socially constructed models. One will note that these three types of models link back to the knowledge paradigms which were discussed earlier (page 24). These paradigms are positivist, cognitive and constructivist theories respectively.

The intellectual capital knowledge management model treats knowledge as an asset which can be managed, whilst the knowledge category model treats knowledge as both a socially constructed artifact as well as intellectual asset. The socially constructed knowledge management model views knowledge management as being cognitively created by individuals thus, suggests that knowledge can not be managed. Such knowledge management models have an emphasis on “communities of practice” social networks and communication. Socially constructed models adapt a holistic view of knowledge management, by linking social to learning processes. These include models which have been suggested by Demarest’s (1997) adaptation of Clark and Staunton’s (1989) model, which was modified by McAdam and McCreedy (1999).

3.5.1. Nonaka’s model for intranets and knowledge management

Nonaka (1991) developed the Socialisation, Externalisation, Combination and Internalisation (SECI) knowledge development framework (Fig. 3) which has since been used to understand knowledge sharing on the intranet. His main argument is that knowledge can be “tangible” and can be expressed but at the same time can be “intangible” and can not be effectively expressed as it resides in a person’s mind. This “intangible” knowledge includes “gut feel,” “hunch,” and “intuition”. The model has been widely used in knowledge-based information strategies. Watanabe (2003) has reported that they successfully applied the SECI model in the knowledge architecture of an education support system.

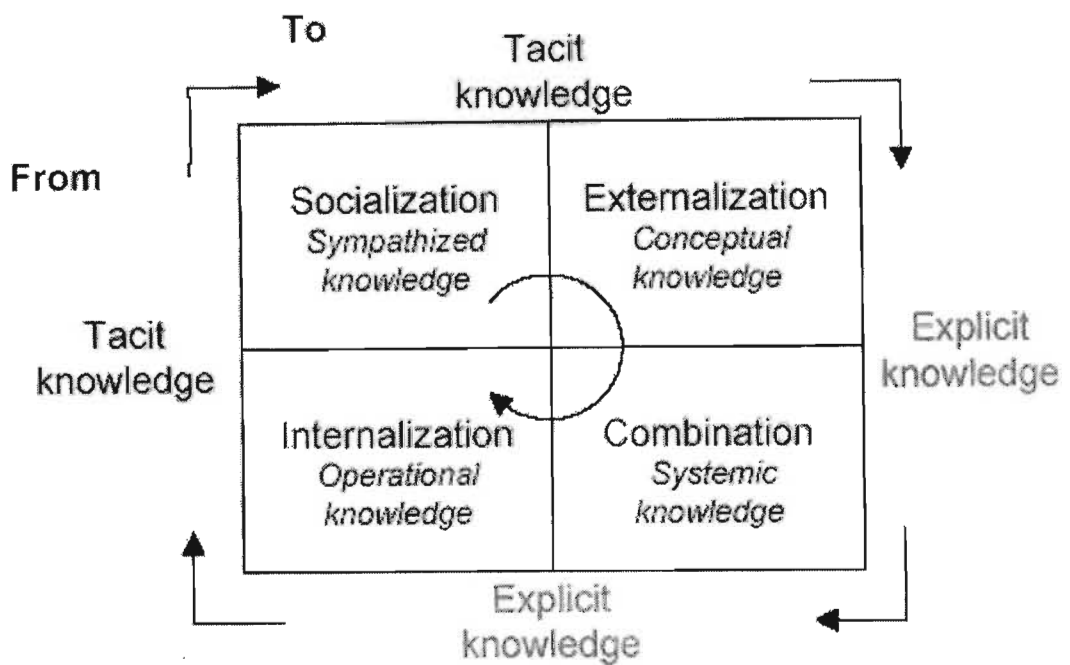


Figure 3: Nonaka's (1991) SECI model which is illustrated by Mansell (2000).

Nonaka (1991) suggests that knowledge is created in a spiral process characterized by the interaction between tacit and explicit knowledge at three levels of socialization which are the individual, group and the context. It is suggested that socialization is the process of sharing tacit knowledge between individuals. This can be done physically or electronically, via synchronous and asynchronous communication tools such as video conferencing, bulletin boards and web cams.

Externalisation is the process through which personal knowledge is shared with others publicly. This can be achieved via publishing tools such as Portable Document Formats (PDF), push technologies, whiteboards and discussion boards. Combination, is the systemization of explicit knowledge via intranets and groupware, databases and communities of practice databases. Internalization refers to individuals reflecting on the externalized knowledge and converting it into tacit knowledge. The whole knowledge creation cycle will continue at individual, group and organisational levels with organisations playing the role of amplifying that knowledge. This knowledge creation cycle could be effectively applied to intranets.

3.5.2. Limitations of the SECI model

The SECI is criticized by Wilson (2002) who argues that it is not possible for tacit knowledge to be converted to explicit knowledge as depicted by Nonaka (1991). Wilson (2002) argues that it is implicit knowledge not tacit knowledge which is translated to explicit knowledge. Implicit knowledge is knowledge of common experience or culture which is shared by others. This implies that the knowledge must be inferred, thus the context of communication should be clearly understood. A question posed by Wilson (2002) in relation to Nonaka's SECI model is *'Does it make any difference to the argument if, in the diagram, we replace "tacit knowledge" with "knowledge" and "explicit knowledge" with "information"?'*

Snowden (2000), also highlights the deficiencies in the SECI model by indicating that organisations are realizing that there is knowledge which can not be made explicit due to cost or other factors. The argument is that a holistic view of an organisation suggests that knowledge is held collectively and not individually.

3.5.3. Reflections on Nonaka's model

In theory the SECI model has a lot of value but it fails to recognize that not everyone will express their tacit knowledge. Various literature has suggested that in the corporate world some employees are not willing to share their knowledge for fear of being dispensable, so would rather hoard what they know if there is no apparent reward for them. Choo, Detlor and Turnbull (2000) refer to this as information politics. Whilst this research does not delve into this aspect, it could be investigated separately to see if it would influence the findings of this study. Further, because people share different life experiences, culture and motivation, it might be challenging to get people to really "talk" and capture their tacit knowledge.

3.6. Agent based approach to knowledge management

Based on their research on knowledge seeking behaviour of intranet users, Choo *et al.* (2000) suggest that an intranet should be viewed as a “socio-technical” system instead of a system whose primary aim is to store and retrieve information. Stenmark (2002b) adds to this viewpoint by suggesting that institutions designing intranets should move away from the traditional mechanistic, rationalistic approach to organisations and embrace designs, which encourage “knowledge cultivation to foster innovation”. He articulates that,

“The problem at hand is not that of recurrence and redundancy, but to create a surplus of innovative ideas that can guide knowledge workers when developing new solutions.”

Stenmark (2002b) calls for the use of pattern identification technologies which can sift through unstructured data and make correlations of unlinked resources. The main argument is that if intranet contributors are required to manually categorise their resources, they will be discouraged from making use of the intranet.

Stenmark (2002b) further argues that the fact that users can not find information on the intranet could be because the information is simply not available, thus the author strongly advocates for an open intranet where everyone should be able to publish whatever they want without being restricted by gatekeeper control.

Another argument is that an intranet should make use of tools capable of alerting users of any new information, which is relevant to them. This is made possible through in-built system agents, which track and compile usage patterns and profiles of intranet users. A third argument is that system agents such as search engines, could assist in the creation of communities of practice by identifying users who frequent the same type of information. Stenmark (2002b) suggests that this encourages communication amongst people with similar interest. He has created a model (Fig. 4) which encompasses the three imperatives which should support users of intranets.

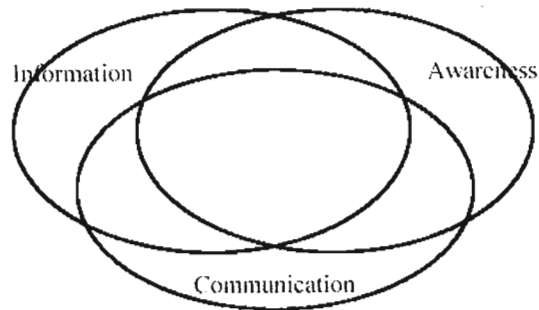


Figure 4: Stenmark's (2002b) model of intranets in innovative organisations.

3.7. Open - free publishing Intranets versus controlled intranets

As articulated by Stenmark (2002b), *"Much of the research conducted on intranets has been informed by a mechanistic and rationalistic understanding of organisations, information, and management... and sometimes also explicitly, adhere to the library model of information managing"*. To add to this point of view, Nielsen (2000) observes critically that organisations use their intranets for publishing documents in the same way as they would publish any print document. Nielsen (2000) suggests that organisations should rather hire full-time knowledge editors instead of presenting on-line documents in the same format as traditional printed material. The concept of hiring "knowledge experts" has attracted contentious debate on the actual role of so called "knowledge engineers", "knowledge transfer experts," "chief knowledge officers" and "knowledge editors" (Gaines and Shaw, 1995 and Davenport, 2002). These roles are probably roles which are already being performed by business analysts and documentation or information analyst.

Stenmark's (2002b) argument is that the intranet should not be used as a one-way advanced bulletin board but that everyone should be allowed to publish on the intranet. This could be achieved by decentralising publishing in order to allow for information to come from different sources, thus avoiding one-sidedness. Stenmark (2002b) supports Wachter and Gupta's (1997), suggestion that what is needed is empowerment for everyone to have freedom to publish. The authors suggest that instead of restricting intranet publishing, members of an organization should be informed of the direction and purpose of the intranet efforts. Stenmark (2002b) strongly calls for an "innovative organization" or what others term "organic or networked" organization. This type of organization is

characterized by dynamic intranets which are not highly controlled. This calls for a shift from a "Taylorism" style of bureaucratic intranets to a more organic dynamic intranet which encourages lateral communication.

At the University of Natal, "freedom of expression" would be made possible via the newly established on-line newspaper, "Shisa", where students can air their views. If portal technologies are used for the University intranet, a link to the newspaper could be made available via the intranet interface.

3.8. The difference between commercial intranets and university intranets

The majority of the literature on intranets discusses knowledge management research, with specific reference and application to commercial organisations. Although there is some literature referring particularly to knowledge management in institutions of higher learning, the literature is not as vast when compared to that of commercial enterprises. It is important to make this distinction because the goals of a profit-driven commercial organization are different from the goals of an institution whose primary goal is to explore and share knowledge for the advancement of humanity, for no (direct) commercial gain.

Others argue that the hype on knowledge management is nothing but remnants from the "Information Age / Revolution" which was later referred to as "knowledge economy." This knowledge economy saw commercial organisations "re-engineering" their business processes in an attempt to increase their competitive edge via either supply of or access to appropriate information for achieving specific business goals. Concepts such as world-class manufacturing and Total Quality Management (TQM) are a few of the business initiatives, which tried to adapt this "right information" at the "right time" concept. This "commercial" view of knowledge management places a lot of emphasis on the term "intellectual capital" as a way of increasing an organisation's competitive edge. This view of treating knowledge as part of an organisation's assets, has been criticised by others as suggesting that knowledge management is an asset which can be captured and managed like any other organizational asset.

To illustrate the different view points of knowledge management goals, one can compare the following two statements: Reid (undated) points out that

“An important part of the knowledge management paradigm is the ability to put the right person in the right place at the right time and provide them the information they need to be productive.”

On the other hand in Oosterlinck (2002) asserts that

“Knowledge management embodies organizational processes that seek the synergistic combination of data and information processing capacity of information technologies, and the creative and innovative capacity of human beings.”

Reid’s (undated) statement suggests a performance driven knowledge management goal whereas Oosterlinck (2002) suggests a human centered approach where humans have the capacity to reflect and innovate. This implies that different knowledge management strategies and models would be necessary to suit different contexts. Since the focus of this study is based on an institution of learning, the following section discusses some of the viewpoints of authors who have focused on knowledge management in institutions of learning.

3.8.1. Knowledge Management in Universities

Some authors such as Oosterlinck (2002) argue that knowledge management in universities is not a new concept and that knowledge management is what universities have been involved in ever-since they were established. He asserts that universities have always been practicing knowledge management even before the advent of information technology and that computers and technologies are merely enablers but not essential. However, Oosterlinck (2002) stresses that knowledge management in modern universities reflects the changing needs of *society*. It is argued that society is the main stakeholder of universities.

In the paper on knowledge management and universities, Reid (2000a) suggests that branding and marketing of courses to prospective learners as well as external forces such as reduced government financial support to universities and “competitive pressure on universities” could be some of the reasons for a university to consider knowledge management. A university should not adopt

knowledge management practices in response to “a range of external forces” as Reid (2000) puts it. There is danger that institutions of higher learning may be reduced to nothing more than a commercial entity. Reid (2000) provides a knowledge management framework which was adopted by the University of Australia and finally suggests that web-enabled technologies could enable better management of knowledge by Universities.

With reference to a university, Davenport (1998) suggests that ideally each academic staff member should have a web page which states, what each academic staff member is working on, their area of expertise, as well as the courses they facilitate. Standard web page guidelines and format should be provided for this purpose. Members of staff may add personal details to their web pages, but the challenge as suggested by Davenport (1998) is to ensure that the format of the web pages display the most important information first.

3.9. Knowledge management - linking people, processes and technology

Casey Stengal, manager of the New York Yankees, in Millan (2003) remarked that “finding good players is easy, getting them to play together is the hard part”. The purpose of the study reported here is to try to elevate the status of intranets from a perceived status of being an “electronic bulletin board” to that of a sophisticated synchronous and asynchronous interactive tool where various activities which are synonymous with an institution of learning could be performed. It has been argued that at the centre of intranets lies a knowledge hub which could add value to both an institution and an individual’s daily activities. Sivan (1999) suggests that before any organization embarks on knowledge management implementation, it must “adopt a knowledge culture that understands and supports the effort”. Technology alone does not stimulate knowledge sharing but other factors such as an organization’s social practice have a major influence on supporting a culture of sharing.

Some authors are of the opinion that technology is the main component of knowledge management whilst others view humans, what is coined “knowledge workers” by Drucker (1988), as the key component of knowledge management. Liebowitz and Beckman (1998) assert that knowledge

management is the heart of building a culture of a learning organization. This dichotomy is illustrated by comparing the two opposing statements below.

“Information systems will maintain the corporate history, experience and expertise that long-term employees now hold. The information systems themselves – not the people – can become the stable structure of the organization. People will be free to come and go, but the value of their experience will be incorporated in the systems that help them and their successors run the business.”

Applegate et al., 1988 in Malhotra (2002)

“Technology can be, and is being, used for several predictable knowledge processing activities generally ranging from automation to semi-intelligence. Examples include the notions of AI, expert systems, genetic algorithms, Big Blue, software agents, etc.”

Arthur (undated) in Malhotra (1997)

These statements clearly imply that knowledge can be stored in a computerized database ready to be retrieved for use for predictable actions. Contrary to this is the statement by Churchman (1971):

“To conceive of knowledge as a collection of information seems to rob the concept of all of its life... Knowledge resides in the user and not in the collection.”

This statement clearly rejects the technology-information driven notion of knowledge management.

3.10. Critique on Knowledge Management

Some researchers have dismissed knowledge management as a “fad” which adds no value to an organisation. In their paper Galliers and Newell (2000) proposed a “*refocus on data since information technology processes data and not information and certainly not knowledge*” (see Fig. 5). A brief explanation of this model is provided in the next paragraph.

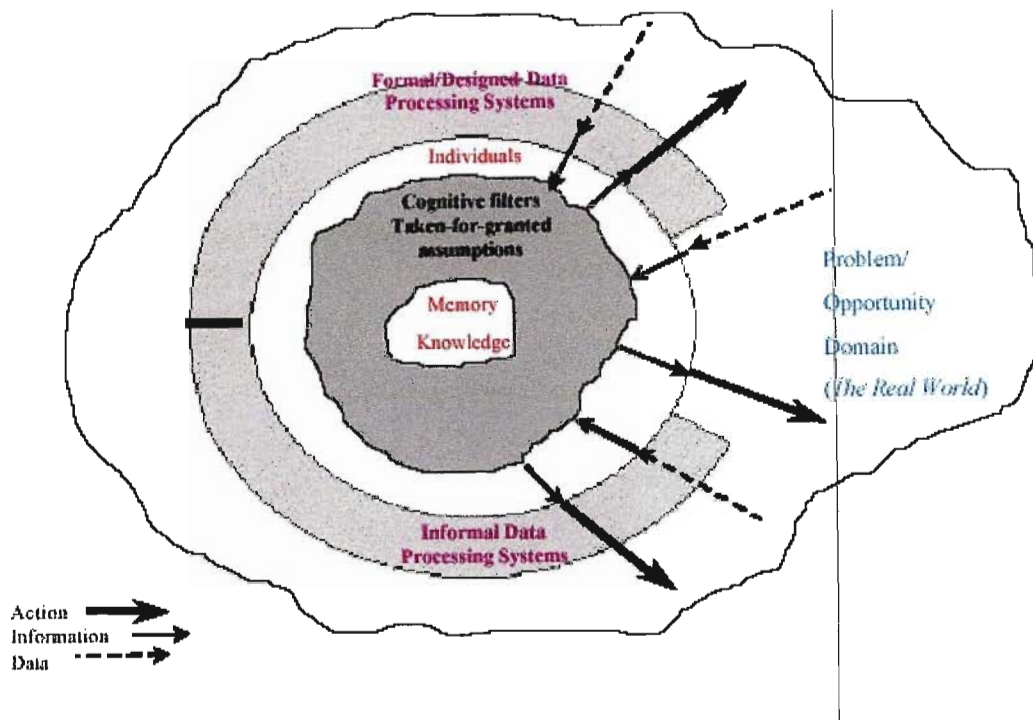


Figure 5: Visualisation, data, information and knowledge model illustrated by Galliers and Newell (2000)

Galliers and Newell (2000) suggest what they term a “trans-disciplinary” approach which draws from Organisational Behaviour as well as Information Systems theories to develop a model which explains the interpretive nature of data and information. The model suggests that people make sense of their own world by using their embedded knowledge for interpreting data from the “real world” from informal data processing systems as well as formal IT based data processing systems. People are at the centre of this model as they make use of their cognitive ability to make sense of the reality by interpreting data both formally or informally. Their model suggests that because meaning is inferred, context determines information needs and use. These authors suggest that knowledge management is nothing other than data processing systems, as computers cannot “hold” knowledge.

Wilson (2002) describes knowledge management as a management utopia whose main essence is really on the management of work practice. The author supports this claim by listing examples of some of the so called “cutting edge” business practice which are in fact, old practices which are

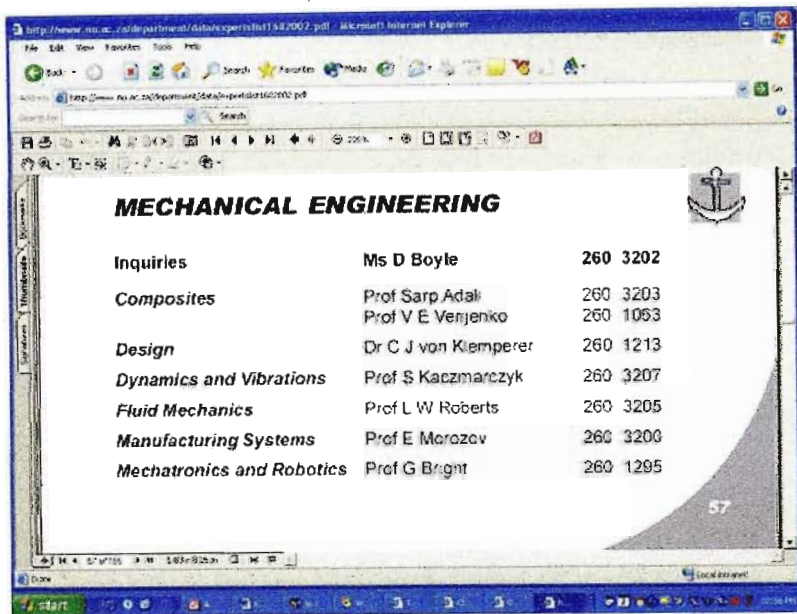
disguised under a new name. For example, the term “organizational learning” has been used to refer to systems thinking and “enterprise resource planning” to refer to nothing other than “customer relationship management” and the term “repertory grid” is a fad substitute for “management by objectives”. Wilson (2002) seems to suggest that the term “knowledge management” is a case of “old wine in new bottles.”

Wilson (2002) claims that business management consultants have promulgated the knowledge management hype, thus dismisses knowledge management as “management consultancy rhetoric”. The author supports this claim by giving a detailed account of the changing phrases which have been used by various consultancy firms such as Ernst and Young, Accenture and Price Waterhouse Coopers (PWC). Wilson (2002) is also concerned by the fact that the term “knowledge” is being used interchangeably with “information,” thus concludes that knowledge management is “... *an umbrella term for a variety of organizational activities, none of which are concerned with the management of knowledge*”. To support this claim, the author illustrates how various companies, who claim to have a knowledge management system in place, are after close scrutiny, actually referring to a variety of other management activities. This includes competency management systems, skills planning and training management systems.

Wilson (2002) also argues that tacit knowledge can not be captured as it is not as obvious even to the “owner” of the knowledge. How then can tacit knowledge be captured and stored into a database? Tacit knowledge can only be expressed through our actions. Wilson contests that knowledge management is nothing other than (1) information management (2) management of work practices and is highly critical of universities which have jumped onto the knowledge management band wagon, “which lacks wheels” by offering so called “knowledge management” courses.

3.11. Using the intranet for connecting people

One of the requirements expressed by the University of Natal's users is the need for a "list of experts". A version of this is currently available on the University web site in the form of a 155 page list of lecturers and their contact details (Fig. 6). This could be enhanced to include more details about a person's area of interest and expertise as well as courses the person facilitates.



MECHANICAL ENGINEERING		
Inquiries	Ms D Boyle	260 3202
Composites	Prof Sarp Adali	260 3203
	Prof V E Venjenko	260 1053
Design	Dr C J von Klemperer	260 1213
Dynamics and Vibrations	Prof S Kaczmarczyk	260 3207
Fluid Mechanics	Prof L W Roberts	260 3205
Manufacturing Systems	Prof E Merozov	260 3200
Mechatronics and Robotics	Prof G Bright	260 1295

Figure 6: University of Natal's "List of Experts" which is currently available on the University web site.

As suggested by Stenmark (2002b) an intranet should not be seen as a tool for retrieving and storing information but as a tool which could enable the identification of expertise in an organization which is geographically dispersed. The purpose of differentiating between tacit and explicit knowledge is to clarify the argument that individuals possess tacit knowledge which is not necessarily known by others. This knowledge could remain untapped if others are not aware of such expertise within an organization and if the "owner" is not aware that others are interested in this tacit knowledge. Stenmark (2002b) suggests that an intranet should be used as a platform for connecting people with expertise within an organization instead of just publishing documents and corporate literature.

Instead of trying to capture tacit knowledge intranets should be designed in such a way that social interaction between novice and experienced people is encouraged. He suggests that competence systems could be ideal for establishing interest groups within an institution. The issue of converting tacit knowledge into explicit knowledge will be addressed by providing an “interest-activated technology” platform which will, according to Stenmark (2002b), “detect, visualise and leverage interests”. Stenmark’s (2002b) remarks are valid but one assumption, which is still not clear, is whether the exchange of information is equal to exchange of knowledge?

3.12. Limitations of out-of-the-box Knowledge Management software

Knowledge management has been viewed by some as out-of-the-box solutions where employee experience, procedural knowledge and “best practice” are purported to be captured into a database for use by other organizational members to solve pre-determined business challenges. The limitation of approaching knowledge management from this angle is that it fails to acknowledge the dynamic nature of organisations and the human capacity to innovate. The danger is that this “best practice” may become institutionalized and a culture of “this is how we have always done it” could prevail. It also assumes a linear and routine environment.

3.13. Main themes which emerge on knowledge management

The following themes emerge regarding knowledge management and intranet portals.

Portals should be designed to build formal and informal communities of practice via synchronous and asynchronous tools such as discussion groups through sharing experiences and even technical support (Wenger, 2000). It is suggested that providing a comprehensive expert list for users brings awareness on whom to tap on if users are unable to find what they are looking for as well as helps build formal and informal networks of people with similar interests. This will help foster a “knowledge culture” within the organisation. Understanding information seeking behaviour of intranet users is important to provide a platform which allows users to move seamlessly between various services offered via the portal. This is because intranet portals can handle user diversity more effectively than conventional intranets. Fast feedback loops help strengthen user confidence

in the system and encourage them to rely on the portal as a first choice of performing various tasks and transactions (Brown and Eisenhardt, 1998). The idea is to explore how information, which sits in repositories is translated into action by the users for the purpose of what Malhotra (1999) termed “facilitate both learning and unlearning processes.” The idea is to create an environment which will encourage people to think across organizational boundaries and foster a “self motivated enquiring mind” especially amongst learners of the university.

3.14. Concluding remarks on knowledge management

The focus on knowledge management is not about exclusively technology but as discussed in this section, about three elements which are (1) people, (2) business processes and (3) technology. As articulated by the National Electronic Library for Health (2003):

“These three components are often compared to the legs of a three-legged stool - if one is missing, then the stool will collapse. However, one leg is viewed as being more important than the others – people”

The idea is to move the intranet from what Guenther and Braun (2001) term “from document dump to a knowledge repository.” Stenmark (2000) asserts that intranets can raise the probability of creative acts by stimulating the factors that work in favour of creativity. Although Stenmark (2000) listed eight factors which were described as factors for creativity an institution should try to establish its own factors which are relevant to its own institutional culture and context.

The University of Natal would benefit from adopting a constructivist rather than the positivist approach to knowledge management as discussed in this chapter. The constructivist approach emphasizes the benefits of social networks and open communication. Individuals are viewed as reflecting actors who can actively contribute, not only to knowledge exploitation but also to knowledge exploration, which McAdam and McCreedy (1999) suggest is the key to a learning organisation. We should not dwell on the issue of what is being exchanged but should also try to discover what is **not** being exchanged via this portal. It may be argued that the critical issue is to try to address ways of gaining access to what is *not* exchanged via an intranet. One way of doing this is to conduct on-going information audits along the lines suggested by White (2002). White

(2002) suggests the use of ethnographic research in order to “understand insider view of their own world.”

Knowledge is purported to be acquired through the interaction between an individual with other people and taking action as a result of integrating the newly acquired knowledge with prior knowledge. Thus, an intranet platform should be provided where individuals can actively engage in the creation of shared reality. Other dynamics such as cultural issues as suggested by Choo *et al.* (2000) should also be considered as user acceptance is the key issue to the proper implementation and use of the proposed knowledge portal. The proposed portal should be a centre where structured and unstructured data can be viewed by authorized users. Unstructured data includes projects which are still in progress and are still not yet published. Incorporating project management tools into the intranet will enable team members and other interested parties, to track a project’s progress via the portal. Other administrative processes should also be accessed via the portal. Any process flows should be interlinked and viewed via the intranet as a de-compartmentalized seamless start-to-end process.

It is clear from the discussion that tacit knowledge is knowledge which resides in a person’s head. The issue we should be asking ourselves is how that knowledge can be made known to other people as well as how a person will know that their tacit knowledge is needed by other people. The National Electronic Library for Health (2003) express that,

“Too frequently people in one part of the organisation reinvent the wheel or fail to solve a problem because the knowledge they need is elsewhere in the organisation but not known or accessible to them.”

Thus, one initiative towards knowledge management would be to conduct knowledge audits or knowledge mapping in order to have an idea of the resources available in an institution. This could be done by ensuring that everyone is clear of the goals of the intranets and how everyone plays an important role. Current training and induction workshops could include a brief session on the purpose of the University intranet. A limitation of knowledge audits is an assumption that

knowledge is static. This means that audits would have to be conducted regularly.

From the literature reviewed, it is obvious that the challenge to designing intranets is to find ways of opening up the flow of communication to enhance human interaction instead of merely "dumping" documents on the intranet. Suggestions offered by the National Electronic Library for Health (2003) include:

"skills directories and expert directories - searchable online staff directories that give much more detail about who does what and who knows what, collaborative working, communities of practice - networks of people with a common interest, and various 'socialisation' activities designed to support knowledge flows".

Most of the literature on the subject suggests that intranets evolve, and for that reason, it is imperative to realize that this project is merely one part of the many phases which a project of this nature should take.

3.15. Reflections on knowledge management

South Africa, a developing country has to find strategies of developing skills to its people using various ICT. In the case of the University of Natal, introducing a carefully planned intranet portal will no doubt equip university members with the "information searching and retrieval skills" which are so vital in a global economy which is characterized by information as a commodity. The University of Natal needs to develop a knowledge management strategy which is relevant to its own unique context. This involves using established hybrid theories which include educational, organisational behaviour, communication, information systems and HCI theories to create an environment which stimulates intranet user's cognitive skills in order to encourage learning and collaborating across discipline boundaries. Various synchronous and asynchronous tools could be used to support formal as well as informal interest groups or communities of practice.

An area which has not been discussed extensively is the role of story telling as a communicative aspect of knowledge management. African people as a whole, are known to use oral records as a way of sharing knowledge. BP Shell Petroleum (2001) has compiled a booklet entitled "Story-telling in Shell - Managing Knowledge through New Ways of Working" in which they suggest that story

telling could be an effective means of good knowledge practice. Knowledge management should be approached in a holistic manner to ensure that all possible methods of communication and awareness are utilized.

Literature makes a clear distinction between Western concepts of knowledge management and Japanese concepts of knowledge management. Further research should be conducted in this area to build an African framework for knowledge management in order to address issues which are pertinent to the African context. Since one of the key features which appear in almost all the literature consulted mention socio-cultural issues as one of the important factors in knowledge management. South Africa has its unique problems which are characterized by a very distinct cultural division where the majority of students registering at university have not been exposed to a variety of "taken for granted" basic life skills. Efforts to introduce technologies and related innovations, should always aim at narrowing the evident "exposure" gap, which exists amongst students.

Some students and staff who register at the University do not have the same exposure to technologies as their counter parts, thus, it is a necessity to rapidly skill those members so they can confidently contribute to national development and economic activities. The global economy is increasingly demanding knowledge based services. An assumption is that a dynamic intranet portal will encourage University members to want to participate in on-line activities which could take place via the portal, thus, fostering reading, writing, communication and information seeking skills. Okunoye (2002) says,

"recognizing that knowledge is at the core of all our development efforts will allow us to discover unexpected solutions to seemingly intractable problems."

Leavitt (1965) points out that we need to not only understand the dynamics of the organisation but also the external environment in which the organisation operates. The University of Natal is situated in a province which has a huge socio-economic gap amongst its citizens. Any innovative activities which take place on campus should be aimed at, not only increasing computer literacy but

as suggested by Gouveia (2003),

“basic literacy, technological literacy, information literacy and communication literacy”.

According to Gouveia (2003) the “know-how approach (data and information)” is no longer a valid method of learning in an institution of learning, instead “... to provide critical skills on (know) where, (know) who, (know) what, (know) when and (know) why to use information and knowledge.”

Davenport (1998) articulates,

“If we're serious about creating lifelong learners, the skill that matters most of all is teaching people how to find, filter, and act on information. It ought to be the first course that every freshman takes. We need to start to develop schools that address information issues in holistic ways.”

This chapter reflected on the nature of knowledge and what is termed knowledge management.

The next section focuses on the proposed design of an intranet model.

3.16. Information Ecology and Knowledge Management

This section will discuss the Behavioural-Ecological Framework for intranet design. Intranets are increasingly being promoted as knowledge platforms where members of an organisation can interact for the purpose of sharing knowledge instead of the traditional document dumping ground. Choo *et al.* (2000) argue that the design of intranets involves more than just concentrating on data transfer. They argue that the design focus should be based on the “organizational and human processes that are being supported” and social factors such as information culture, ecology, politics and organisational culture shape the flow of information within organisations. Choo *et al.* (2000) conducted a study on information seeking behaviour of intranet users and developed a conceptual framework for intranet design which they adapted from Detlor’s (2000) original framework. They suggest four design principles for intranets that include:

Analyzing the organization’s information ecology;

- (1) Identifying the typical problems and associated problem dimensions experienced by major sets of users;
- (2) Analyzing the information behaviours of these sets of users by concentrating on typical problem resolutions in terms of the information sources used and the information traits that are valued most; and
- (3) Creating value-added processes in the intranet design that foster and enhance the information ecology of the organization and help users resolve their typical problems.

With respect to this framework, it is necessary to understand what the term “ecology” means. Dictionary.com defines the term “ecology” as (1) the relationship between organisms and their environment; (2) The science of the relationships between organisms and their environments, also called bionomics. In stable Biological eco-systems, there is mutual inter-dependence between all the living organisms, that is plant and animal life which is found in that habitat. There is free flow of energy (currency) between the organisms. The system exists for the mutual benefit of the organisms in the ecosystem. Any factors that impact on one aspect of the system will ultimately affect the whole eco-system. Detlor (2000) proposed that components of the knowledge management system, which include organisational mission, intranet goals, information politics, etc.

are inter-dependent. Mis-managing any of these components, could restrict the free exchange of information. Choo *et al.* (2000) suggested a framework (Fig. 7) which comprises three nested layers of unit of analysis which are: information ecology, information behaviours and value-added processes. A brief explanation of each one of these unit of analysis is provided in the next paragraphs.

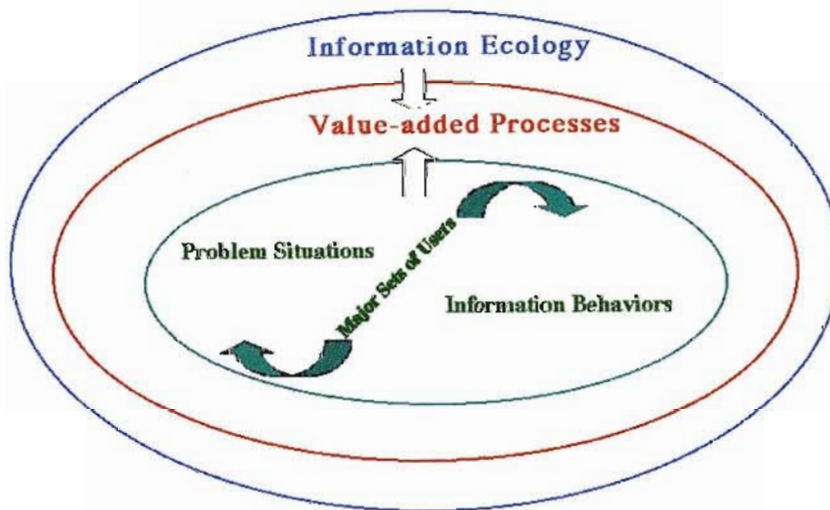


Figure 7: A design framework by Choo *et al.* (2000) which illustrates the inter-relationship and inter-dependence between information ecology and information behaviour.

Information ecology is defined by Nardi and O'Day (1999) as "... a system of people, practices, values, and technologies in a particular local environment." The purpose of information ecology is to understand the landscape in which information is used. The spotlight is not on technology, but "on human activities that are served by technology". Nardi and O'Day (1999) give an example of a hospital intensive care unit as an illustration of information ecology. This environment has machines, health care personnel (i.e. doctors, nurses, porters), medication, etc. but the critical purpose is to use human judgment, expertise, co-operation and knowledge for the purpose of healing a patient. Their argument is that in this environment, each one of these elements is co-dependent and inter-related. A change in one would influence the other. When relating information ecology to intranets, the idea is to capitalise on the diversity of the institution to

influence the direction of the process of knowledge sharing. The information ecology in an organisation would be influenced by information politics, information security, access restriction levels, information culture and other social subsystems which shape the creation and use of the information (Choo *et al.* 2000).

Davenport and Prusak (1997) added eight factors that could be used in analysing an organisation's information ecology. These are organisational mission, intranet goals, information management plans, information culture, information politics, physical setting, information staff and information handling. Thus the first step in designing a knowledge portal would be to analyse the information ecology of the institution.

Information behaviour focuses on how individuals perceive their roles within an organisation and how they go about finding and using information according to its fit and merit to fulfil their particular needs and purpose. Choo *et al.* (2000) suggest that this could be done by observing the users in their natural setting and identifying the problem situations which cause them to seek and use information. The analysis could assist in identifying information traits of sets of users. Sets of users are groups of people who share specific characteristics such as job roles, economic, interest or profession. MacMullin and Taylor (1984) in Choo *et al.* (2000) suggest that it would be necessary to describe the attributes of the information which they find useful as well as how users make use of this information. They list eight traits which form the basis of how information is recognised and evaluated. These traits and their related use categories are illustrated in Fig. 8. MacMullin and Taylor's (1984) model suggests that it is important to understand information traits, i.e. what information is like and related problems.

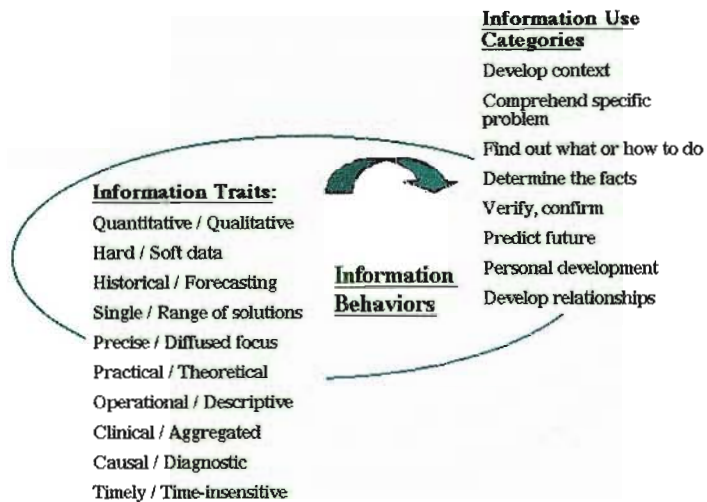


Figure 8: MacMullin and Taylor's (1984) information behaviour traits

Value-added processes can then be designed to dovetail and support or improve the identified information ecology and information needs and behaviour. According to Davenport and Prusak (1997) value-added processes should "support sense-making, knowledge-creation, and decision-making by making use of tacit, explicit, and cultural knowledge". For example, if a problem dimension such as *difficulty to find information* is identified, value added processes to address this problem could include use of meta-data or a more powerful search engine, browse, FAQs, alerts, etc. Value-added processes should ideally support knowledge creating and decision making.

3.17. Limitation of the Information Ecology Framework

Malhotra (2002) argues that the information ecology assumes a relatively stable and predictable environment which is characterised by "incremental change ... embedded in procedure manuals". He asserts that this is not always the case in an organisation which is complex and evolving as knowledge gets created and re-created. Malhotra (2002) criticises information ecology for concentrating on "today's status quo" unlike the knowledge ecology which the author argues, "takes a pro-active approach" to innovative breakthroughs. Although these are valid observations, a critical analysis suggests that the knowledge-ecology framework is not very different from the information-ecology model.

3.18. Conclusion on information ecology framework for intranet design

The framework by Choo *et al.* (2000) incorporates the concepts and conditions which contribute to the effectiveness of an intranet. They suggest an analysis and understanding of; (1) information ecology (environment) of an organisation; (2) information behaviour of the users and (3) design of value-added processes to meet the needs of the latter. Their framework, which is influenced by constructivist principles, provides a holist, encompassing strategy of intranet design. This framework extends the possibilities offered by data-base driven websites by using technology to possibly enhance the sharing of information which can then be critically analysed and applied by an individual to create knowledge. This model clearly illustrates that technology (data-base driven) should not be the main focus but just an enabler. An understanding of the institution's information ecology and user information seeking behaviour are the foundations of good intranet architecture. It would be worthwhile to integrate some of the concepts of this model for the next phase of this project as there is much to learn about user dynamics in the field of intranet use and we are at the early stages of this analysis.

In the next chapter, a brief overview of databases will be discussed as they are part of the technological requirements of a database driven intranet portal.

CHAPTER 4 – Web technologies which enable intranets

4.1. Introduction

An examination of current literature suggests that the advantages of database driven intranet portals are rapidly being recognised in many organisations, including institutions of higher learning. It is evident from the literature that many people use the term “portal” to refer to a conventional intranet when in fact, it is not a “true” portal. There are distinct functionality and capability differences between conventional intranets and intranet portals. These differences have to be clearly understood in order to make informed decisions and choices. This section will explore current practice on some of the concepts and technologies which contribute to the development of an effective intranet portal. These include web databases, web content management, information architecture and search engines for simplifying the retrieval of information from these databases.

A body of literature has emerged which suggests that designing an intranet, particularly in an institution of learning, should aim to create what Bogdanov (1999) terms a “personal workspace (PWS)” for all the members of an academic institution (Fig. 9). The personal workspace makes use of various devices to display information from various sources. The workspace is customisable to suit an individual’s preference.

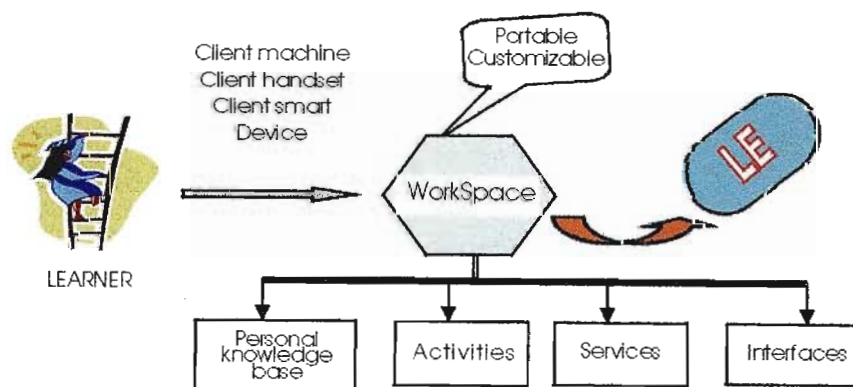


Figure 9: The basic components of a Personal Work Space (PWS) proposed by Bogdanov (1999).

4.2. Differences between conventional intranets and intranet portals

It is imperative from the on-set to make a clear distinction between an intranet portal (also known as enterprise portal) and a conventional intranet. The type of intranet, which is being explored in this study, is an intranet portal as opposed to a conventional intranet. The difference is that an intranet portal integrates all corporate applications and resources under one “single web interface” using one password whereas a conventional intranet is made up of static HTML pages, which have to be accessed individually. Further, users have to sign in and out, using multiple passwords to access various applications, which they are authorised to use. A definition of a portal provided by (Hagedorn, 2000) is, “*A site for a particular audience providing a path to all encompassing content and services through one access point*” and another definition by Gery (2003) is,

“a unified space that enables users to easily identify, retrieve and use resources to achieve their learning and performance goals”.

The “hype” around database-driven portal intranets is their functionality of providing users with an option to customise as well as personalise their intranet interface view. Head (2000) argues that such functionalities help reduce the “information overload syndrome” whereby users are overwhelmed by the vast amount of information on the intranet.

4.2.1. Functionalities offered by portals

The functionality offered by portals differs from institution to institution but the majority of them offer the following basic functions which have been listed by Gery (2003): single log-on to applications, gateway, home page, search, personalization and customization, browsing resources, directory/indexing, site maps, data, forms, contacts or information look up, create and manage documents, provide feedback, create new knowledge, locate experts, subscribe to services, view alerts and collaboration with others. Interoperability is another key aspect of a portal in that it provides the ability of different software from different vendors to “communicate” to each other. This reduces the need for multiple log-ins by users. One sign-on

access should ideally connect a user to every other system which a user is authorised to use. These resources are available on different databases of which there are different types of databases. The next section will briefly explain what databases are and how they relate to portal technologies.

4.2.2. Two types of portals

There are two types of portals which are: (1) vertical portals which are specialised portals dealing with a specific "special interest" topic targeted for a specific group of people and (2) horizontal portals (also known as mega portals) which provide a gateway to a broad range of subjects from various sources and information channels which are made available on one page. Users have the opportunity of customising their interface to include the channels which are relevant to them. A university would most likely benefit from a combination of the two portals. This is because of the complexity of activities and processes which take place in an institution of learning. Most activities are of a niche interest whereas others are of a general nature.

Eisler (2001) observes that campus portals have common evolving features (Fig. 10) and suggests that the centre circle deals with issues of user access and authentication whilst the outer layers represent content modules, user tools, or data resources which can be adjusted accordingly.

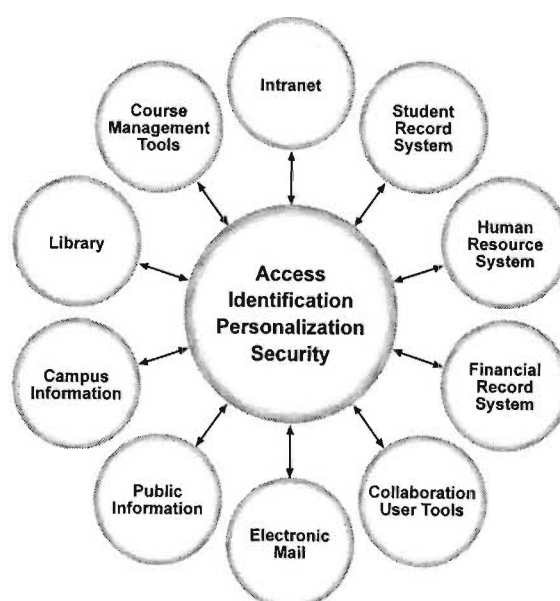


Figure 10: An illustration of a campus portal structure suggested by Eisler (2001).

4.3. What are databases?

Because this project is dealing specifically with database driven intranets, it is important to briefly explain the setup and functionalities of databases. According to Beynon-Davies (2000) a database is a filing cabinet with structured repository of different data types. Because there are different types of databases available, their different functionalities determine the extent and level to which users can access and manipulate the data.

4.3.1. Types of Databases

Beynon-Davies (2000) classified these databases as (1) production databases, (2) decision support databases and (3) mass-deployment databases. A brief explanation of these databases will follow. Most organisations choose to design separate databases instead of keeping everything in one database. The idea would then be to use portal technologies to provide one access point to all the databases instead of a user having to log in and out of each and every one of those databases, as is currently the case at the University of Natal.

The primary use of production databases is for enabling, what Beynon-Davies (2000) refers to as "CRUD" activities, which is, creating, reading, updating and deleting data activities. An example of a production database, is the on-going record of student progression. At the University of Natal, this type of database would be the student records database system known as ITS. On the other hand, decision support databases are usually read-only databases mainly used for decision making and for monitoring an organisation's activities. An example of a decision support database at the University of Natal is the Human Resource database, used to monitor staff recruitment, demographics and other statistics. Mass-Deployment Databases are used for disseminating information to individual desktop computers. An example of a mass-deployment database would be the University Notice System (Addendum 13).

However, to extend the usefulness of the databases, an effective web content management system has to be utilised. Fig. 11 illustrates the relationship between databases, web content

management systems and portals. The illustration shows how portals can work as interfaces for content management system. Structured and unstructured content are processed by the content management system and displayed either on wireless devices, web pages or as portable document format (PDF). Templates for web contributors and for end-users assist provide consistent publishing and display of database content.

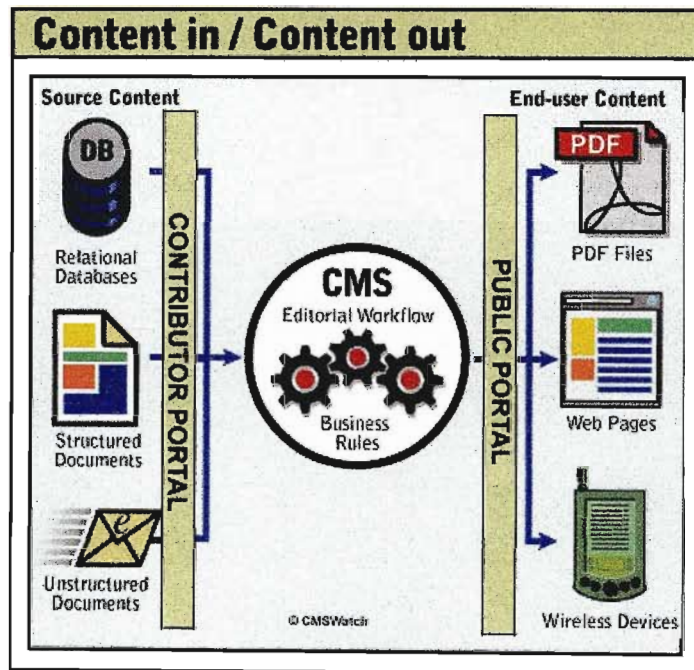


Figure 11: Illustration of a web content management system with a portal interface for content providers and another for end users. (*source web content management watch*)

The next section will explain the relationship between databases and web content management systems as well as the advantages and limitations of web content management systems.

4.4. Content Management

A variety of phrases have been used to refer to what are basically digital libraries which process, manage and store web content, which is made available on a portal driven intranet. Phrases such as document management systems, enterprise resource systems, web content management systems, enterprise web content management and information asset management systems have been used to refer to the same concept. When one takes a closer look at all these systems one would notice a degree of overlap in what each purports to do over the other. Differences between document management systems and web content management systems will be discussed in this section as we have to be very clear on these differences in order to make informed decisions on the proposed intranet.

A document management system stores and indexes electronic documents in a repository with the primary aim of making them searchable and retrievable. On the other hand, a web content management system goes a step further than document management systems by providing a web content editor which has a 'What-you-see-is-what-you-get' (WYSIWIG) interface. The WYSIWIG interface provides functionality for web content publishers to create documents from within the web content management system without any knowledge of HTML or by merely copying and pasting Word documents into the web content management editor. This means that a content management system has the ability to store data in a database separately from the templates, which control its appearance, so web content can be updated or reused in various contexts without any HTML coding.

Although maintaining a web content management system is more labour intensive than a document management system, it provides rigid functionalities of publishing, editing, tracking workflow, archiving and deleting documents from the repository. Web content management systems can manage any type of media, be it images, documents, sound files and other digital objects. Some content management systems enable users to convert most documents into any file format of their choice. A further advantage of an effective web content management system

is that the possibility of web content publishers, having the functionality of associating related web content to a particular item, thus providing intuitive search results to end-users. Thus, end-users have the advantage of referring to associated web content, which is related to a particular item they are looking for. Another feature of an effective web content management system is the ability to connect to and extract information, which is outside of the web content management system. Web content owners would need to decide on who would access their information. This leads to the question of the new Information Act Bill, which was recently passed in South Africa. Although this Information Act will not be discussed in this report, it is pertinent to take cognisance of the possible implications of this Act with reference to the legislation on access to information.

Web content management systems use customisable templates, which control the display of web content. On the other hand, document management systems are mainly concerned with the processing, organising and safeguarding of many documents in a large institution. An effective web content management system, provides for web content manipulation at web content level and not merely at document level as in document management systems. This implies that the value of web content managed would be higher in terms of re-use and personalisation as opposed to content made available via a document management system. A powerful web content management system will make provision for how an end user chooses to view the web content and appearance of what is available on the database repositories using any device such as a PDA or cell phone (voluntary personalization). Personalization can also be done at system level based on the role of the user (role based personalising). This means that web content made available matches the profile and expressed requirements of a user.

Eirinaki and Vazirgiannis (2003) suggest that the overall process of web personalization consists of five modules namely, user profiling, log analysis and web usage mining, information acquisition, web content management and website publishing. Other advantages of content management systems include multi-level security mechanisms as well as template based publishing facilities which can be automated in various ways.

4.5. Organisational Memory

One cannot under-estimate the usefulness of an intranet as a major organisational memory bank. Mintzberg , Raisinighani and Théorêt (1976) suggest that memory search refers to “the scanning of the organization’s existing memory, human or paper”. If this is the case, it makes sense to ensure that facilities are put into place to assist users to access the institutions’ memory bank (Nisbett and Ross, 1980).

4.6. Affective aspects of an intranet

It is pertinent to mention, that aesthetic issues as well as advanced technical utilities alone do not equate a successful intranet portal. There is growing interest in the emotional responses which web sites illicit. These responses range from positive to negative responses, and include user frustration. Thus, the revamping of the InnerWeb should take into consideration some of these aspects in order to design an ultimate interface which will induce more positive emotions than negative ones (Reece, Rogers and Sharp, 2002).

4.7. Conclusion on Web content Management

It is worthwhile investigating the possibilities and limitations of web content management systems as opposed to traditional document management systems. A web content management system automates the creation, revision, publishing, presentation and automatic archiving of web content. There are various Web content management systems on the market but the basic functionality of most of them are that users can publish from anywhere, without the need for HTML coding or FTP (file transfer protocol). Changes made are real time. A further advantage is that readers can subscribe to channels which interest them. As stated by Molepo (2003), “Without effective content management there can be no intranet”.

The next section will discuss information architecture and the relationship between controlled vocabulary and intranets.

4.8. Information architecture

Whilst there are a variety of definitions for information architecture, there is common understanding that the aim is to try to create a unified, consistent user navigational and information seeking and retrieving experience (Krug 2000). Information architecture is concerned with how information on a site is organized and how the users interact with it. There is no point in having a database full of “valuable” resources if users cannot access some of that information. Some have even argued that 80% of user needs are fulfilled by 20% of intranet content. Van Brakel (2003a) stresses that, “...the user experience is the most important part of any information application design”.

Davenport and Prusak (1997) offer this definition:

"Information architecture, in the broadest sense, is simply a set of aids that match information needs with information resources. A well-implemented architectural design structures information in an organization through specific formats, categories, and relationships."

The concept information architecture can be broadly divided into two main categories. The first category, commonly referred to as “top down information architecture” is mainly concerned with an institution and its members. The focal point would be on users and their information needs. The second information architecture approach, commonly referred to as “bottom up” is mainly concerned with establishing logical relationships between concepts, documents and other types of media resources. These two types of information architecture work in synchrony in the development of an institution’s information architecture. In this report the primary focus is on the “top down” approach to information architecture.

In general, the concept “information architecture” focuses on the following six components: (1) Information usage patterns, (2) Information access points, (3) Taxonomy, (4) Administration structure, (5) Information flow and (6) Standards and guidelines (Head 2000, Instone 2000). Each of these concepts provides a building block for providing an effective information structure, which

can easily be understood and used by the end-users. Fig. 12 illustrates an overview of how each of these components fit into the bigger picture. A brief discussion on how the concepts fit into the big picture of information architecture is provided in the following paragraphs.

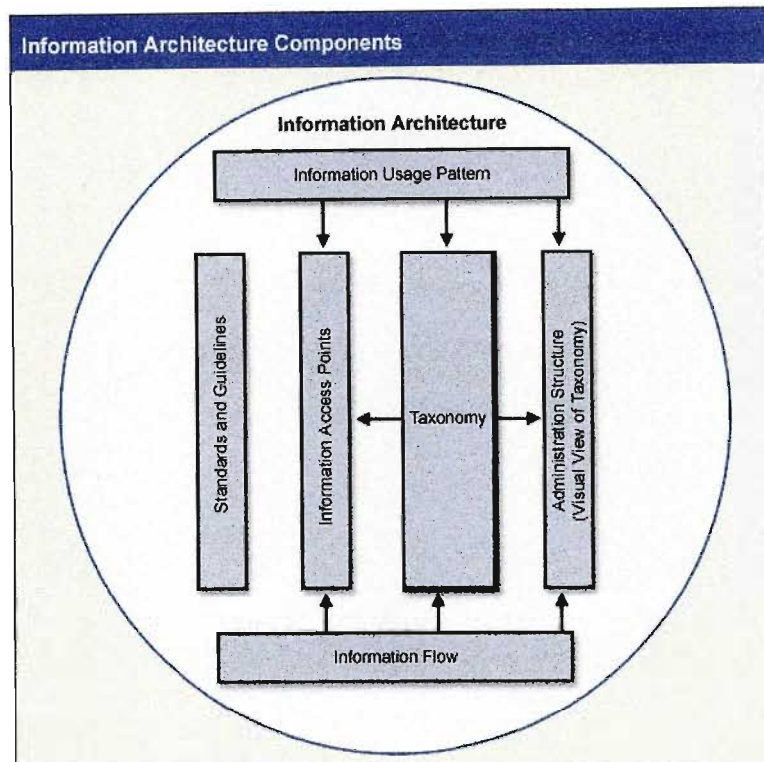


Figure 12: Information Architecture illustrated by Head, 2002.

It is important to first identify typical user patterns on the intranet. The assumption is that the diverse user groups have different information needs. For this reason, it is important to use the identified usage patterns for purposes of continuously improving the intranet. One way of achieving this is through the use of web usage software or by asking the individuals themselves. At the University of Natal, because of the absence of web usage statistics, the first part of this study, attempted to gain an understanding of the web usage patterns via an online survey. It is necessary at a later phase of the project to conduct dedicated in-depth user profiles as suggested by Detlor (2000) and Choo *et al.* (2002). These authors suggest in-depth ethnographic study carried out in the environments where users work from in order to have a clear understanding of the type of problems they experience as well as identify their information seeking behaviour.

Information access points are the channels which users can use to access information and perform any function they wish. This includes menus, site maps, search functions, drop down menus, directory links of categories and news flashes. It is important to map out these information access points in order to design an interface, which can cater for different user needs. For the purpose of this study, preference for information access points will be established via formative evaluation of the interface prototype.

4.8.1. Taxonomy

The core of information architecture is the information taxonomy that forms a link between all the other five architecture components mentioned earlier (Head, 2002). Taxonomy incorporates the view as well as the structure of the architecture. The view involves the front-end of the intranet whilst the structure involves the set-up of the databases where information is stored. Taxonomy is the creation of structure and labels (name) to assist in the retrieval of information.

The administration component of the information architecture considers how owners of information maintain and use taxonomy categories which they intend incorporating into the web content management system. This component includes the use of metadata. Some have argued that in an institution of higher education, most academics will not have the time and patience of incorporating metadata into the web content they own. For this reason other authors have reported hiring staff such as metadata librarians for this purpose. However, the researcher that with any new system, there could be resistance, but with time, people will come to accept the "new way" of doing things. Thus, all web content providers should be encouraged to make use of the administrative structure of the information architecture. An alternative would be to use intelligent agents suggested by Stenmark (2002a) which will relieve content providers of the task of providing meta-data manually.

Standards and guidelines provide a framework from which users and publishers can operate. Standards should be set by all the relevant stakeholders for the benefit of the institutions' goals as well as to benefit the users. Standards should be set for the benefit of all concerned and not to hinder creativity of all users.

Information flow is concerned with ensuring a smooth information flow within the institution. The researcher believes that this component incorporates the other five components mentioned including the hardware and technical aspects that would be necessary to enable seamless flow of information.

The main emphasis on Information Architecture and its contribution to intranets, is the use of a common vocabulary, which is meaningful to the users. It is acknowledged that the use of abstract language, which is not familiar to the users, will only confuse and frustrate users. Therefore, the importance of using language, terms and even acronyms, which are used by members of the institution, would be most appropriate in creating an intuitive intranet (Instone, 2000 and Wodtke, 2002).

At the heart of information architecture is the critical issue of the use of controlled vocabulary. Controlled vocabulary enables users to navigate a site using easy to understand labels as well as search for information using vocabulary which is natural to them. This is done by ensuring that all resources on a database are described using common, preferred terms as well as alternative names. Ideally, search results should assist users by displaying similar or related items which users can explore should they wish to do so. This requires the correct mapping of relationships of concepts and variants.

4.8.2. Navigation and Labelling Schema

Navigation refers to how users move from one space to the next on a particular site. This could include the use of drop-down menus, hyper linked text, graphics such as image maps and icons. Just like signposts next to a road, the navigation features on the site should be clearly labelled to guide users on how to navigate the site. For this reason, each navigation object should be clearly labelled to enable users to instantly identify the purpose of each site navigation object.

However, labelling is not about designers giving their own labels to the site objects. Words and phrases (vocabulary) used for labels should be meaningful and unambiguous to site users. Some of the basic principles are that the labelling schema for intranets should be internally focused and should be relevant to an institution's culture and common internal vocabulary. Thus, an intranet's labelling schema has a narrower focus when compared to the labelling schema of the Internet. Rosenfeld and Morville (2002) suggest that labels should be drawn from a controlled consistent vocabulary. Labels should be as intuitive as possible to reflect the user's needs, not the institution's organogram.

This implies that the information taxonomy should reflect the core function of an institution at a glance. The main activities of an organisation should be clearly visible from the onset. For this reason, the presentation and layout of an intranet interface should be carefully planned. The interface should be highly focused and "to the point." Portal technologies are especially useful in providing information from different sources on one single page. Some of the ways of soliciting the appropriate vocabulary is by involving users in a menu labelling exercise using card sorting, which was used for this project.

On the other hand, it is pertinent to note that despite the reported advantages of portal technologies, intranet portals are only as good as the resources which are contained in the databases. Thus, the onus still remains on web content providers to ensure that the resources in their area of control are current and valid. Extensive literature has emphasised the importance of "trust" in the information made available. This can be achieved by the use of metadata to describe what is available in the databases as well as alerting web content owners when web content needs revision. Although the use of meta-data suggests good practice, in theory, literature indicates that web content publishers do not use metadata schemas effectively, thus there is still a grey shadow on this issue. Keary (2000) warns that 'the weakest links in electronic document management are indexing, searching and retrieving'. Nielsen (2003)

suggests that the real challenge in portals lies in meaningful meta-data being used by intranet contributors. The use of metadata will be discussed in the next section.

4.8.3. Metadata

Metadata are often referred to as "data about data". In other words, metadata are data, which describe the resources, which are available in a database. Their purpose is to facilitate the retrieval of requested data with precision. There are a lot of definitions, which define metadata. One of the definitions is:

Metadata is structured data, which describes the characteristics of a resource. It shares many similar characteristics to the cataloguing that takes place in libraries, museums and archives (Chris Taylor, Queensland University, in Warner, 2002).

A U.S. Geographical Survey (USGS) (2003) suggest that "... in essence, metadata answer who, what, when, where, why, and how about every facet of the data that are being documented". There are various types of metadata, which are guided by different standards. Some of these standards include the Dublin Core Metadata, Warwick Frame work and the more recent Open Language Archives Community (OLAC metadata set). Wodtke (2002) suggests that metadata can be categorized as either descriptive, administrative, preservation or technical metadata.

Descriptive metadata standards emphasizes the nature of the resource being described. They address the questions of what is it? What does it look/feel/smell like? What categories could it fit into? Whereas administrative and preservation metadata address questions on how an item is to be handled.

The Dublin Core Metadata standard is commonly used to describe a wide range of information resources whereas other types of metadata standards have been developed to identify only one type of data. An example of a standard used to identify geospatial resources is that of the US Federal Geographic Data Committee (FGDC). However with the advent of XML, a platform independent programming language, the Resource Descriptive Framework (RDF) (which makes use of some of the Dublin Core Metadata fields) is increasingly being utilized for interoperability of metadata on the web. The Dublin Core Metadata standard consists of the 15 optional

elements (also referred to as qualifiers). These 15 elements can be classified according to their "TYPE" and "SCHEME" Cathro (1997). The "type and scheme" determine whether it is imperative to have the description to aid the discovery of information. These 15 elements include fields for Title, Creator (or Author) Subject (or Keywords), Description, Publisher, Contributors, Data, Resource Type amongst others.

Search precision is achieved through the use of metadata descriptors whilst searching for information. For example, if a person is looking for information on "desks" instead of the search engine retrieving all the documents which mention the term "desks", users could retrieve better results if they specify the author under the "author" field search form.

Search engines usually look through the metadata tags to find information. However, some search engines fail to look in either the "description" tag or the "keyword tag" of the metadata, thus limiting the results and relevance of the search findings. A limitation of metadata is that it is time consuming because ideally every item found in a database should have corresponding metadata and in most cases, someone has to capture the descriptors. In large institutions, it would be necessary to have specific metadata repositories, which will record and manage all the different metadata vocabularies.

4.9. Semantic Web

A new type of web is slowly emerging which is meant to counteract some of the limitations of traditional metadata such as Dublin Core. This web known as semantic web, enables the seamless interoperability of computerized devices from different databases. Berners-Lee (2000), the inventor of the World Wide Web, developed a model describing the semantic web, commonly referred to as a layered cake (Fig. 13). Although the semantic web is still in its infancy, it uses unique identifiers known as Uniform Resource Identifiers (URI), to identify every resource which is available in a database. Human intervention becomes unnecessary as computers are able to identify resources using semantic meaning.

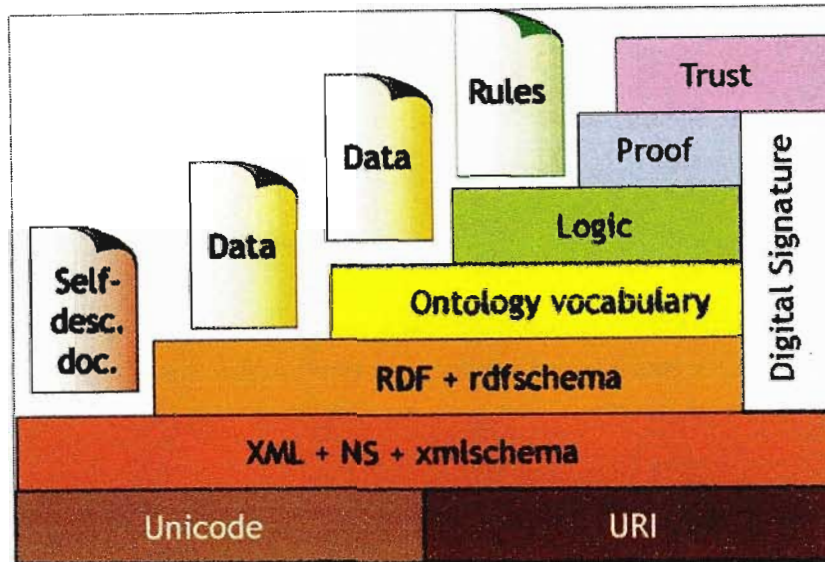


Figure 13: A semantic Web structure provided by Berners-Lee (2000) to illustrate the main concepts of the architecture of the semantic web.

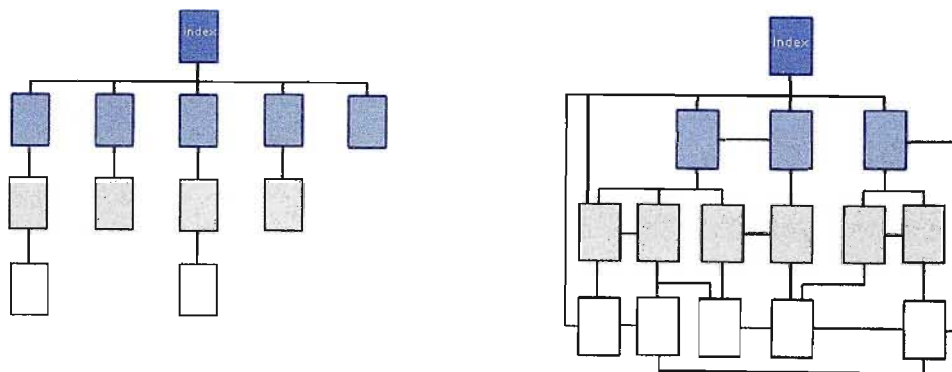
4.10. Difference between search engines and directories

The difference between directories and search engines is that directories are created by site administrators who review the web content, which is submitted to them, and make decisions on how to classify and categorise the information. On the other hand, a search engines use artificial search agents known as spiders to crawl through the database in order to find requested information. What makes search engines different from directories is that search engines use a specified algorithm to index and rank the search results Thorpe (2002). The algorithm varies from search engine to search engine, thus the difference of results when a user uses two different search engines. This means that a powerful search engine would have to be used for the proposed university intranet portal to improve the search precision. One way of improving the search precision is through the use of metadata.

4.11. Theories on site structure

Extensive research has been carried out on the effectiveness of site structures. Some of the research has been centred on the most effective navigation structure of a site. The topics include the use of breadcrumbs on a site as well as the differences between hierarchical, sequential and website structures. Breadcrumbs are navigational "sign posts" which inform users where they are on a site. They act as a path which users can follow to find their way back and forth (as in the children's fable of Hansel and Gretel) (Bowler, Ng and Schwartz, 2001; Maldonado and Resnick, 2002).

Hierarchical structures are characterised by large volumes of organised data which are made available on a single home page from where users can browse a tree structure to see what is available. On the other hand, a web-structured site provides links to other pages and does not provide a prescribed access point (Fig. 14).



Linear structured site

web structured site

Figure 14: Linear and web structured websites by Chismark, Rodgers and Scott (2003).

Another type of site structure is sequential in nature and is more applicable to an environment, which provides instructions to users, i.e. one option unfolds to another option etc (Chismark *et al.*, 2003). It is imperative to take into consideration all these options when designing an intranet portal for the University of Natal. Thus, the importance of adopting a user centric approach to design in order to establish user preference on the site structure.

4.12. Lessons from other institutions

Some of the organisations who have revamped their intranets have reported having a dilemma of adopting to the most effective schemes for classifying information which is available on their intranets. One such organization, Kosmoi.com (2003) reported that they had initially thought of using the Dewey Decimal Classification (DDC) system for their intranets but reported that they found the system “too inflexible” for an intranet audience. DDC was designed primarily to classify and categorise books according to their subject matter as well as their actual physical location where they could be found and perused by a prospective reader (Sales and Squire 2002). Kosmoi.com (2003) also explored using hierarchical schemes such as the one used for Yahoo but they eventually chose a hybrid schema. They did not however, elaborate on the challenges they experienced with a hierarchical structure.

Schutte (2003) of Nampak Research and Development (RSA) also documented the techniques they used for developing the Nampak database intranet portal. Although Schutte (2003) does not provide the methodology used in designing the intranet portal for Nampak, their paper gives insight into the importance of web content management which makes use of the Programmed Retrievable Objects (PRO) synonymous with semantic webs.

Van Brakel (2003b) informs us that, *“The requirements for a good campus or academic portal (are) ease of use, maintainability, potential for personalisation, ease of customisation, ease of integration with existing services, platform independence, performance, expandability, conformity to open standards, favourability of pricing and licensing terms, and viability.”* Although van Brakel does not specify whether these requirements are targeted for intranet portals or main site portals, his requirements are valid for both systems.

4.13. Conclusion on Information Architecture and databases

One cannot overemphasize the importance of using common vocabulary for websites. The use of powerful search engines will not yield desired results if the vocabulary used by publishers is unfamiliar to users. Conformance to metadata standards increases the predictability of the search results. Hiring the services of full time metadata librarians or simply having workshops to inform users of the importance of metadata could help. As with any new system there is always resistance to its adoption. There are definitely mechanisms which could be put into place to overcome this resistance.

A new field of practice seems to be emerging which is that portal technology instead of conventional intranets is a better way of meeting the needs of the academic institutions and users of their systems. The introduction of portal technologies requires more than information technology to ensure their success. It is imperative to explore and use the most appropriate information architecture, content management and information technology systems. However, having these technological resources only addresses a part of the challenge. The main issue, which should be clearly understood, is the socio-cultural aspect of the system. As mentioned earlier, human needs and not technological forces should be the driving force of the project. Thus, controlled vocabulary, which is appropriate for a community of practice, should be one of the main issues which could make or break a site. The process of designing the controlled vocabulary involves a clear articulation of what we want the controlled vocabulary to do, the terms used to describe the content as well as a match between what is written and what users perceive. It must be very clear to decide whether the controlled vocabulary is going to be used for navigation purposes, for searching or both (Fast, Leise and Steckel, 2002).

The primary aim of this project is to find an appropriate controlled vocabulary for the University of Natal's intranet portal. The next section will discuss the methodology used for this study to identify controlled vocabulary to improve the usability of the main intranet interface.

Chapter 5 - Methodology

5.1. Introduction

This section discusses the procedure and materials used in this study to identify an information taxonomy for the proposed intranet. Data collection was done in three phases for the purpose of: (1) needs analysis; (2) early prototype development; and (3) evaluation and validating solutions. The main activities were: (1) prioritizing user requirements by identifying the “must haves” and eliminating some intranet components (2) analysing suggested intranet item categories and labels followed by designing a paper-based wire frame intranet prototype; and (3) validating the wire frame intranet prototype. Data-gathering methods which include group card sorting, on-line card sorting, semi-structured interviews, prototype walkthrough and category membership expectation test will be discussed in this section. An overview of van den Akker’s (1999) in Reeves (2000a) development research process which guided this study, is discussed in the ‘Discussion of Methodology’ section. The actual proceedings and observations (field study) of the group sorting workshop for this study will be described under the findings section of this report.

5.2. RESEARCH DESIGN

5.2.1. Phase 1

AIM: Needs Analysis (identify InnerWeb users’ perceptions, attitudes and expectations)

This phase of the study was carried out in two stages which included an on-line survey and interviews with key stakeholders. A web-based database driven online survey was conducted in 2002. An invitation, which included an overview of the study, was distributed via the University on-line notice system asking all University students and staff from the Medical School, Pietermaritzburg, Durban and Edgewood campuses, to participate. On-line open-ended questions which were made available on the website were used to solicit user expectations, likes and dislikes of the current and future intranet (see Addendum 1).

The QSR NVIVO version 2.0 qualitative software package was used to analyse the responses. Data analysis was conducted using Glaser and Strauss's (1967) constant comparative method. This method of analysis involves the identification and coding of themes, patterns and number of incidents from the responses. After the initial data analysis, interviews with stakeholders, from all campuses, were held to verify the results from the on-line survey. From these two studies, a wish list of 93 requirements was drawn up. These items are listed in the results section (Chapter 7) of this report (Table 4).


5.2.2. Phase 2

AIM: Early development (prioritise requirements and establish preferred categories and labels)


This part of the study was carried out in 3 stages which included a group sorting workshop, on-line sorting and development of a paper-based wire frame prototype. These activities will be discussed in this section. Advantages and limitations of these data collection methods will be discussed at the end of this section.

An invitation was extended, via the University on-line notice system (Fig. 15), to all computer users from the Medical School, Pietermaritzburg, Durban and Edgewood campuses to participate in card sorting workshops, which were scheduled at each of these geographically dispersed campuses.

There was a low response rate from Pietermaritzburg, Medical School and Edgewood campuses, thus one workshop was held in Durban only. The few willing participants from these three campuses were given the option of joining the Durban workshop but all of them opted to participate in the on-line sorting exercise instead of traveling to Durban.



University of Natal Intranet User-Needs Specification



Information Technology Division

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Fax: +27-(0)31-260-2125 (Durban)
 Email: <mailto:202511713@nu.ac.za>

Currently, the University has no dedicated intranet, but offers such functionality with our InnerWeb that has served many purposes over the past years. However, many believe that we need to design, develop and deploy an Intranet that will better serve our needs. We are running workshops to establish what you as a university member, would like to see on the intranet and how you want the content to be arranged on the site. At the workshop, you will be asked to rate, categorise and label items for the website content. Your input will help in designing a site which is as intuitive as possible, based on the university community needs. Please book yourself on one of the workshops listed below. If you are unable to attend, but wish to participate in the exercise, please contact [Saru Mahomva](#) to make alternative arrangements.

First name

Department

Tel no

Surname

Faculty

E-mail

What is your primary university function?

Academic staff
 Administrative / Support staff
 Library staff
 Postgraduate student
 Undergraduate student

Your office is situated on the

Durban campus
 Edgewood campus
 Medical School Campus
 Pietermaritzburg campus

Workshop Schedule *(please select a workshop you wish to attend)*

	Venue	Date	Time
<input type="radio"/>	Medical School	Seminar Room 2	29 May 2003 12:30 pm - 13:45pm
<input type="radio"/>	Edgewood campus	Staff Room	27 May 2003 12:30 pm - 13:45pm
<input type="radio"/>	Pietermaritzburg campus	Colin Webb Hall	22 May 2003 12:30 pm - 13:45pm
<input type="radio"/>	Durban Campus	ITD seminar room	20 May 2003 12:30 pm - 13:45pm

Additional comments

Submit

Refreshments will be served

Thank you for participating in this project.
 Centre for Information Technology in Higher Education

Figure 15: Screen capture of invitation to participate in card sorting workshop.

5.2.3. Methods and materials

5.2.3.1. Group card sorting workshop

Each of the 93 requirements or topics, which were identified in the phase 1 of the study (see Chapter 7: Table 4) was printed on a separate orange card with a unique number (see Fig. 16). A rating scale and space for comments, was provided at the back of each card (see Fig. 17). Blank cards of a different colour (white) were provided in case participants needed to add new topics. Other blank cards of a different colour (grey) were also provided for participants to label and briefly describe the identified categories. Different coloured cards help to identify and differentiate category labels from category items and additional items suggested by participants. Rubber bands were used for securing the categorised cards. A participant profile form was distributed at the workshop to establish the participant computer literacy level as well as experience in using an intranet (Addendum 2). Details of the workshop proceedings are provided in the results section (chapter 7) of this report.

Three groups of 4 participants were given similar packs of 93 randomly ordered cards and asked to discuss, rate and categorise each card (open card sort). Figure 18 depicts one of the participants sorting cards. Once all cards were categorised, groups were asked to provide an appropriate label and a brief description for each of the categories. The groups were asked to present their findings to the rest of the workshop participants on completion of the sorting exercise. Results gathered from the group card-sorting workshop were analysed as described in the data analysis section. Items which were deemed as important were carried forward to the next phase of the study, whilst items which were rated least important were eliminated. Some items were amalgamated.

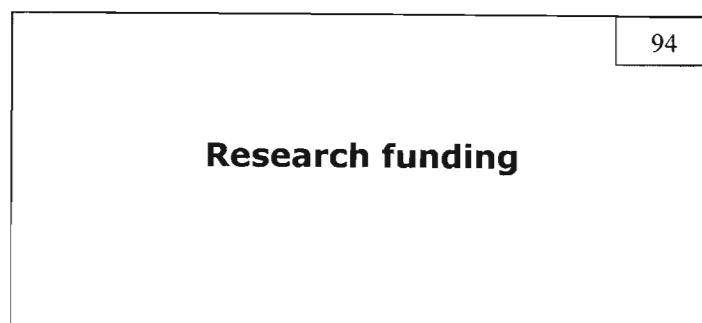


Figure 16: An example of the front of each card.

<p>Importance of item rating scale from 1 - 3 (3 being most important) 1 2 3</p> <p>Group decision consensus ___ out of ___ group members</p> <p>Confidence level of decision _____ (% indicates level of confidence with group decision, 50% being average)</p> <p>Additional comments</p>
--

Figure 17: An example of the back of each card.



Figure 18: A participant sorting cards for this project.

5.2.3.2. On-line sorting

The items identified in the group sorting workshop were entered into an IBM EZSort database using the WebSort card sorting interface. Brighton Young University in the United States, who developed WebSort, hosted the database for this study. The researcher designed a website (Fig. 19) with a link to WebSort and an invitation asking University members to participate, was extended via the University notice system. This study is available at <http://www.nu.ac.za/ited/websort/>. On clicking on the 'start sorting' link, a user was directed to a WebSort screen where instructions on

how to sort the items were provided (Fig. 20). As depicted in Figure 21, on-line web sorting enables users to create and name groups. Users may then drag and drop items into what they perceive to be an appropriate category. As soon as a participant completes a sort exercise, results are automatically e-mailed to the system administrator, who then uses IBM EZCalc to open and analyse a participant's sort record.

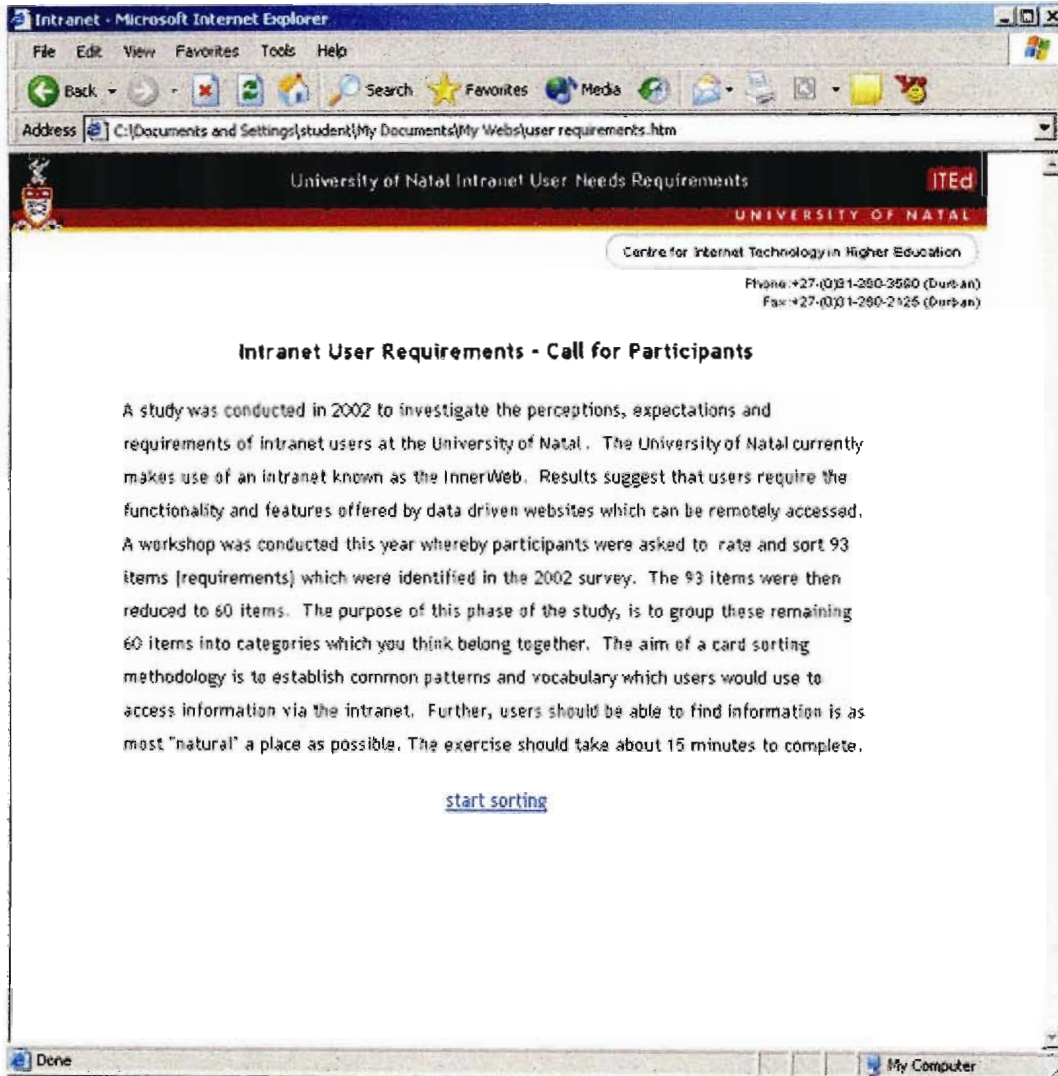


Figure 19: A screen capture of the call for participants.

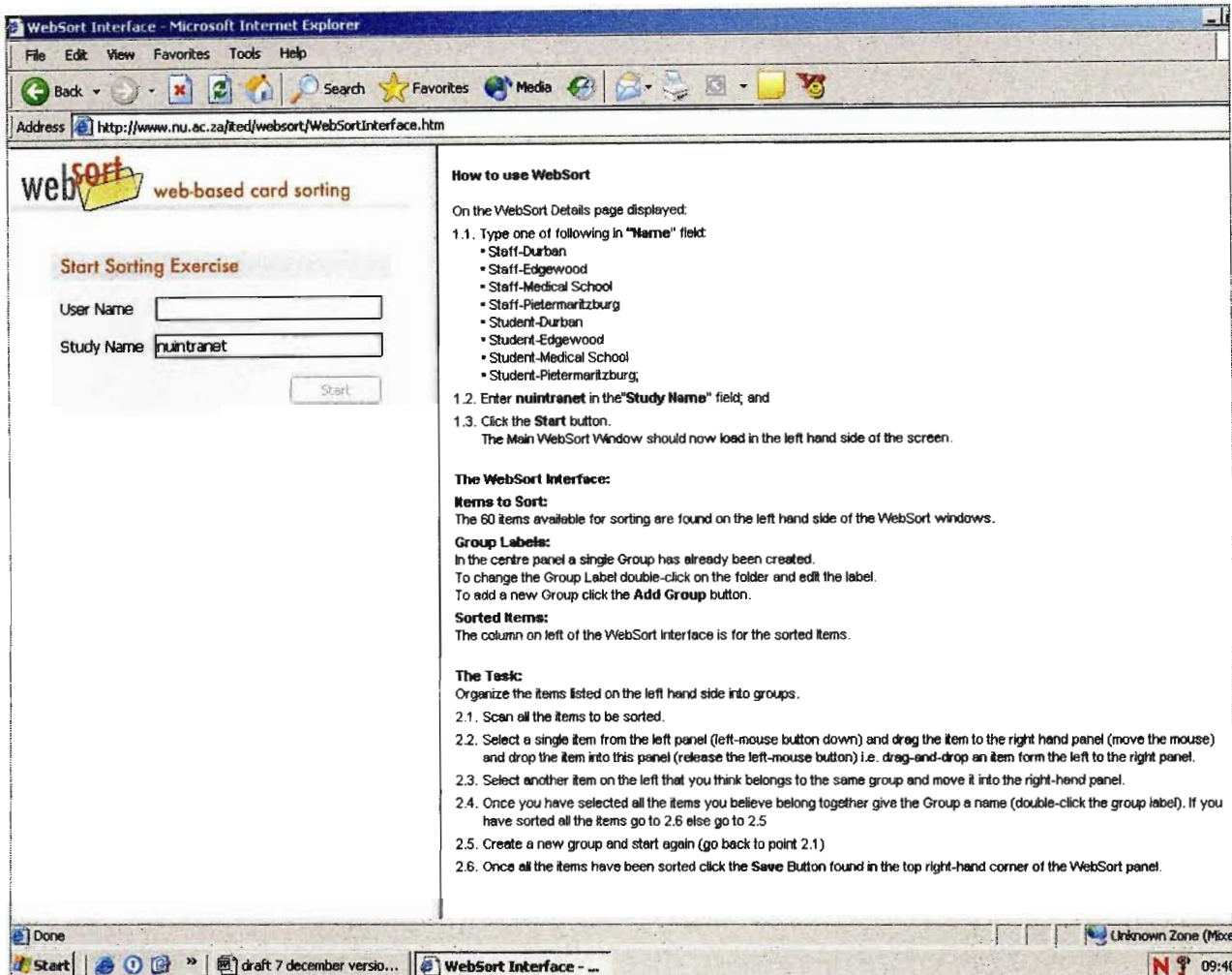


Figure 20: Screen capture of instructions, on how to sort cards.

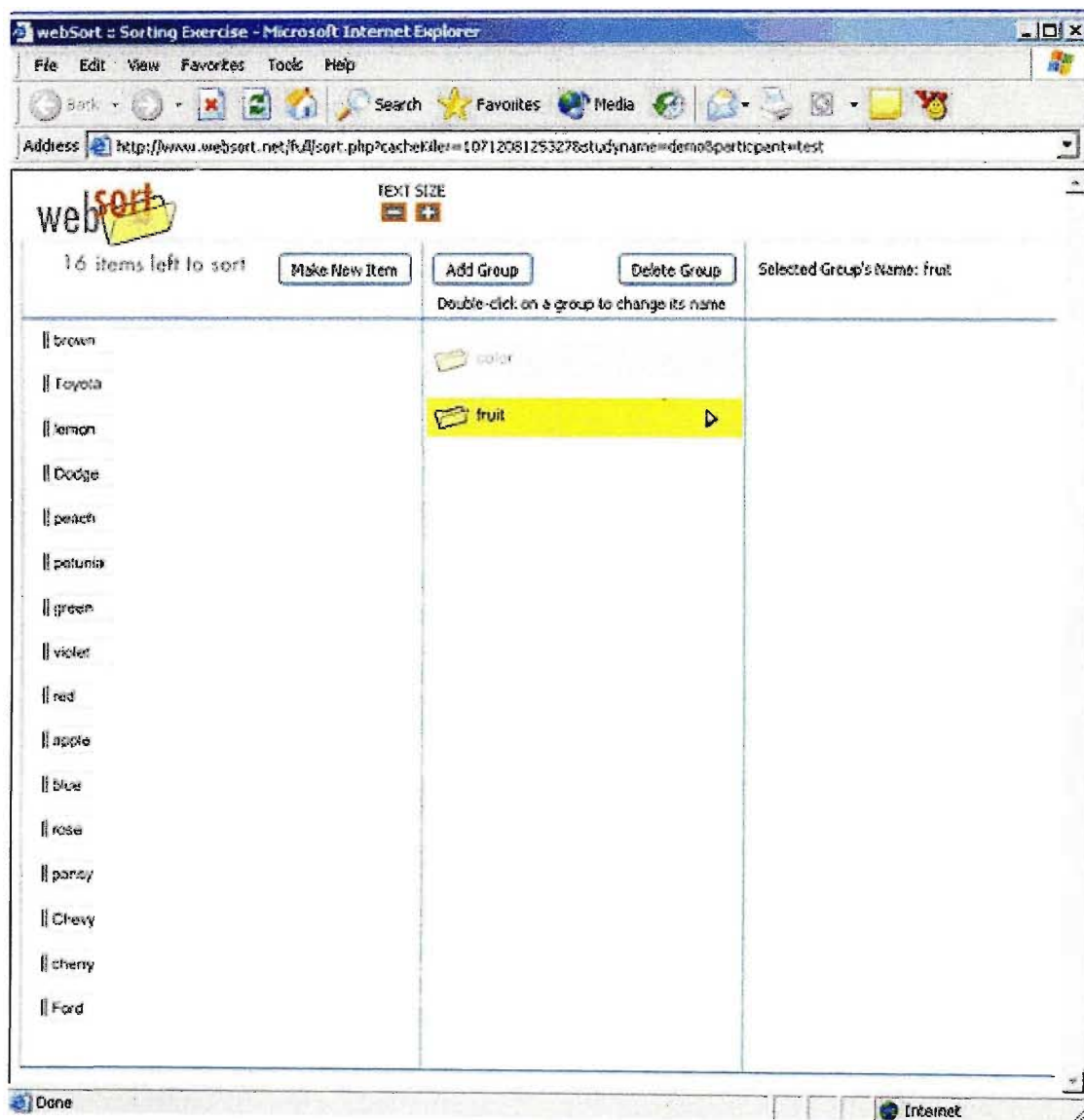


Figure 21: Screen capture of an exercise using WebSort.

5.2.3.3. How the wire frame prototype was developed

In order to develop the first paper-based wire frame prototype, it was necessary to consolidate the suggested groupings of the dendrogram, with the suggestions made by the sorting workshop participants. Suggestions made by the workshop participants provided indications on which cards to merge, which ones to eliminate as well as new cards to add. These suggestions are discussed in the results section (chapter 7) of this report. The prototype was made by analysing the comments made at the card sorting workshop and consolidating these comments with the on-line card sort results displayed in a dendrogram. For example, participants suggested that items which were related to research should all fall under one category called 'research' instead of listing the research items separately. On analysing the sub-categories on the dendrogram, the same research items were indeed grouped together. Thus in designing the paper-based prototype, only the label 'research' was used.

5.2.4. Phase 3

AIM: Evaluation and testing of solutions (validating of suggested categories and labels)

The focus of this phase of the study was to validate the proposed paper-based wireframe prototype as well as to solicit input from key stakeholders. This was done by using semi-structured interviews; paper prototype "talk-walk-through" and category membership expectation tests. Advantages and limitations of these data collection methods will be discussed at the end of this section.

5.2.4.1. Interviews with key stakeholders and prototype walk-throughs

After the first wire frame paper-based prototype was developed, interviews with 12 key stakeholders were scheduled in order to validate the prototype. These key stakeholders represented faculties, support functions including Human Resources, Library, University management, Information Technology as well as the Students Representative Council.

Semi-structured interviews were used to gain an overview of the experiences, suggestions, attitude and general expectations of the key-stakeholders (Addendum 3). The stakeholders were then presented with the paper-based prototype. They were asked to talk-out-loud as they perused the paper-based prototype. This 'talk-walk-through' method (also referred to as "think-out-loud") is suggested by Nielsen (1992b and 1994). Participants were asked to add, delete or move items as they saw fit.

Participants were not only asked to look at the category names but also to evaluate the integrity of the category items. The purpose was to establish the similarity and overlap of the items within a category as well as how well the items represented their parent (main category).

5.2.4.2. Testing intuitiveness of suggested categories

After all the key stakeholders had had an opportunity to add, delete or move items as they saw fit, a revised paper-based prototype was drawn up. A category membership expectation test (Addendum 4) as suggested by Frederickson-Mele, Levi and Conrad (2002) was conducted using 7 intranet users to test the intuitiveness of the suggested category labels presented in the paper-based prototype. Purposive convenient sampling approach was used to recruit 2 students, 2 academic staff members and 3 administrative / support staff members for this exercise. Category labels were printed in a table form and participants were asked to write a brief explanation of the type of information which they expect to find under the suggested categories (Addendum 4). The purpose was to establish whether these category labels were intuitive. Thus participants were asked not to spend too much time thinking about their response but to write the first ideas which came into their minds. The results of this study will be discussed in the results section (Chapter 7).

5.2.5. Phase 4

AIM: Reflections on the design process for this study

Reflections on the possibilities and limitations of the methodology and design process are provided in the following paragraphs. The purpose is to give an overview of the experiences at the University of Natal in the implementation of this methodology.

5.3. Discussion on Methodology

Following the recommendation by Stokes (1997) on “use-inspired” research, most of the activities for this study were guided by a need to understand the “use and purpose” of the proposed intranet as perceived by prospective users. The study followed the development research process suggested by Van den Akker (1999) in Reeves (2000a) (see Fig. 22) which was discussed in the theoretical framework of this report. Van den Akker’s development approach is an iterative development cycle from which results from one phase provide leads for the following phase. Thus, this study took cognisance of Reeves and Reeves(1997) eclectic mixed methods paradigm of inquiry which suggests that development research should take advantage of strengths from hybrid methods of inquiry for the purpose of achieving a more realistic and holistic picture of the phenomenon under study.

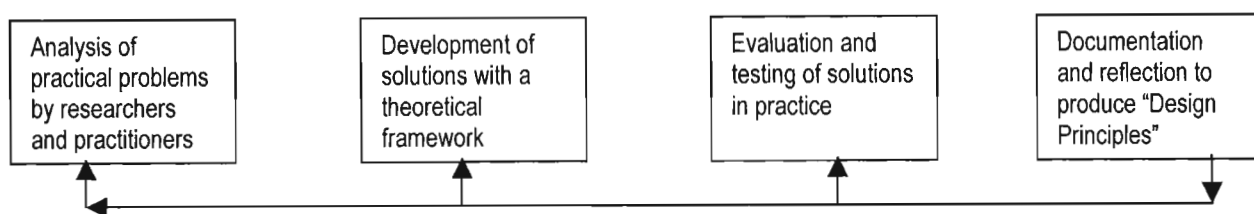


Figure 22: Van den Akker’s (1999) empirical and development approaches to research in learning technologies cited in Reeves and Hedberg 2003.

Qualitative research methods are particularly useful for both exploratory and interpretive inquiry in an authentic setting. They provide insight into the unique experiences and subjective opinions of participants whilst quantitative methods offer means of measuring and in some cases, triangulating qualitative observations. Further, qualitative methods could be useful for validating quantitative data. Some of the known limitations of qualitative research are that reproducibility can be very difficult due to the uniqueness of the context under study (Babbie, 2000). The research process for this study is depicted in Figure 23. The rest of this section will discuss the possibilities and limitations of the data collection methods used.

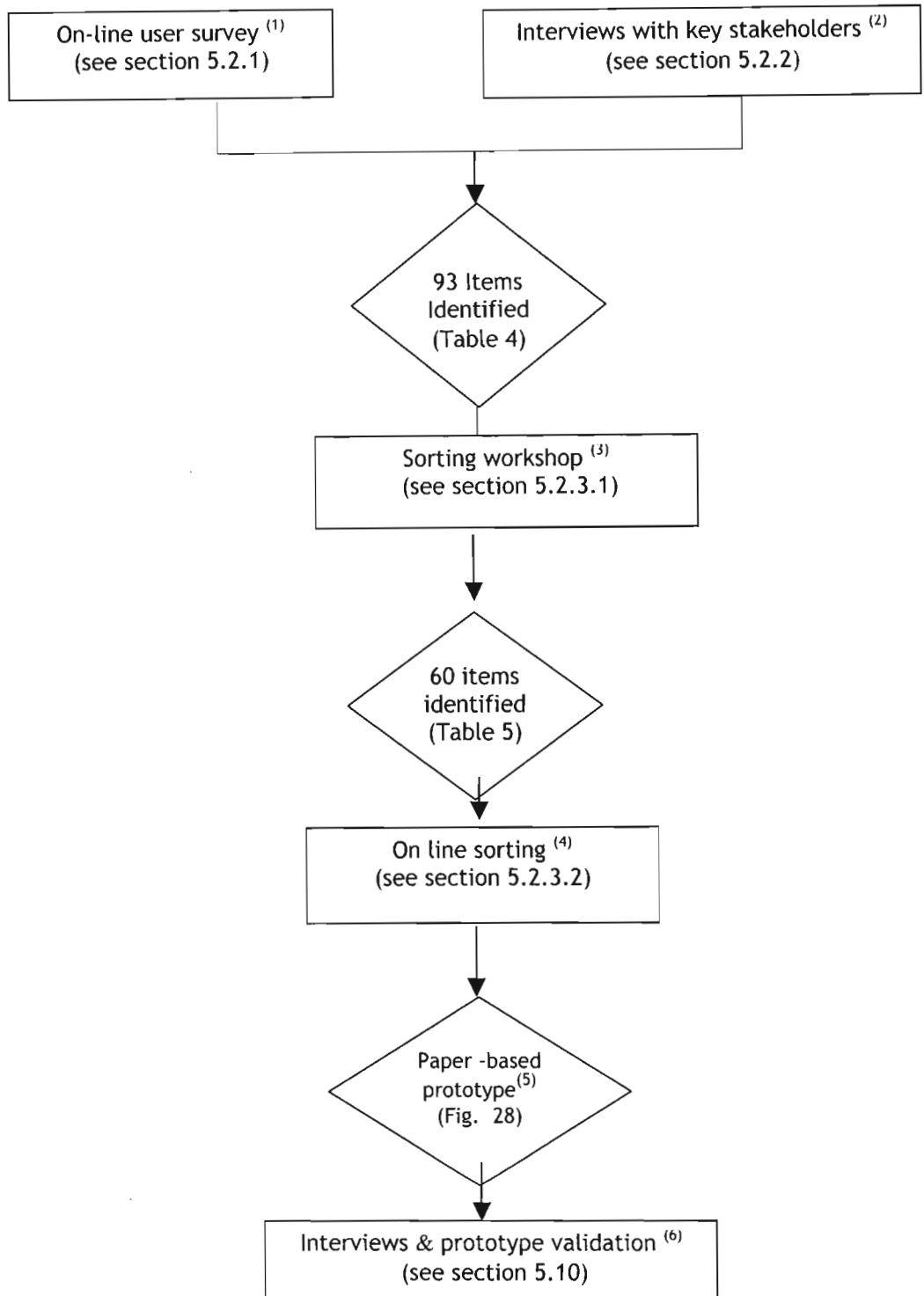


Figure 23: The research process of this study.

5.3.1. Possibilities and limitation of card sorting

Card sorting, which is (depicted as stage 3 in Fig. 23) is a discovery technique used to gain insight into how users organise and think about the information available on a web site. Open card sorting, requires users to group items and create their own category names (labels) whereas "closed card sort" has predetermined category names, under which users may group items. It is reported that results from open card sort are more difficult to analyse than closed card sort though they provide better insight because users are given total control of categorising and creating labels. Nielsen (1993) and Fucella and Pizzolato (1998) advocate that card sorting maximises the probability of users finding what they are looking for on a website. Item categories and labels suggested by users may be incorporated into a site's structure, menu design and site map. The National Cancer Institute (2002) suggests, "...one can gather many realistic scenarios and learn what makes a Website work or not work for them". The disadvantage of group card sorting is that it is time consuming. Although electronic card sorting is an alternative, it does not give the researcher the added advantage of face-to face interaction with the participants and it is time consuming (D'Hertefelt, 1999).

5.3.2. The researcher's experience

The actual preparation of the card sort is very time consuming as it involved typing and printing of cards as well as the running of a pilot study in order to establish the estimated duration of the card sort. It is interesting to note that the duration of the pilot study, using a small group of three participants, was 1 hour, whereas for the actual exercise the duration was 2 hours excluding the initial overview discussion. The duration of the card sort workshop at the University of Natal could have been shortened by scheduling 3 workshops at which only 30 cards could have been presented per session. Ninety three cards proved to be a "bit too much" for participants to remain motivated to continue with the sort. Whilst card sorting has been extensively used for a variety of purposes in social science research, care has to be taken to ensure that the environment is conducive to active participation. The facilitator has to be highly observant of the group dynamics as other participants might not have a fair chance of participating. Debating cards could lead to unreliable results as some participants can easily

impose their suggestions on the group. For this reason, others have reported using individual sorting instead of group sorting. On the whole, group card sorting as well as on-line card sorting have their pros and cons (Chambers, 2002).

5.3.2.1. Interviews and prototype walk-throughs

The purpose of the semi-structured interviews was to understand any concerns and suggestions which could have an impact on the proposed intranet. Another reason was to expand on the findings of the card sorting workshop by using interviews to establish whether participants share any common experiences. Interviews provide an opportunity of gaining in-depth knowledge via the discovery of complex information which was previously unknown to a researcher. Probing questions during an interview provide an opportunity of clarifying issues raised during the interview process. Another reason for the interviews was to ask the stakeholders to validate the proposed vocabulary presented on the paper-based prototype. A 'talk-walk-through' (also known as "think-out loud") as described by Nielsen (1994a) was conducted. This involved listening and writing down participants' comments as they perused the suggested categories and vocabulary presented to them on a paper-based prototype.

5.3.2.2. Paper-based prototype

Paper-based prototypes (also referred to as horizontal prototypes) are touted by Nielsen (1993) as a quick method of displaying partial features of a product. They are used for conducting perception tests and reducing guess work at an early development stage. The idea is to visualise an artefact at an early stage of the design process, so users can have an idea of the concept even if it is only sketched on paper using a pen or pencil (Nielsen, 1993). Others have reported that when they used flowcharts to present their findings to their users, their users could not easily conceptualise how the labels would fit into the "bigger picture." For this purpose, we presented our prototype using a Yahoo-style layout. In order to avoid any distraction from our main focus, no graphics or other aesthetic enhancers were added to this paper prototype to ensure that users focused on the vocabulary used. This suggestion of separating visual from content is stressed by Fuccella and Pizzolato (1999). A vertical prototype on the other hand, is used to demonstrate

functional features for users to test. Although users will not always agree on all issues, important trends and insights can be gained from involving users in the evaluation of paper-based prototypes.

5.3.3. Triangulation

For validation and triangulation purposes it was necessary to involve different sets of participants to evaluate and validate results derived from different groups of participants. Eclectic-mixed method approach to design provides two types of triangulation. The first one triangulates the development process and the second one triangulates the actual results of the study. Triangulation of results gathered from card sorting, was done by using different methods, which are; interviews, prototype walk-through and a category membership expectation test.

5.4. Conclusion of Methodology

Card sorting for web design involves three main stages which are: (1) Identifying a list of items to be sorted via an appropriate needs analysis method; (2) Asking participants to sort and label the items using an appropriate scale and (3) Analysing and interpreting the data. As described in this section, results from one inquiry exercise informed the next stage. In this instance, results from (i) group card sorting produced data which was used for (ii) on-line sorting, followed by (iii) the development of a paper-based blue print (iv) semi structured interviews and (vi) a paper-based prototype "talk-out-loud" and category membership expectation tests were used to validate findings.

Figure 23 maps a flow chart for the research process for this study. An online user survey (1) was conducted at the University of Natal to establish InnerWeb users' perceptions, attitudes, expectations and needs. For triangulation purposes, interviews with key stakeholders (2) were also conducted, following the initial analysis of the identified user requirements. From this study, a "wish-list" of 93 requirements was drawn up. The second phase of the study focused on prioritising, categorising and labelling these requirements for the purpose of establishing a

controlled vocabulary. This was done via a card sorting workshop (3) and online remote sorting (4) of items identified in stage 3. Results from stage 4 were used to develop a paper-based prototype (5). Interviews (6) with key stakeholders as well as prototype walkthroughs and category membership expectation tests were conducted to validate the paper prototype.

Chapter 6 - Data Analysis

6.1. Introduction

Data analysis was done in 4 stages which involved: (1) Analysing data from the card sort workshop; (2) Analysing data from the on-line card sort; (3) Analysing interview transcripts and prototype validation and (4) Analysing category membership expectation test results. This section will discuss how data was analysed. The results from each analysis will be discussed in the results section (Chapter 7) of this report.

6.2. Analysing data from the card sorting workshop

Before conducting cluster analysis, items from the sorting workshop, which scored a total less than 7/10 were eliminated. Table 2 is a sample of the spreadsheet used for the calculations. Multi-dimensional scoring was used for calculating each score using Microsoft Excel. For example, if a group failed to achieve 80% consensus for a card, a point was deducted. This means a card either gained or lost a point, based on the rating provided by the participants. The rating dimensions required the participants to: (1) Decide on the importance of each item (on a scale of 1 to 3, 3 being the most important); (2) Indicate the group decision consensus i.e. how many people from each group agreed to the decision; and (3) Each group was asked to indicate their confidence with their decision, as well as provide any additional comments at the back of each card. Literature suggests that 80% of the items should have a consensus of at least 70%. The purpose of eliminating the cards was to ensure that only items which were confidently perceived as important, that is cards which scored above 70%, were used in the next stage of the development process.

The first row of Table 2 reflects the formulae used to calculate the scores. The 'card rating' column reflects the rating score of importance for each card. 'Confidence level' indicates the degree of confidence which the group assigned to their decision. If their degree of confidence was 70% or more, a card would gain a point in the 'confidence point' column. If 70% or more of the group members agreed on the rating for a card, the card would gain a point in the 'consensus point' column. The total score is reflected in the 'Group Totals' column.

Table 2: Sample of the template designed to calculate the results of the card sorting workshop.

	Card rating	Confidence level	Confidence point	Group consensus	Consensus point	Group 1 Totals
e-mail	3	100%	=IF(confidence level<70%,0,1)	=4/4	=IF(group consensus>=70%,1,0)	=card rating score + confidence point + consensus point
on-line learning	3	100%	1	100%	1	5
date of student payouts	3	100%	1	100%	1	5
exam results	3	100%	1	100%	1	5
examination timetable (all courses)	3	100%	1	100%	1	5

6.3. Analysing data from on-line card sort

IBM EZSort⁶ was used for cluster analysis of the remaining items. IBM EZSort comprises two components which are USort and EZCalc. USort is used by the administrator to enter a minimum of 3 and a maximum of 100 topics into the database. Items may also be copied from Excel or Word into USort. EZCalc analysis the card sort data from USort, using a cluster analysis statistical tool to calculate the strength of perceived relationships between cards, based on the frequency the sorted cards appear together in common groups. Similarity points are given each time cards appear together and a distance score is then displayed in the form of either a

⁶ IBM EZSort may be downloaded on http://www-3.ibm.com/easy/eou_ext.nsf/Publish/649.

dendrogram or a cluster matrix. Details of the dendrogram analysis are shown in the results section (Chapter 7) of this report.

It must be mentioned however, that a dendrogram and clustering matrix provide a partial, inconclusive picture. The results from the dendrogram merely give an indication of perceived strength of suggested groupings thus other qualitative usability methods such as expert reviews and prototyping would have to be used to verify some of these assumptions. The main idea of conducting cluster analysis is to try to minimise decisions which are based on assumptions as well as reducing uncertainty from complex data. The results of the on-line card sort exercise will be discussed in the results section (Chapter 7) of this report.

6.4. Analysing interview transcripts and prototype validation

Interview transcripts were analysed using QSR NVivo version 2.0 qualitative analysis software. The aim was to use open coding to discover themes from interview proceedings as suggested by Vaughn, Schumm and Sinagub (1996). As the themes emerged, information units as suggested by Glaser and Strauss (1967) were established and in some cases, similar themes were merged. The themes which emerged from the data analysis are discussed in the results section (Chapter 7) of this report. The researcher also collated what the respondents said during the interviews with what they actually did on their computers as the researcher had an opportunity to observe them using the current intranet to illustrate some of their experiences and concerns.

6.5. Analysing results of the category membership expectation tests

There were only 7 participants for this exercise, thus, the researcher used simple "eye balling" as suggested by Nielson and Sano (1994), to establish what the category labels meant to the participants. If there were any major obvious differences or if there were more participants, the researcher would have used NVivo qualitative data analysis software to analyse the data. At a glance, it was easy to see how participants interpreted the suggested category label.

6.6. Conclusion on data analysis

The use of a dendrogram provides a partial picture of the suggested grouping thus this necessitates further validation. Whilst on-line sort provides the convenience of remote participation, it does not provide for the collection of 'rich' data offered by a workshop setting. However, WebSort provided a "user friendly" sorting interface.

CHAPTER 7 – Results

7.1. Introduction

As mentioned in the Methodology (Chapter 5) and Data Analysis (Chapter 6) sections of this report, data collection was done in different phases. This section will discuss the results of each of these phases. Results from one phase provided leads for the next phase. Table 3 depicts how the results of each of these phases will be presented in this section. The “Activities” column of this table gives an indication of what is discussed in each phase.

Table 3: Structure of the Results section.

Phase	Activities
Phase One (Results of needs analysis) (Section 7.2)	Table of items identified from the initial needs analysis phase
Phase Two (Results of early development activities) (Section 7.3)	Group card sorting <ul style="list-style-type: none"> - participants of group sorting workshop - categories and sub-categories as identified by workshop participants - sorted items listed in order of importance - items which were merged - items which were eliminated - items which were added by participants On-line card sorting <ul style="list-style-type: none"> - results of on-line card sort - first draft of paper-based wire frame prototype
Phase Three (Results of evaluation and testing of solutions) (Section 7.4)	Results of interviews and prototype validation <ul style="list-style-type: none"> - response to paper-based prototype - results of interviews - general observations Results of the category membership expectation test <ul style="list-style-type: none"> - findings of category membership expectation test - items which were not understood by participants
Discussion of results	

7.2. Phase One - results of needs analysis

The initial study identified 93 items (Table 4). The items were given a unique number for identification purposes. Thus, items listed in Table 4 are listed according to the unique number assigned to each item.

Table 4: List of 93 items identified.

Unique No.	Item
1.	alumni news
2.	classified advertisements
3.	condolences
4.	date of student payouts
5.	digital university archives
6.	e-mail
7.	entertainment announcements
8.	exam results
9.	examination timetable (all courses)
10.	Faculty handbooks
11.	financial clearance status
12.	graduate scholarship matters
13.	halls of residence activities
14.	help on using the intranet
15.	individual exam timetable
16.	interdepartmental research activities
17.	internet billing
18.	intranet suggestions / requests corner
19.	IT help desk
20.	IT support FAQs
21.	lecture notes
22.	link to main University site
23.	links to other RSA universities
24.	list of alphabetical university departments
25.	list of university subject experts
26.	management meetings & minutes
27.	merger issues
28.	message board
29.	news desk
30.	news flash broadcast
31.	newsgroups
32.	on-line academic record viewing
33.	on-line academic transcript requests
34.	on-line accommodation booking
35.	on-line bill payment
36.	on-line chat
37.	on-line course bookings for staff courses
38.	on-line course schedules
39.	on-line document publishing (PDF)
40.	on-line essay submission

Table 4: List of 93 items identified continued.

Unique No	Item
41.	on-line forms
42.	on-line graduation announcements
43.	on-line graduation attendance booking
44.	on-line interest groups
45.	on-line learning
46.	on-line module withdrawal notification
47.	on-line personal calendar
48.	on-line polls
49.	on-line staff orientation/ induction programme
50.	on-line student orientation / induction programme
51.	on-line surveys
52.	on-line university calendar
53.	on-line university enrolment
54.	on-line venue bookings
55.	open-discussion forums
56.	past dissertations & theses
57.	past exam papers
58.	personal homepage for each lecturer
59.	personal library fines
60.	personal library items on loan
61.	personal library-use records
62.	policy & procedures
63.	postgraduate guidelines
64.	publish onto the intranet
65.	research activities by dept
66.	research collaboration
67.	research funding
68.	research in progress
69.	research office information
70.	RMS announcements
71.	scholarship announcements
72.	search engine
73.	Senate minutes
74.	sessional dates
75.	social functions announcements
76.	societies & clubs homepages
77.	software library
78.	sports announcements
79.	student counselling services
80.	students financial statements
81.	templates for web publishing
82.	tenders
83.	text books on sale
84.	University directory
85.	University Handbook
86.	University logos
87.	university maps
88.	University notice system
89.	University regulations
90.	University statistics
91.	update personal records online
92.	video conferencing
93.	weather

7.3. Phase Two - results of early development activities

7.3.1. Participants of group sorting workshop

The participants for the workshop were made up of 9 post graduate students, 1 undergraduate student and 2 staff members (Fig. 24).

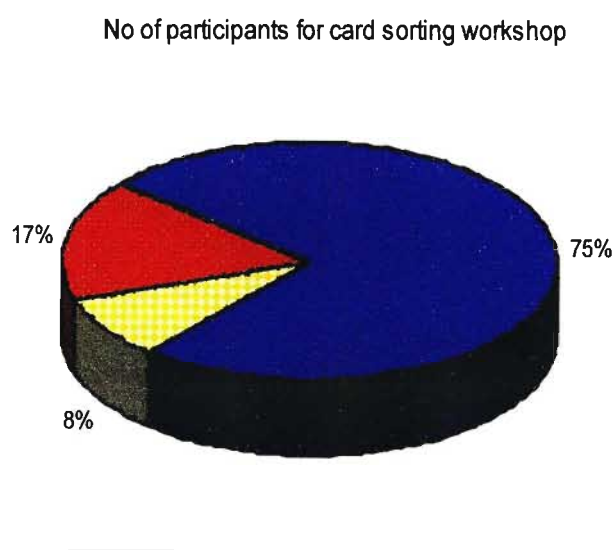


Figure 24: Profile of participants in sorting workshop ■ postgrad ■ staff ■ undergrad (N=12)

Some of the participants (17%) indicated that they had never used the InnerWeb before, but on further questioning, it turned out that they had been using InnerWeb without realizing that they were using InnerWeb, 58% of the participants indicated that they have been using InnerWeb for a period of one year and twenty five percent for less than a year (Fig. 25).

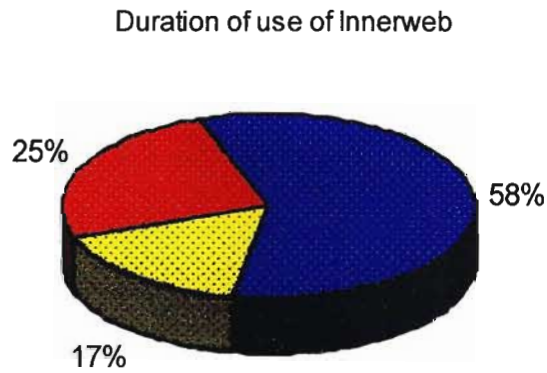


Figure 25: Participants' experience with the use of InnerWeb ■ more than a yr ■ less than a yr ■ never used it (N=12)

The frequency of use of InnerWeb ranged from those who indicated that they had never used InnerWeb before (though it turned out that they had used it without realizing it) to those that used the InnerWeb daily (8%) (Fig. 26).

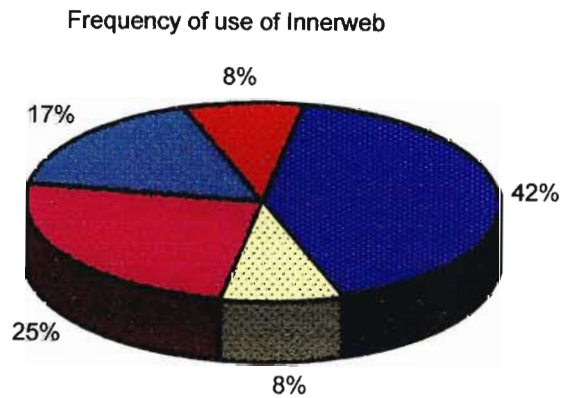


Figure 26: Participants' frequency of use of the InnerWeb ■ a few times per week ■ daily ■ once per month ■ Never ■ a few times per month (N=12)

7.3.2. Categories and sub-categories as identified by workshop participants

Workshop participants suggested a number of possible categories and labels (Table 5).

Although the labels suggested by Group 3 are listed in this table, their rating results were not used for this study as they only gave partial ratings to the cards which were provided. In some cases they did not indicate their group decision consensus rating and in some they did not rate the importance of each card as required.

Table 5: Possible categories identified by workshop participants.

GROUP 1	GROUP 2	GROUP 3
Social On-line chat, on-line interest groups, societies & club homepages, sports announcements	Social classified advertisements, entertainment announcements, intranet suggestions / requests corner, message board, newsgroups, on-line chat, on-line personal calendar, social functions announcements, societies & clubs homepages sports announcements, student counseling services	Social Issues Alumni news, merger issues, on-line graduation announcements, on-line graduation attendance booking, social functions announcements, societies & clubs homepages, sports announcements
Research interdepartmental research activities, research activities by department, research collaboration Research funding, research in progress, research office information	Research past dissertation & theses, postgraduate guidelines, research collaboration, research funding research in progress, Research office information,	Research Issues research collaboration, research in progress research office information,
News Alumni news, classified advertisements, condolences, entertainment announcements, merger issues, message board, news broadcast, news desk, newsgroups, on-line orientation/induction programme, scholarship announcements, senate minutes, sessional dates, social functions announcements, tenders,	Information Alumni news, exam results, help on using the intranet, IT help desk, IT support FAQs, link to main University site, links to other RSA universities, list of alphabetical university departments, list of university subject experts, merger issues, news broadcast, weather, news desk, on-line polls, on-line course schedules,	Announcements classified advertisements, condolences, entertainment announcements, tenders text books on sale,

Table 5: Possible categories identified by workshop participants continued.

GROUP 1	GROUP 2	GROUP 3
text books on sale, university notice system, intranet suggestions / request corner, on-line graduation announcements,	sessional dates, university maps University notice system,	
Forums on-line bill payments, on-line document publishing (PDF), on-line essay submission, on-line learning on-line module withdrawal notification, on-line polls, on-line surveys, open-discussion forums, publish onto the intranet, video conferencing	Communication Tools e-mail, video conferencing	Forums Intranet suggestions / requests corner, message board, news desk, on-line chat on-line forms, on-line polls, on-line surveys, open-discussion forums,
Student Resources date of student payouts, digital university archives, e-mail, exam results, examination timetable (all courses), financial clearance status, halls of residence activities, help on using the intranet, individual exam timetable, internet billing, IT help desk, IT support FAQs, list of alphabetical university departments, list of university subject experts on-line academic record viewing, on-line academic transcript requests, on-line accommodation booking, on-line course books for staff course, on-line course schedules, on-line forms, on-line staff orientation / induction programme, on-line university calendar, on-line university enrolment, past exam papers, lecture notes, personal homepage fore each lecturer, postgraduate guidelines, search engine, software library, student counseling services, student financial statements, university directory, university handbook, university maps, university statistics, update personal records online	Student Academic Support examination timetable, Faculty handbooks, graduate scholarship matters, individual exam timetable, interdepartmental research activities, lecture notes, on-line academic record viewing, on-line document publishing (PDF), on-line enrolment, on-line forms, on-line essay submission, on-line graduation announcements, on-line graduation attendance booking, on-line interest groups, on-line learning, on-line module withdrawal notification, on-line student orientation/induction programme, on-line surveys, on-line university calendar, open-discussion forums, past exam papers, research activities by department, RMS announcements, scholarship announcements	Resources digital university archives, on-line document publishing (PDF), past dissertations & theses past exam papers,

Table 5: Possible categories identified by workshop participants continued.

GROUP 1	GROUP 2	GROUP 3
Security Policy & procedures, RMS announcements University regulations,	Computer tools search engine, software library,	Security RMS announcements
General Faculty handbooks, management meetings & minutes, past dissertations & theses, templates for web publishing University logos,	Admin internet billing management meetings & minutes, on-line accommodation booking, on-line course bookings for staff courses, on-line staff orientation / induction programme, on-line venue bookings, templates for web publishing, senate minutes, university directory, University handbook, University logos, policy & procedures, University regulations, University statistics, Update personal records online	Search Engine IT help desk IT support FAQs, Search engine,
Links Link to main University site, links to other RSA universities	Student matters date of student payouts, digital university archives, financial clearance status, Halls of residence activities, on-line academic transcript requests, on-line bill payment, personal library fines, personal library-use records. publish onto the intranet, student financial statements, text books on sale	External links Link to main University site, links to other RSA universities
Bookings on-line graduation attendance booking, on-line venue bookings		Individual academic /fees/scholarship/links date of student payouts, e-mail, examination timetable, financial clearance status, individual exam timetable, internet billing, exam results on-line academic record viewing, on-line academic transcript requests, on-line bill payment, On-line personal calendar, scholarship announcements, students financial statements, update personal records online

Table 5: Possible categories identified by workshop participants continued.

GROUP 1	GROUP 2	GROUP 3
<p>Not sure where to classify on-line personal calendar, personal library fines, personal library-use records weather,</p>	<p>Not sure where to classify condolences, personal homepage for each lecturer, tenders</p>	<p>Library Infor (sic) personal library fines, personal library-use records, software library</p>
		<p>Departments (link) Faculty handbooks, interdepartmental research activities, lecture notes, List of alphabetical university departments, list of university subject experts, personal homepage for each lecturer research activities by department,</p>
		<p>On-line Learning help on using the intranet on-line course bookings for staff courses, on-line course schedules, on-line essay submission, on-line learning, on-line module withdrawal notification,</p>
		<p>Residence Issues halls of residence activities, on-line accommodation booking</p>
		<p>Newsgroups newsgroups, on-line interest groups</p>
		<p>Policies & Procedures on-line university calendar, policy & procedures, senate minutes, sessional dates university directory, university notice system, University regulations,</p>
		<p>University Issues graduate scholarship matters, management meetings & minutes, news broadcast, on-line staff orientation / induction programme, on-line venue bookings, postgraduate guidelines, publish onto the intranet, research funding, university handbook, student counseling services, templates for web publishing. university logos, University maps, university statistics, video conferencing, weather,</p>
		<p>On-line application / enrolment on-line student orientation / induction programme on-line university enrolment,</p>

7.3.3. Sorted items ranked in order of importance

As explained in the previously, data gathered from Group 3 could not be used for item rating purposes of this study as participants did not rate the items as instructed. Thus, results of two groups were used. Table 6 shows the final scores which the two groups assigned to each of the cards. The scores were calculated as described in Chapter 6 and illustrated in Table 2.

Table 6: Items ranked in order of importance.

IMPORTANCE OF ITEMS				
		Group 1 Totals	Group 2 Totals	Total
4	date of student payouts	5	5	10
6	e-mail	5	5	10
8	exam results	5	5	10
9	examination timetable (all courses)	5	5	10
22	link to main University site	5	5	10
25	list of university subject experts	5	5	10
40	on-line essay submission	5	5	10
41	on-line forms	5	5	10
45	on-line learning	5	5	10
53	on-line university enrolment	5	5	10
54	on-line venue bookings	5	5	10
56	past dissertations & theses	5	5	10
57	past exam papers	5	5	10
71	scholarship announcements	5	5	10
72	search engine	5	5	10
74	sessional dates	5	5	10
79	student counseling services	5	5	10
83	text books on sale	5	5	10
88	University notice system	5	5	10
16	interdepartmental research activities	4	5	9
20	IT support FAQs	4	5	9
23	links to other RSA universities	4	5	9
27	merger issues	5	4	9
32	on-line academic record viewing	4	5	9
33	on-line academic transcript requests	4	5	9
38	on-line course schedules	4	5	9
39	on-line document publishing (PDF)	4	5	9
50	on-line student orientation / induction programme	4	5	9
70	RMS announcements	4	5	9
80	students financial statements	4	5	9
84	university directory	4	5	9
1	Alumni news	3	5	8
3	condolences	3	5	8

Table 6: Items ranked in order of importance continued.

	Group 1 Totals	Group 2 Totals	Total	
10	Faculty handbooks	3	5	8
11	financial clearance status	3	5	8
14	Help on using the intranet	3	5	8
15	individual exam timetable	3	5	8
18	intranet suggestions / requests corner	3	5	8
19	IT help desk	3	5	8
21	lecture notes	3	5	8
24	list of alphabetical university departments	3	5	8
26	management mtngs & minutes	5	3	8
28	message board	3	5	8
34	on-line accommodation booking	3	5	8
43	on-line graduation attendance booking	3	5	8
46	on-line module withdrawal notification	3	5	8
52	on-line university calendar	3	5	8
62	policy & procedures	3	5	8
66	research collaboration	3	5	8
67	research funding	3	5	8
69	research office information	3	5	8
75	social functions announcements	4	4	8
76	societies & clubs homepages	3	5	8
77	software library	3	5	8
78	sports announcements	3	5	8
82	tenders	3	5	8
85	University Handbook	3	5	8
87	university maps	3	5	8
89	University regulations	3	5	8
91	update personal records online	3	5	8
5	digital university archives	2	5	7
7	entertainment announcements	4	3	7
13	halls of residence activities	2	5	7
35	on-line bill payment	3	4	7
42	on-line graduation announcements	2	5	7
44	on-line interest groups	3	4	7
48	on-line polls	3	4	7
51	on-line surveys	3	4	7
64	publish onto the intranet	2	5	7
65	research activities by dept	2	5	7
68	research in progress	2	5	7
73	Senate minutes	3	4	7
86	University logos	2	5	7
90	University statistics	2	5	7
2	classified advertisements	4	2	6
29	news desk	3	3	6
31	newsgroups	3	3	6
36	on-line chat	3	3	6
49	on-line staff orientation/ induction programme	1	5	6
58	personal homepage for each lecturer	3	3	6
63	postgraduate guidelines	2	4	6

Table 6: Items ranked in order of importance continued.

		Group 1 Totals	Group 2 Totals	Total
81	templates for web publishing	2	4	6
93	Weather	4	2	6
12	graduate scholarship matters	5	0	5
17	internet billing	0	5	5
37	on-line course staff course bookings	0	5	5
47	on-line personal calendar	3	2	5
55	open-discussion forums	1	4	5
59	personal library fines	3	2	5
61	personal library-use records	3	2	5
92	video conferencing	1	4	5
30	NEWS flash broadcast	3	0	3
60	personal library items on loan	0	0	0

Although all the items were ranked by the participants, the participants suggested that some of the items could be merged to form one item. These items are listed below:

- Online bill payments and financial clearance statements merged to 'financial transactions'.
- Online graduation announcements and online graduation attendance booking merged to 'graduation'.
- On-line polls combined with online survey to form 'on-line survey'.
- Research activities by department combined with research in progress, research office information, research collaboration, research in progress to form 'research'.
- University regulations combined with University Handbook.
- On-line essay submission to go under 'on-line learning' .

Items that were eliminated include:

Condolences;
 Links to other university sites (should be moved to main University page) ;
 Message board;
 News desk;
 News flash broadcast;
 Newsgroups;
 On-line personal calendar;
 Personal home page for each lecturer;
 On-line enrolment;
 Personal library fines;
 Personal library items on loan;
 Personal library-use records;
 University statistics;
 Weather;
 Lecture notes;
 Management meetings and minutes; and
 On-line chat.

New items which were added by participants included: academic calendar; academic records; employment and schedule of meetings.

A dendrogram is a tool used to show relationship between items. It is constructed by IBM EZCalc software using statistical data entered into Usort. EZCalc has three clustering methods - Average, Single Linkage and Complete Linkage. The "Single" linkage clustering method emphasizes similarities in the relationship of objects whereas the "Complete" linkage clustering method emphasises more on the differences between the objects. The "Average" clustering method looks at both similarities and differences between objects in determining the cluster relationships (Fig. 27). In this study, we used the "Average" clustering method. There are two main forms of information that can be derived from a dendrogram: (1) The relationship between various items and (2) The strengths of those relationships. Figure 27 is a dendrogram showing the results from our on-line card sorting exercise.

Items that are closely related are grouped together to form clusters. Items that are not related are dispersed. This is graphically shown in a dendrogram which is a stick diagram of vertical and horizontal lines. The closer the items are related, the closer the vertical line linking them is to the zero vertical line of the dendrogram. The less related they are, the greater the distance between the vertical line linking them and the zero reference point. Thus, the less related they are, the distance between them approaches 1 on the horizontal scale. Items that are relatively related are shown closer together as originating from a common branch of the tree, thus forming a cluster. In the diagram, the different clusters are shaded for ease of interpretation.

A specific colour coding is used in EZCalc dendrograms. Red horizontal lines are used to show strong relationship whereas blue indicates a weak relationship. Blue and yellow background shading indicates low level groupings.

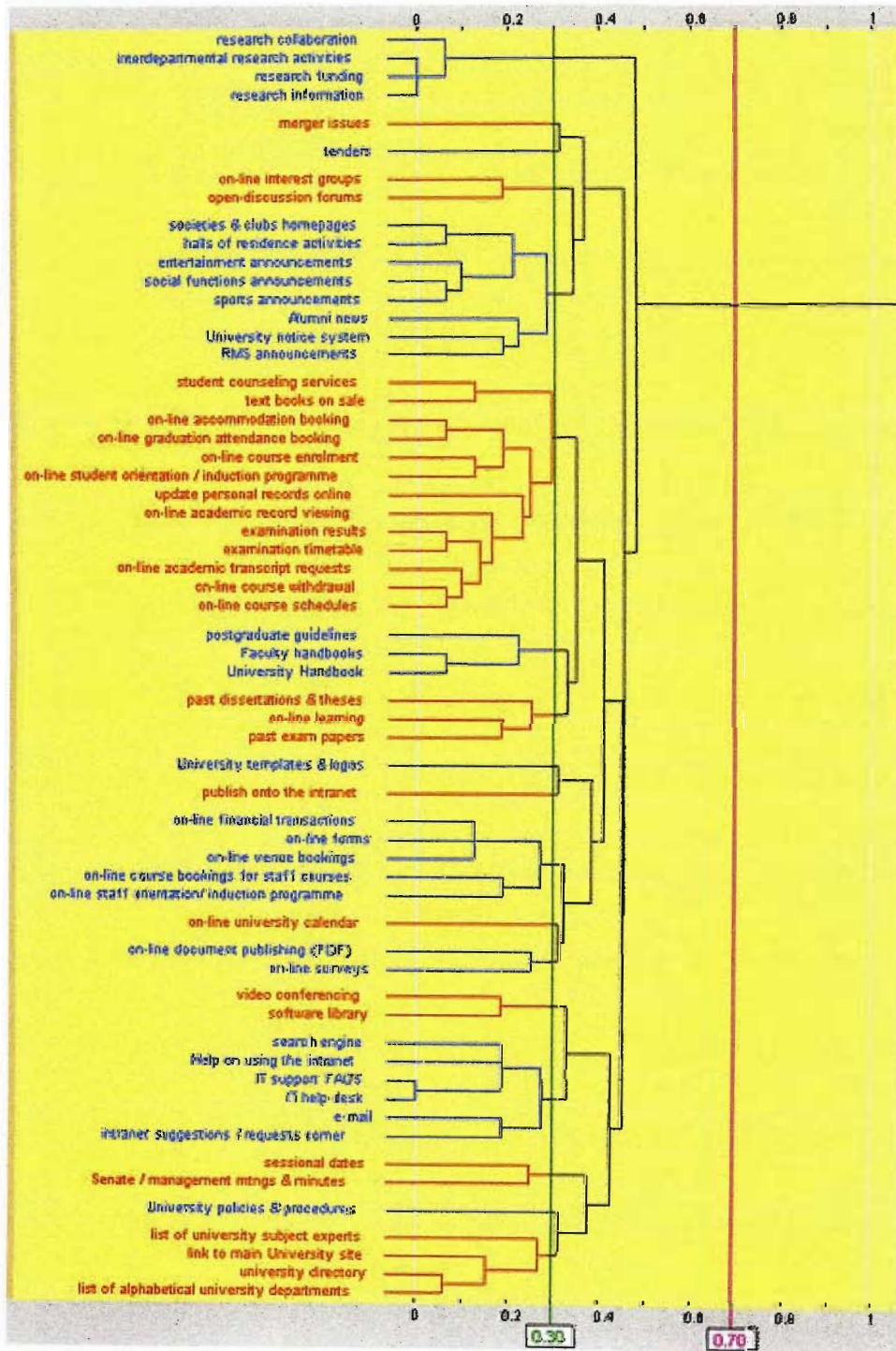


Figure 27: Dendrogram showing the results from the on-line card sorting exercise.

Relationships to the right of the 0.30 vertical line are strong, meaning that most of the participants paired the relative items as related. Items between 0.30 and 0.70 show a moderate degree of relationship. The closer the vertical line linking related items is to 0, the closer the relationship, thus in the diagram (Fig. 27), independent research activities, research funding and research information (top left hand corner) are very closely related. Their distance value is 0, implying that 100% of participants grouped these items together. On the other hand, University policies and procedures, list of University subject experts, link to main University site, University directory, list of alphabetical University departments (bottom left hand corner of the diagram) are not as closely related as indicated by a distance value just greater than 0.30.

From the dendrogram (Fig. 27) it is seen that most of the categories are less than a distance of 0.30 from the origin 0 suggesting a very high concordance in the use of the terminology by the participants. Results of the group sorting exercise are shown in Table 5. One third of the top 30 items which received the highest ranking scores are items which are related to on-line transactions. This suggests that participants expect to see more on-line features on the intranet. The three groups classified the items very differently though some similarities exist. Although group 3 grouped the cards, they did not rate half the items. Thus, their input was not fully utilised. The differences in categorizations by the three groups helps emphasise the importance of choosing taxonomy categories which have a common meaning to as many people as possible. This difference in categorisation by the groups probably reflects different degrees of knowledge, past experience and understanding of the participants. There is evidence of significant discordance on how the 93 items were grouped by participants whereas on 60 items, there is a high degree of concordance. Most of the items categorised a distance of less than 0.30 from the zero reference point on the dendrogram. This suggests the importance of refining the controlled vocabulary because the fewer items there are, the higher the degree of concordance. This confirms the theory that a good taxonomy should have few items were every item fits into only one place.

Table 7 is the first taxonomy after consolidating the results of the group sorting workshop with on-line card sorting. The taxonomy was then presented to participants in a Yahoo style format (Fig. 28).

Table 7: First draft taxonomy.

Category	Content Entity
Directory Services	student directory staff directory classified ads
Calendars	academic calendar university events calendar social calendar sessional dates
Academic Matters	on-line learning system Faculty handbooks University subject matter experts on-line surveys post-graduate guidelines research
Library Services	University Library software library university logos general forms
Recreation	sports university clubs & societies social calendar social functions & announcements on-line interest groups societies & clubs homepages
Administration	Policy & Guidelines University Management Minutes Schedule of meetings
Student Matters	academic records student employment exam results counselling financial issues
Staff Issues	Human Resources financial issues IT support
Communication tools	e-mail on-line chat open-discussion forums video conferencing

7.3.4. Development of the first paper-based wire frame prototype

Figure 28 depicts the first paper-based prototype which was developed after consolidating suggestions from participants of the group card sorting workshop as well as results of the on-line card sorting exercise (Fig. 27).

[Help](#) | [FAQ](#) | [Log Out](#)

University of Natal Intranet

Enter your ID and password to log in & customise your own Intranet start page

ID

Password

Search [Advanced](#)

search Natal University ☉ search the Internet ○

- Directory Services** [Student directory](#), [Staff directory](#), [Classified Ads](#)
- Calenders** [Academic calendar](#), [university events calendar](#), [social calendar](#)
- Academic Matters** [On-line Learning System](#), [Faculty Handbooks](#), [university subject matter experts](#)
- Library Services** [University Library](#), [software library](#) [university logos](#), [general forms](#)
- Recreation** [Sports](#), [university clubs & societies](#), [social calendar](#)
- Administration** [Policy & Guidelines](#), [University Management Minutes](#), [schedule of meetings](#)
- Student Matters** [academic records](#) [student employment](#) [exam results](#)
- Staff Issues** [Human Resources](#), [financial](#) [IT support](#)

After an authorised user has logged in, the user should be able to view a personalised workspace / intranet such as the one available at <https://access.uni.edu/>

Figure 28: First paper-based wire frame prototype.

7.3.5. Results from interviews

Semi-structured interviews were held with key stakeholders representing faculties, support functions including Human Resources, Library, University management, Information Technology as well as the Students Representative Council. This section will discuss the interview results.

Response to the paper-based prototype

Key stakeholders were presented with the proposed paper-based wire frame (Fig. 28). They were asked to peruse it whilst "talking-out-loud" in order for the researcher to hear their initial response. After making a couple of alterations, the participants interviewed, except for two, expressed that they were happy with the proposed vocabulary and categories which were presented to them. Other participants referred the researcher to other departmental members, whom they felt, were better able to contribute to the issues of item categorisation and related vocabulary. The researcher gathered all their suggestions and modified the original blue print accordingly (see Table7) but only after all participants had had a chance to look at the original. Some of the suggestions mentioned included: re-arranging the main labels alphabetically; changing 'Students Matters' to 'Students Services' to the list; questioning the necessity of a students' directory services when this could be accessed via GroupWise. The changes made to the original blue-print are presented in Figure 29 which is the revised blue-print after taking into consideration, all the participant's suggestions.

Items which did not enjoy majority classification consensus were: parking, classified ads, general forms, use of the label 'Minutes' to refer to the category label for all University corporate minutes such as Senate and Council minutes. Some felt that software library, university logos and web templates under 'IT Support' should only be made available once an authorised user logs onto the intranet to avoid unauthorised use of these facilities. Thus, it should not be listed on the main intranet page.

In general, everybody expressed a positive response to the vocabularies and categories proposed. Each person had an opportunity to add, move or delete any items as they saw fit.

Ambiguous vocabulary on the current InnerWeb

To emphasize their experiences, participants logged onto the current InnerWeb in order to highlight some of the labels which they felt were ambiguous listed in Table 8.

Table 8: Some of the ambiguous items mentioned by participants.

Ambiguous Term	Location on the Current InnerWeb
'Diary of Dates for 2003' (see Addendum 10) 'Schedule of meetings 2003' (see Addendum 10)	"Dates" page on the current InnerWeb
'Departments' (see Addendum 11) The menu called "Departments" is meant to link University staff to support divisions such as Finance, Human Resources and Information Technology. Users felt that the current label "Departments" is misleading.	"Department" page on the current InnerWeb
Use of the term "Resources" (Addendum 12)	"Resources" page on the current InnerWeb
Use of the term "Information" (Addendum 14) Items included under this link range from Senex minutes to HIV needle stick injury policy. This link received the most comments.	"Information" page on the current InnerWeb

Layout of proposed intranet

Although at this stage the focus of the study was not on aesthetic issues, two participants suggested an alternative lay-out (Addendum 8). They felt that the proposed Yahoo-style prototype would require excessive vertical scrolling. They added that it would be worthwhile investigating drop down menus instead of the "Yahoo style" interface layout. They expressed that the paper-based prototype looked a bit "cluttered" and that the "log in" fields as well as the search field were too wide and imposing. One of them indicated that users might feel discouraged from entering the intranet site if they realise that they would need a password to log in. They indicated that a smaller "log-in" field would suffice and suggested that it should be placed on the left hand side of the page without "throwing the search and log in fields into the user's face."

It was interesting to note that most of the participants referred to the UNISA intranet and indicated that it was an ideal intranet site which used “natural vocabulary”. The reason they gave was that UNISA was the biggest distance education institution in South Africa, but had managed to develop an interactive, intuitive intranet for the benefit of their students who are resident globally (Addendum 5). Another participant was impressed with the UCT intranet, which they use to read the UCT Monday on-line newsletter (Addendum 6). These participants also felt that the Carlton University intranet site is an example of what they termed “a clean, user-friendly intranet”. Another participant went to the South African Government site to demonstrate an example of what they believed to be a well designed site. What impressed them most about this site was the fact that everything available on that Website could be viewed in multiple ways both hierarchically as well as by process (Addendum 7).

One respondent mentioned that he/she was very happy with the current InnerWeb set-up because the only link he/she used, is the “Documents” link so he/she do not need to see anything else other than that link. This participant mentioned that he/she did not see any reason for having a search engine because he/she knew which departments to find the information he/she require. Thus, they articulated that the current InnerWeb worked very well for their purpose. On the other hand, the rest of the participants indicated that the label “Documents” on the current InnerWeb, was very ambiguous, and suggested a complete classification of the items found under this link.

Aesthetic Issues

The current InnerWeb interface (Addendum 9) was described as “too clumsy, cluttered, wordy, chaotic, unappealing, badly organised” by all respondents except for two. The students, who represented the Student Representative Council, strongly felt that the interface of the intranet should reflect what they termed an “African University.” One of the student representatives felt that the intranet should be reflective of the “new vision” of a “transformed” institution. This respondent gave an example of the South African government Website which can be accessed at <http://www.gov.co.za> . They felt that this site provides an ultimate navigation experience in terms of both web content structure, vocabulary, as well as the graphics used.

On the other hand, other key stakeholders expressed that they would prefer an intranet interface which was free of excessive use of “bells and whistles” and would prefer what they termed “simple, clean, straightforward look with a minimum amount of graphics”.

When the researcher conducted the interviews, the participants were asked whether it was possible to make use of their computers, during the interviews. It was important to allow participants to demonstrate or point to the features they were referring to during the interview. The site walk-throughs proved to be very fruitful and beneficial as the type of data gathered through observation, would not have been as precise, as with a questionnaire or simply done a straight forward interview.

The majority of the participants demonstrated that they had never made use of most of the links which are available via the InnerWeb. It appeared that they were only concerned with one or two links which they use in their daily work activities. One person admitted that they only go to the InnerWeb for the purpose of using the “Information” link on the current InnerWeb and nothing else. This participant was not aware that a search facility existed thus asked the researcher why anyone would want to use the available search engine when links to departments were provided. This respondent’s view was that a person looking for something would link directly to the department concerned and download whatever they were looking for. The respondent was asked how users would know which department to turn to, the respondent replied, “... with time, users would have a “feel” for the site thus would end up automatically knowing which links to frequent for their purpose”. Another user was surprised that they could search for staff members e-mail addresses via the InnerWeb. This perception is synonymous with what Stemark (2002b) described as:- *“Knowledge-routinised in the sense that it is well-established recurrent activities characterised by repetitive tasks and known problems.”* This view by Stemark (2002b) is supported by the fact that the participants who expressed that they had no problem with the InnerWeb are those who use the InnerWeb for their routine tasks; thus, the link, which they always use, has become part of their daily routine. Others expressed that the link to the InnerWeb from the main University website would have to be more visible

as some felt that it was not easily visible. The majority of the respondents expressed frustration at the number of clicks they had to make whilst navigating the InnerWeb.

Some of the respondents mentioned that there should be an incentive to encourage students to want to use the InnerWeb. When asked for suggestions on how this could be achieved, one of the respondents suggested that if the majority of administrative transactions could be accessed via a link on the intranet, students would be forced to use the InnerWeb. Another respondent suggested the option of using the student intranet facility which is provided by the current University of Natal student administrative system, ITS. The suggestion of making the intranet the sole platform for certain applications was also made by Hall (2001). Hall (2001) also suggests that ease of use as well as perceived benefit of use could motivate the use of the intranet. However examples provided by Hall (2001) clearly refer to conventional intranets and would not be relevant for intranet portals.

One respondent indicated that it would be beneficial to provide facilities for "guest" access to the intranet and mentioned that allowing prospective students a glimpse of what is going on inside, not only cultivates a sense of community amongst the KwaZulu-Natal community which the University serves but would also attract prospective students. The respondent suggested that it would be "nice" to have a photo gallery of past students at the Medical School as well as buildings and halls of residents. The respondent also indicated that the use of an on-line chat facility to communicate with the various student bodies on-line on occasions would be most welcome.

Some of the participants felt that there was a delay in the publishing of minutes of some of the important University meetings. Further, resolutions made at these meetings were not automatically linked to areas which could be affected by the decisions. The respondent meant that if there was a resolution passed concerning a particular issue, the system should automatically list other related documents which could be affected by the up-dated resolution. One respondent in particular expressed their concern on how institutional memory could "slip through the cracks" if measures were not put into place to preserve what the respondent

termed “institutional memory”. This respondent strongly expressed that they would like an intranet whereby related topics to a subject which they were searching for, could appear as well.

Concluding remarks on Interviews

The researcher believes that meeting with the respondents face-to-face gave a better insight into the usage of the InnerWeb and also gave her a feel of the environment in which respondents operate. The respondents were of two distinct types. The majority articulated enthusiasm and a need for an intranet “that works for all purposes” whereas a minority could not see beyond the intranet being used for anything other than a document storage and retrieval system.

With regards to the proposed intranet prototype which was presented to the key stakeholders, responses suggest that there is a moderately high degree of within-category similarity of items and low between category similarities. Alterations and suggestions made by the respondents confirm Risdén’s (1999) suggestion that a high degree of redundancy, makes it difficult for users to differentiate between categories.

Figure 29 depicts a revised paper-based prototype after respondents had an opportunity to add, delete and move items on the original prototype (Fig. 28).

University of Natal Intranet

Enter your ID and password to log in & customise your own Intranet start page

ID	<input type="text"/>
Password	<input type="password"/>
<input type="button" value="Log In"/>	

Search [Advanced](#)

search natal university ☉ search the internet ○

- Academic Matters [faculty handbooks](#) [university subject matter experts](#) [research on-line learning system](#) [scholarships](#) [postgraduate guidelines](#) [undergraduate guidelines](#) [graduation](#)

- Calendars [academic calendar](#) [university events calendar](#) [exam timetable](#)

- Directory Services [student directory](#) [staff directory](#) [list of all departments](#)

- IT Support [software library](#) [university logos](#) [web templates](#) [IT forms](#) [IT help desk](#)

- Library Services [University Library](#) [general university forms](#)

- Policies & Procedures [academic staff policies](#) [support staff policies](#) [postgraduate policies](#) [undergraduate policies](#) [university policies & regulations](#)

- Minutes [University council minutes](#) [University Senate minutes](#) [SRC minutes](#)

- Sports & Social Activities [alumni sports](#) [campus societies & clubs](#) [classified ads](#) [social events calendar](#)

- Staff services [human resources](#) [financial matters](#) [information technology support](#)

- Student services [academic records](#) [accommodation](#) [counselling](#) [employment](#) [exam results](#) [financial matters](#) [student societies](#) [SRC](#)

- General campus services [security](#) [parking](#) [Estates Services](#) [campus maps](#) [university statistics](#)

Figure 29: Revised paper-based prototype after interviews.

7.3.6. Results of the category membership expectation test

The findings of the category membership expectations test suggest that the majority of the category names presented on the paper-based prototype could be easily understood by the participants who took the exercise. The participants were asked not to dwell too much on their responses and indicate the first response which came to mind. The shortest completion time for the exercise was 5 minutes whilst the longest completion time was 10 minutes. The respondent who took 10 minutes preferred to type out the responses rather than to write them out. Two (one postgraduate student and one support staff) out of 6 respondents indicated that they were not sure what to find under 'Minutes', one participant (support staff) indicated that he /she was not sure what to find under 'student services' and 'General campus info.' One respondent (post graduate student) indicated that the term 'Directory Services' did not mean anything to them. Another respondent felt that 'Directory services' should only be made available once a University member has logged in, thus should not be on the general intranet main page as it could contain potentially confidential staff contact details.

Although some of the category labels such as 'Minutes' would need further refinement, the main purpose of the category membership expectation test is to establish whether the suggested taxonomy has a high within-category similarity and low between-category similarity. Although only 7 participants were used for this test, it is evident from their response that there is a moderately high degree of within-category similarity of items. There was no mention of overlap between the suggested categories.

7.3.7. Experiences of card sorting in the unique context of the University of Natal

An extract of the actual field work which explains how this methodology was implemented in the unique context of the University of Natal is provided in the following paragraphs. This is an attempt, in line with qualitative observation principals, to describe to the reader, the context and proceedings of the sorting workshop. The aim is to try to accurately describe a phenomenon or research setting to anyone who was not present. Further, is it important for a researcher to try to explain the context under which the study took place in order to bring to light, circumstantial factors and dynamics which could have an impact on the results.

7.3.8. Observations of the card sorting workshop

The card sorting workshop was scheduled for 12:30pm and continued for 2 hours. Upon arrival, participants were asked to complete a participant profile questionnaire which could be completed anonymously (Addendum 2). This questionnaire solicited user computer literacy as well as knowledge and experience of the InnerWeb.

At the beginning of the workshop, a brief overview of the project was given as well as a demonstration on how to sort and rate the cards. Users were then asked to divide themselves into 3 groups of 4 people. Each group was given a stack of 93 randomly ordered cards, which were placed in the middle of a table. They were then asked to nominate one person from their group who would pick a card from the pile, read it out and allow the group to discuss each card until consensus was reached on the appropriate category.

The groups were asked to indicate on a scale of 1 - 3, the importance they attached to each card, 1 being "nice to have but not very necessary" and 3 being "must have" i.e. (1 - 3 rating of least important to most important for each card). The purpose of rating is to gauge the importance and necessity of each of the proposed items as well as to assist users and eventually designers to separate the "useful" from the "trivial" and "nice to have items". Participants continued with this process until all the 93 cards had been placed into different piles, which they believed where, appropriate.

Role of facilitator during the card sorting workshop

Whilst the participants were discussing, the facilitator walked from one group to another listening to what was being discussed and clarifying some of the items, which the participants felt, were ambiguous. Unlike other researcher roles such as “researcher as observer” or “researcher as a full participant” or “researcher as a complete participant” as suggested by Babbie (2000) and Neuman (1999) the researcher took the role of facilitator. A major shortcoming of a researcher adopting the “observer as participant” role are that it is tempting to participate fully in the activity, thus influencing the outcome. Another challenge which could have been posed by taking the role of “complete observer” is that an opportunity of assisting the participants could be missed, thus hinder the flow of the proceedings. In this case, it made sense to adopt the stance of a facilitator, in order to let the participants drive the course of action with minimum assistance from the facilitator.

On observing the participants interacting, it was obvious that some of the group members were more dominant than others, they tried to force through their personal ratings and assumptions. Other participants who were not so forceful would just agree with what was said by the dominating group members. This is clearly a limitation of conducting a group card sorting exercise in comparison with an individual sort exercise as described by Nielsen (1994b). One group was particularly vocal and seemed to have an animated discussion throughout the whole process. Interestingly, this same group did not rank the cards as had been explained at the beginning of the workshop, thus the facilitator had to seek clarification from them two days after the workshop. Every group member from that group was very vocal as they debated the merits of each card. The actions of this group suggested that each group member wanted to have their own way.

After grouping the cards into different piles, participants were asked to use a different coloured card to label each pile and provide a short description for each pile. These labels and descriptions would then become the menu items and description on the final system. Participants re-arranged some of the cards more than once until they were happy with their categories. After all groups had completed the sorting, they were asked to nominate a

presenter to explain their classifications to the rest of the participants. This exercise stimulated debate and open discussion on the grouping and labels which were presented by the various groups. This exercise provided insight into the diversity of views, attitudes and opinions of the participants, something which could not have been achieved via the use of an on-line card sort nor the use of a questionnaire. It also stimulated a sense of anticipation and ownership amongst the participants.

One of the participants had to leave before the session was over as the sorting went on beyond the expected duration. At the end of the session, participants were thanked for participating and the session ended. The facilitator then sat down and recorded the proceedings and observations of the workshop.

At the beginning of the workshop, permission was sought from participants to video record the workshop for data analysis and reference purposes. The use of video recording has been reported to be an effective documentation tool. However, there is a possibility that it can distract some of the participants. An advantage is that a recording can be viewed many times to analyse user behaviour and capture the process more accurately. An increase in the use of video for educational research purposes was highlighted by Goldman (2003) at the Hawaii Educational Research Association (HERA) 2003 conference. Although the author was speaking on a cognitive science and ethnographic research perspective, aimed at improving learning processes, the suggestions apply to most types of research which uses video recording. For our purpose, the use of video did not appear intrusive, thus the danger of participants "acting" for the video camera was not evident as the participants seemed to be highly involved in their discussion and oblivious of the camera. Watching the video highlighted some of the group dynamics which the facilitator had not observed during the session.

One of the limitations of card sorting is that it is time consuming and participants could easily be discouraged from participating due to time constraints. Other institutions have indicated that they offered incentives for users to participate but the researcher believes that incentives

will not necessarily yield accurate results. The intention of those participating (for the sake of an incentive) will not necessarily yield reliable results. Although electronic card sorting is an alternative, it does not give the designer the added advantage of face-to-face interaction with the participants.

General Observations

Apart from interviewing key stakeholders, the researcher was interested finding out the general views of acquaintances just to gain further insight into the use of the intranet. One limitation which became obvious is that the majority of students spoken with were not aware of the InnerWeb. The researcher discussed the use of the current intranet informally with colleagues and acquaintances. The majority of them expressed that they had never used it. Some of the users were indeed using it but were unaware of it. The student kiosk seemed to be popular amongst the students as this is where they retrieve their student results. This suggests that if all on-line resources were made available via a single interface, the intranet could indeed be utilised more, just as how almost all the students the researcher spoke with, were aware of the student kiosk because of their need for accessing results.

From my observations, users themselves do not know how to search for information. It would be beneficial for students to attend the library "information seminars" which include topics on effective searching for information. A platform for such workshops would be at induction of new university members such as staff induction or student induction. Although this can be done on-line, face-to-face workshops are beneficial for immediate clarification of any issues as well as for identifying other information challenges. However, it would be ideal to develop a user-friendly intranet which does not need extensive training or any training at all.

Although the main focus of the study was to establish controlled vocabulary for the proposed intranet, the general expectations of the participants of this phase of the study are synonymous with the five intranet use modes which are suggested by Damsgaard and Scheepers (2000). These are publishing (documents, newsletters and directories), transacting (on-line

administrative tasks), interacting (discussion groups and collaboration), searching (search engines and indexes) and recording (frequently asked questions and organisational memory). These requirements are also similar to the requirements expressed in the first phase of this study.

Summary of results

1. What are the common themes and vocabulary which users want to see on the proposed intranet site?

Users expect to see a process driven Website. Suggested categories for the general front page of the proposed intranet should include some of the categories identified in this study. Once a user has logged onto the site using either their staff or student number, they will have an opportunity of customising and personalising their intranet interface.

2. Where and how do users expect to find information on the proposed intranet?

The results are synonymous with the assumptions of the cognitive flexibility theory which proposes that knowledge is non-linear, thus the use of hypertext strategies to suit individual needs is important. This means there is no one-size fits all but an opportunity for users to customise as well as personalise their interface to fit their needs. Multiple ways to navigate and filter the information should be incorporated into the new structure.

3. What will this information architecture look like?

The information architecture should be seamless and process driven as opposed to an hierarchical compartmentalised structure. This project has focused on 'top down information architecture' which focuses on identifying the needs of the institution and its users. Further study should address how the institution can deal with connecting concepts and relationships between its formal and informal information, corporate information, and controlled-access information (bottom up architecture). The issue of the extent to which the institution plans to use various types of media, i.e. streaming technology, audio, text and graphics would have be

considered based on the resources available. An appropriate web content management system which can handle various types of media would have to be identified. Information can be presented via various media and should not be restricted to text based media.

4. What are the possibilities and limitations of knowledge management via intranet portals?

Information can be managed and stored using interdisciplinary methods particularly from Information Science, Information Technology, Cognitive Psychology, Organisational Behaviour and Human Computer Interface in order to support “just-in-time” access to information. The challenge is to provide an intranet environment which supports one-to-one, one-to-many as well as many-to-many social interaction using synchronous and asynchronous tools which are not restricted by time and space. The idea is to move away from the notation of viewing the intranet as merely a document publishing tool.

Limitations of this study

The main limitation factor is the low participant response some of the University of Natal campuses during this phase of the project. However, this limitation will be overcome by actively engaging some participants from these campuses at other development and usability phases of the project. Another limitation is that the researcher is also a user of the system under review. Positivist theorist would argue that the researcher should remain value neutral throughout the research process. However, the nature of this study is an evaluative process which involves various validation activities, involving all stakeholders, throughout the design process, thus any possible bias could be minimised through the various validation activities.

Reliability and Validity

Landauer cited by Nielsen, 1993 suggests that validity is concerned with whether the usability study reflects the usability issues being tested and reliability refers to whether the test can produce the same results if repeated under the same conditions. However, from a

constructivist perspective, reliability could be challenging to achieve as the responses are highly subjective and are based on user perceptions and personal needs. Meaning is dependent on the context and individual's prior knowledge and experience. The idea is to try to increase the level of construct validity or what van den Akker (1999) cited by Reeves (2000a) refers to as "successive approximation of the ideals". This may be achieved via formative and summative evaluation throughout the project cycle. Evaluating the interrelatedness of theory and practical solutions is in line with Stoke's (1997) "use inspired" research which was discussed in the theoretical framework section of this study.

Ethical Issues

It is important to assure participants that their participation is voluntary and that the information they provide will be treated confidentially.

Chapter 8 – Discussion and Conclusion

8.1. Introduction

Although this study attempted to identify common vocabulary, which should facilitate user search, and retrieval activities, it must be emphasised that there is more to intranets than the publishing of text based institutional literature, policies and procedures. It is evident from this report that the development of an intranet should indeed be approached empirically in an attempt to match as closely as possible, institutional and user needs. This report attempted to identify some of the current issues particularly the debate on knowledge management in relation to intranets. The aim was to establish some of the theories and 'best practice' for the design and development of an intranet which can be used as a tool to support student and staff activities which are synonymous with an institution of learning. This section will discuss some of the themes, which emerge from this study. Recommendations will also be made for further investigation.

8.2. Implications of Results

On the basis of this study, it is evident that users at the University of Natal have different information needs, which would be better served by personalisation and customisation facilities offered by portal technologies. Although this study has attempted to identify a common taxonomy for the main interface of the proposed intranet, the results are not conclusive and would need further refinement through on-going user involvement at further development phases of this project. The proposed taxonomy gives an indication of the type of categories, category labels and category entities, which the respondents of this study expect. The fact that there are still some categories, which did not achieve consensus, such as the category 'Minutes,' is an indication that it is imperative to find alternative vocabulary for some of the labels. To illustrate the importance of personalisation, is the fact that the sub-category 'University statistics' was eliminated by the

participants of the study whereas on interviewing key-stakeholders, some of them emphasised the need to include the category 'statistics'.

However, judging from the fact that the participants, who participated in the category membership expectation test, did not experience major difficulties in predicting the content entities of the proposed categories, the researcher believes this study provides the foundation for further development. This could serve as partial solution to one of the problems, which were identified with the current intranet. Other identified problems, which were not addressed in this study, include problems of navigation, aesthetic issues and maintenance of information, which is evidenced by out-dated, redundant, duplication and in some cases, unavailability of information on the current intranet.

This study suggests that the InnerWeb is indeed being under-utilised. Whilst other authors suggest that under utilization is a result of a poorly structured site, Stenmark (2002b) argues that this is not the case. He argues, "when organisations try to re-shape their intranets into a traditional information environment, they violate the characteristics of the web." Indeed, if the intranet is structured in the traditional manner (library Dewey system) the intranet will fail to take full advantage of the semantic web features. Stenmark's (2002b) study suggests that there is no evidence that a well-structured intranet leads to increased frequency of use. Nielsen and Sano (1994) hold a contrary view that is shared by the researcher. The researcher believes that if the intranet is well structured with the right taxonomy, it becomes user friendly and the people's first point of call if users have to look up anything. On the other hand, if the intranet is not efficient and is cumbersome, then it will drive away users. This study is a means of identifying the appropriate taxonomy to use of the intranet interface so that the intranet becomes the everyday tool for each person on campus.

Stenmark's (2002a) view that portal technology empowers users to filter through web content by giving them the autonomy to choose what is relevant to them is a valid point. This confirms the importance of a powerful search engine (pull technology) as well the importance of accurately

mapped inter-disciplinary resources which are available on the databases. An alternative would be the use of push technologies which present information to users based on their pre-established information needs or role in the institution. Others have reported making use of agents to track user information habits and building user profiles in order to assist users by alerting them of new information which is relevant to their needs. It would be worthwhile investigating the possibilities and limitations of such user tracking agents. Another alternative would be to ask users themselves to register for the information channels which would be relevant to them.

The findings of this study suggest that multiple ways of manipulating data should be provided. These include a powerful search engine, drop down menus, site maps and site indexes. The unpredictable nature of the use of information confirms that we can no longer depend on hierarchically structured content lists but that we must take full advantage of the hyper linked, networked facilities of web technologies. Further, some of the responses from this study suggest that users have come to expect more than text-based information. Apart from accessing other digital data types such as digital images, audio and video, users also expect to use the proposed intranet for multi-purposes which include conducting on-line administrative transactions on the intranet. On-line Analytical Processing tools (OLAP), which are more than simple query processing tools, might need to be utilised to access multi-dimensional data.

As discussed in this report, knowledge is non-linear, thus users should effortlessly benefit from accessing information from a variety of sources. This is synonymous with Spiro and Jehng's (1990) cognitive flexibility theory, which was discussed in this report. As suggested by Nonaka (1991), exposure to a variety of information stimulates creativity. The challenge is to ensure that every item on the database has corresponding metadata and links to related objects to ensure that users derive maximum benefit in the use of the intranet.

8.3. Information versus Knowledge Management

This report has discussed two opposing views on the relationship between knowledge management and intranets. A constructivist view is that intranets could be organised to facilitate knowledge

creation processes such as the process suggested by Nonaka's (1991) SECI model. An opposing view is that intranets are instead reinforcing organisational boundaries, which do not facilitate free-flow of knowledge sharing. It is evident that an intranet could indeed facilitate the sense making; decision-making and knowledge creation processes by exploiting existing web based technologies. One way of achieving this is by having a clear understanding of information ecology as suggested by Davenport and Prusak (1997) and Choo *et al.* (2000). It would be worthwhile continuing to investigate problem situations, which cause users to seek and use information from the intranet. Davenport and Prusak (1997) has pointed out that it is important to identify the attributes of the information users find useful. Understanding common terminology, which would make sense to the majority of intranet users, is the first step towards designing an intranet, which can facilitate work, related processes with ease.

Although a well-designed intranet might be possible, users might still need assistance on how to make the most of the proposed intranet. As suggested by some of the respondents, the fact that everyone is not technology literate, users might need initial assistance. However, a well-designed product rarely needs extensive training. The idea is to expose prospective user to the five actions, which define the flow of knowledge as suggested by Marquardt and Kearsley (1999). These are: "knowing what", "knowing how," "knowing who," "knowing why," and the last one which was later added by Quinn, Anderson and Finkelstein (1998) which is "self-motivated creativity." Choo *et al.*'s (2000) suggestion of conducting formal heuristic user information seeking behaviour would be beneficial in future phases of this project. As discussed in this report, knowledge management is a term touted by business consultant companies. It is imperative to find ways of stimulating user tacit, explicit knowledge as well as organisational cultural knowledge via a platform such as an intranet.

8.4. Is it information or knowledge that is being transferred?

On the question of whether it is knowledge or information, which is being enabled via intranet technologies, the researcher's understanding is that it is information that is being transmitted. An individual can then process that information into knowledge but the prerogative of what is important

and what to discard still rests on the individual. The intranet should serve as an open communication forum for sharing inter-disciplinary information, thus bringing awareness of what was previously unknown to an individual. A case in point is the recent live broadcast of the African Scholarship conference (November 2003), which was held at the University of Natal. The use of streaming technology enabled all geographically dispersed members of the University to watch the proceedings. The intranet would be ideal to serve such purposes and perhaps remote audience could be afforded the opportunity of participating instead of just watching. On-line cross-disciplinary conferences within the University of Natal, could become reality as is done by the Commonwealth of Learning for various on-line international ICT in Education conferences. The idea is to create a unified seamless information personal workspace for content access, communication and collaboration for University of Natal members.

As the debate on whether it is information or knowledge, which is being accessed, continues, the fact still remains that an intranet is as good as the extent to which it meets its goals. The intranet could be well designed but still fail to meet its objectives. For the intranet to succeed it must be custom-made to meet its objectives. However, in a University community, not all people have the same requirements from the intranet, thus each individual should be able to customise their interface. The fundamental issue, for all intranets, whether they are portals or conventional intranets, is the use of common language, which enables people to communicate more effectively both synchronously and asynchronously.

Connecting people, institutional processes and technology

From a usability point of view, there is much to learn about user dynamics and we are at the early stages of this exploration. Technology may enhance the transfer of information, which could be used for knowledge creation. The idea is to try to understand the conditions, which make this possible.

As discussed in this report, the key purpose of an intranet is to link people, institutional processes and technology. The University of Natal needs to ensure that any technological innovations taking place will, by all means expose and stimulate University members to make use of such technologies through promoting, to the University intranet users, an awareness of their surroundings and experts in various fields. Huysman (2002) argues that "communities of practice are the social unit best suited to support organisational learning...through externalizing, objectifying and internalizing knowledge."

A project of this nature is said to be prone to organisational politics as it has a lot of stakeholders involved. Care should be taken to ensure that all stakeholders' views are taken into consideration (D'Hertefelt,1999). For this reason, it is not only important to understand user information needs and information seeking behaviour, but the organisational context which include organisational culture, psychology of groupware dynamics and other organisational behavioural issues. Some of these issues could be investigated at a later phase of this project (Detlor, 2000). The more we know about these dynamics, the better we will be able to improve the institutional information processes.

8.5. Advantages of portal technologies

As discussed in this report, portal technologies offer the advantage of standardization (by institutions) as well as personalisation (by users). Identifying user profiles could facilitate timely presentation of targeted information to the correct users (push technology). This set-up creates checks and balances to ensure that information and resources are highly visible and users have the option of knowing where to go to if they cannot find what they are looking for. Stemark's (2002) argument that a mechanistic view of intranets stifles creativity and reduces the benefits, which could be derived, is a valid argument. The challenge is to move away from a traditional mechanistic, hierarchical view of thinking about information to a more fluid, seamless access to information, which will facilitate the knowledge creation process. We need to be wary of bureaucratic processes and practice, which could become "engrained" and institutionalised that is, "this is how we have always done things" (Berger and Luckman, 1966).

8.6. Discussion on the research process of this study

Card sorting has provided a partial picture of the vocabulary, which some users expect to use on the proposed intranet. The iterative research process used in this study identified new leads and actions for each stage. As expressed by other researchers who have made use of card sorting, it is true that open card sorting results are more difficult to analyse as opposed to closed card sort. The researcher believes that open card sort is important at the foundation stage of a project in order to solicit as wide a variety of options as possible. Further development phases may then make use of closed card sort as a form of elimination process. Development research has been particularly useful by involving beneficiaries of the proposed product in the evaluation of the initial paper-based prototype. This study also confirms Nielsen's (1994b) view that what users say they do and what they actually do is not always the same. It is important to conduct heuristic observations to collate their assumptions with their actions. This project is an example of "use inspired" research whereby the purpose is to understand the use and purpose of a phenomenon for the purpose of improving a situation as opposed to research for the sake of research. This means that the study should continue in order to fulfil the initial goal of providing a functional database driven intranet portal for the University of Natal. Participants should continue to evaluate and validate every phase of the project.

8.7. Further suggestions for research

This study focused on a bottom up information taxonomy, which concentrates on end-user and front-end interface issues. Research which focuses on top down taxonomy (back-end issues) could be carried out in order to advise content owners (publishers) on how to map information in their respective areas. This is particularly important to ensure that related resources are clearly linked and classified. At an institutional level, "best practice" for intranet design requires knowledge of an institution's information ecology which includes; an initial understanding of the intranet goals, the information culture which prevails (attitudes towards knowledge and information sharing), an understanding of the physical setting as well as personnel who are responsible for administering the intranet. An understanding of the knowledge ecology contributes to the development of value-

added processes as suggested by Choo *et al.* (2000) and Detlor (2000). These should support the information practices of the identified user sets in their endeavours in sense making, decision making and knowledge creation and sharing. This will ensure that the intranet remains relevant in view of the fact that an institution of learning such as the University of Natal is dynamic and user and institutional needs are constantly changing.

If the proposed intranet is intended to facilitate collaboration, it is imperative to conduct further research on collaborative information seeking. Prekop's (2002) study suggests that there is limited research on different types of collaboration information seeking as opposed to individual information seeking. A study could be developed into a longitudinal study, which will create a seamless cross-faculty knowledge-sharing platform for the university community through a single portal. The researcher believes that language is a living evolving entity which is constantly changing and adapting to new situations as they arise. For this reason it is important at regular intervals, to determine if there are any alterations which might need to be made.

8.8. External factors

Although there has been much debate on whether the intranet could indeed be a knowledge sharing platform or whether it is merely information or data processing centre, the idea is to use technology to enhance and extend formal, informal learning and administrative activities. The use of Information Communication Technologies (ICT) should be exploited by institutions of higher learning to ensure that South Africa has a pool of citizens who can contribute meaningfully to developmental and economic activities. On a broader level, all ICT activities taking place in South Africa should be directed at developing end-users who are knowledgeable about the possibilities and limitations of technology to enhance their daily activities. This project has the potential of exposing University members to web technologies, which could expose users to technological innovations and enhance their technology literacy.

8.9. Conclusion

Although the main thrust of this study was to establish controlled vocabulary for the intranet interface, it is evident that vocabulary can not be looked at in isolation. Whilst vocabulary is one of the “threads” which enable common understanding of menu labels and objects found on a website, it is not a simple task to reach majority consensus on what that vocabulary should be. This study has shown that there are two types of users. Those who use the intranet constantly and want more than document publishing and retrieving and those who are blasé and are content with clicking on the one link which they need to perform their work. The long term strategy is to identify a holistic information ecology which can underpin the intranet portal. This includes a study of the organisation’s culture, information seeking behaviour of members and group collaboration behaviour.

The participants of this study suggest the need for information that can be presented in multiple rather than single dimensions. The views expressed by some of the participants reflect the bureaucratic nature of an institution which is driven by policies and processes which are mechanical in nature. On the other hand, the need for innovation requires fluid open channels which are not bound by organisational structures. This report has pointed out that a database driven intranet portal is an ideal system to support the various activities which are required by participants of this study. These activities include single log-in access to various on-line administrative user services such as financial and personal transactions as well as access to on-line learning activities.

Participants also expect to use the intranet as a collegiate communication tool. However, it is important to note that user perceptions of what they need and what they actually do are not necessarily the same. Thus, an iterative design and development process using different participants is one way of triangulating and evaluating the perceived requirements.

In order to provide a “value-added” intranet for the University of Natal, current debate on whether the intranet can indeed be used as a knowledge management tool was explored. Technology may assist by connecting users and assisting the knowledge creating process of learners and staff. Thus,

this study suggests that the proposed intranet portal should be creatively designed to emulate what Jonassen (2003) calls a "mind tool." This stems from a constructivist assumption that knowledge is non-linear thus information may be used for purposes that were not in the mind of the originator. With Spiro and Jehng's (1997) constructivist cognitive flexibility theory, in mind, sources of information should be inter-related rather than compartmentalized. The idea is not to view activities performed on the intranet as isolated activities but as inter-related and dynamic.

The known limitations of the University of Natal intranet such as poor document organisation, redundancy and duplication may be better managed by the use of a good web content management system. This will facilitate content mapping and push and pull technologies. However, a web content management system is no panacea for sloppy content management. The idea is to make the intranet the first point of reference for communication, accessing and performing tasks. By so doing, this may assist learners and staff to improve their computer literacy, information literacy and communication literacy. The type of intranet perceived by users is synonymous with a "self service" intranet which can be customised and personalised accordingly. Although this study identified some items which did not receive majority consensus, further user testing and evaluation at the beta-prototype development phase should solve this challenge. Further development activities will need to be looked at in terms of immediate, intermediate and long term tasks.

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ADDENDA

NU

InnerWeb

Staff Email Search: GO

[Feedback](#)
[Exam Results](#)
[Groupwise WebAccess](#)

Resources
Information
Documents
Notices
Dates
Departments
NU Web

Innerweb Home

Merger Process Website

Click here to visit the University's Merger Process website

<http://care.nu.ac.za>

AIDS HELPLINE
☎ 0800-0123-22

FIND INFORMATION

International Internet Search:

South African Internet Search:

To search all NU web servers using HtDig:

 GO

Important Info

- ▶ [A New Academic Policy for Programmes and Qualifications in Higher Education: UN Response](#)
- ▶ [Report of the Study Team on the Implementation of the National Qualifications Framework: UN Response](#)
- ▶ [Senate and Council Policy and Procedures Web site](#)
- ▶ **UPDATED 2003**
- ▶ [Sessional Dates](#)
- ▶ [Latest Draft \(November 2002\) of the proposed Funding Framework for Higher Education from the Ministry of Education](#)
- ▶ [University of Natal response to Funding Framework Document](#)
- ▶ [Senex, Senate and Council minutes Web site](#)
- ▶ [Senex Minutes : 7 October 2003](#)

Site Map

Document4 - Microsoft Word

Addendum 9: Innerweb interface screen capture as at 14/11/2003

Natal University Notice System

[LOGIN](#)

[HELP](#)

Filter: All Staff

Page 1 of 20

DATE	SUBJECT
11/14/2003	END OF YEAR PARTY RETURNS BY POST PLEASE
11/14/2003	ITD NOTICE - NETWORK DISRUPTION - OLD MAIN BUILDING - 17/11/2003
11/14/2003	HIYAN/MRC KZN AIDS FORUM - PIETERMARITZBURG - NOVEMBER 2003
11/14/2003	REMINDER - EQUIPMENT REMOVED FROM THE CAMPUS FOR OFFICIAL PURPOSES
11/14/2003	WORK IN PROGRESS - HOWARD COLLEGE CAMPUS

[Next](#) [Last](#)

Notice System: Developed and Maintained by Technical Services ITD

Addendum 13: University Notice System as at 14/11/2003

University of Natal Intranet User-Needs Evaluation

What is an intranet?

“A network based on TCP/IP protocols (an Internet) belonging to an organization, usually a corporation, accessible only by the organization’s members, employees, or others with authorization. An intranet’s Web sites look and act just like any other Web sites, but the firewall surrounding an intranet fends off unauthorized access. Like the Internet itself, intranets are used to share information.”

(<http://www.webopedia.com/TERM/I/intranet.html>)

Currently the University has no dedicated intranet but offers such functionality with our Innerweb that has served many purposes over the past years. However, many believe that we need to design, develop and deploy an intranet that will better serve our needs. This survey is the first step of a user-needs evaluation/analyses process which aims to identify your intranet requirements. In this survey we wish to establish the tasks you frequently perform on the Innerweb as well as your current and future requirements. Please answer the following questions.

1. What is your primary university function?
- Library staff
 - Academic staff
 - Administrative / support staff
 - Undergraduate student
 - Postgraduate student

2. Your office is situated on the
- Durban campus
 - Edgewood campus
 - Medical School campus
 - Pietermaritzburg campus

Your Department / School _____

3. What do you think is the most important function of an intranet

4. How frequent do you use Innerweb?

- Daily
- A few times per week
- Once per month
- A few times per month
- Never
- I do not know what InnerWeb is

5. What primary information (content) do you access from our current intranet (Innerweb)?

Addendum 1: User needs questionnaire.

6. What information would you like to see on our Intranet which is not available now?

7. What tasks would you like to be able to perform on the Innerweb that would make it a usable and useful site to you?

8. What do you like best about the current Innerweb?

9. What do you least like about the current Innerweb?

10. What functionality is needed for the InnerWeb to be useful to you?

11. How is your department currently sharing departmental information? (e.g. do you see a shared GroupWise folder?)

12. Any further comments.

*Thank you for participating in this project.
Centre for Information Technology in Higher Education*

Participant Profile Form

1. **Name (optional)**

2. **What is your primary University function?**

- | | |
|--|--|
| <input type="checkbox"/> academic staff | admin / support staff <input type="checkbox"/> |
| <input type="checkbox"/> undergraduate student | postgraduate student <input type="checkbox"/> |

3. **For how long have you been using the Innerweb?**

- | | |
|--|---|
| <input type="checkbox"/> since its inception | less than a year <input type="checkbox"/> |
| <input type="checkbox"/> more than a year | have never used it <input type="checkbox"/> |

4. **How often do you use Innerweb?**


- | | | |
|--|---|---|
| <input type="checkbox"/> Daily | a few times per week <input type="checkbox"/> | <input type="checkbox"/> |
| <input type="checkbox"/> A few times per month | Once per month | <input type="checkbox"/> Never <input type="checkbox"/> |

5. **Have you used other intranet sites elsewhere? (briefly explain)**

6. **Are you interested in participating in future development phases of the proposed site?**

- Yes No

7. **If yes, please provide your contact details**

 **e-mail**
.....

Additional comments / suggestions

*Thank you for participating in this project.
Centre for Information Technology in Higher Education*

Addendum 2: Card sorting participant profile form.

DISCUSSION WITH STAKEHOLDERS

1. In your opinion, what would be an efficient way of presenting information which is available on the Innerweb?
2. What are some of the features of the current Innerweb which you would like to preserve?
3. What are some of the features of the current Innerweb you would like to change / get rid of?
4. How would you describe your ultimate navigation experience on an intranet?
5. What do you think of this type of proposed interface? (see attached intranet blue print / prototype)

Addendum 3: Stakeholder interview questions.

University of Natal Intranet

Enter your ID and password to log in & customise your own Intranet start page

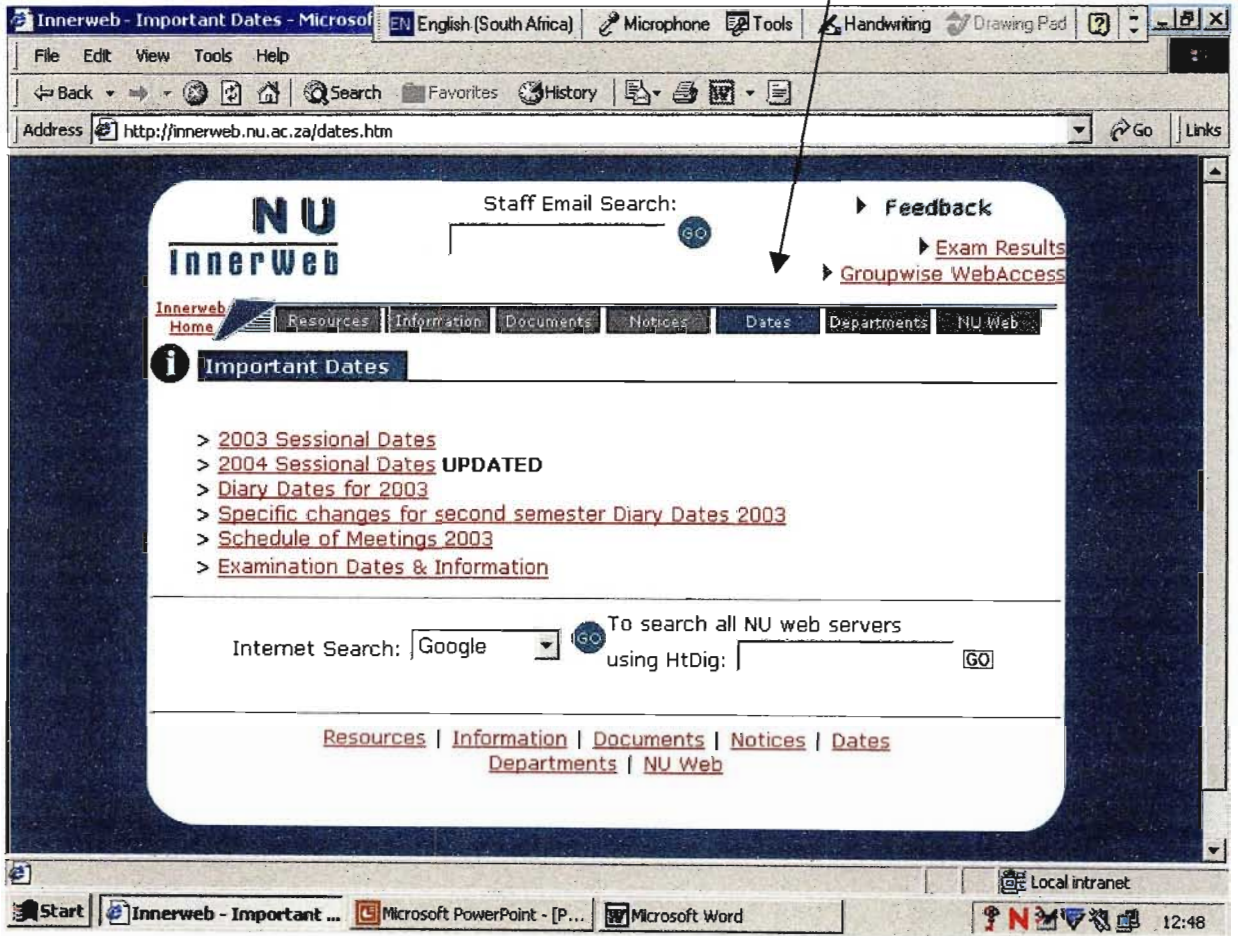
ID	<input type="text"/>
Password	<input type="password"/>
<input type="button" value="Log In"/>	

Academic Matters	
Calenders	
Directory Services	
IT Support	
Library Services	
Policies and Procedures	

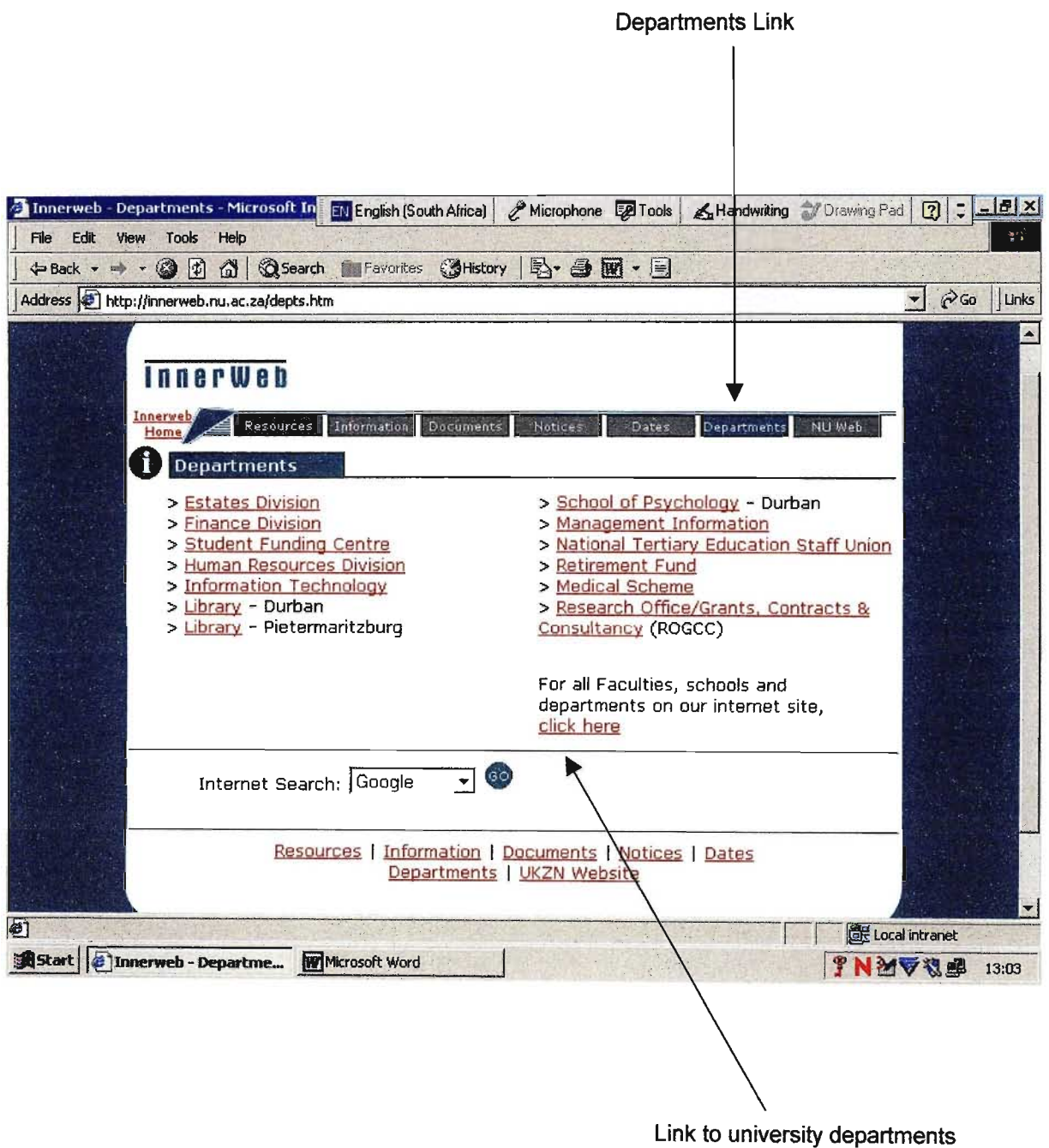
Minutes	
Sports and social activities	
Staff services	
Student services	
General campus info	

Addendum 4: Content membership expectation test.

Items found under the Dates link

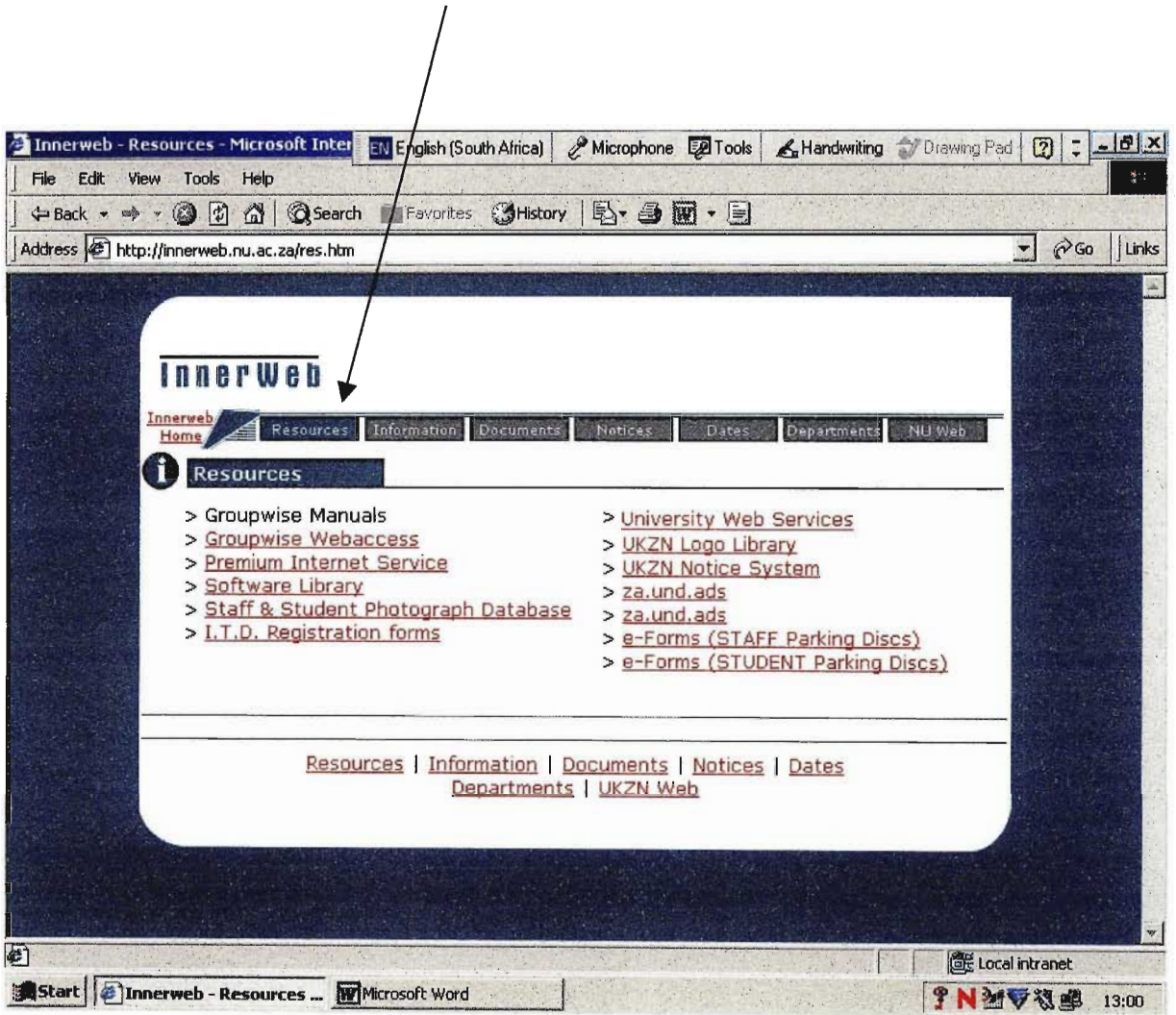


Addendum 10: Display of Dates Link



Addendum 11: Display of Departments link

Items which are found under the Resources link



Addendum 14: Display of Resources link

[Inzantsi Home](#)
[Resources](#)
[Information](#)
[Documents](#)
[Notices](#)
[Dates](#)
[Departments](#)
[NU Web](#)

Information

- > [Academic Policies](#)
- > [CADD Faculty: Minutes of Meetings](#)
- > [CHE Size and Shape- Task Team Discussion Document](#)
- > [CHE Size and Shape- Task Team Discussion Document: Response](#)
- > [CHE Size and Shape- Task Team Report: Response](#)
- > [Copyright](#)
- > [Costing and Pricing of External Funded Research Grants and Contracts](#)
- > [Emergency Telephone and Speed dial numbers](#)
- > [Examination Results](#)
- > [Experts List \(in alphabetical order\)](#)
- > [Faculty Handbooks 2003](#)

> **HIV/AIDS Policies**

1. [AIDS Policy](#)
2. [Occupational Exposure Policy](#)
3. [Sexual Assault Policy](#)
4. [Comprehensive Student HIV/AIDS Prevention, Treatment and Care Policy](#)

- > [Installation Address - Professor M W Makgoba, 28 October 2002](#)
- > [Institutional Plan 2000-2002](#)
- > [Private Remuneration Work Procedures](#)
- > [Senex Minutes - 29 November 2000](#)
- > [Senex Minutes - 14 March 2001](#)
- > [Senex Minutes - 10 April 2001](#)
- > [Senex Minutes - 19 June 2001](#)
- > [Senex Minutes - 9 July 2001](#)
- > [Senex Minutes - 3 September 2001](#)
- > [Senex Minutes - 28 November 2001](#)
- > [Senex Minutes - 13 March 2002](#)
- > [Senex Minutes - 29 April 2002](#)
- > [Senex Minutes - 18 June 2002](#)
- > [Senex Minutes - 1 October 2002](#)
- > [Senex Minutes - 26 November 2002](#)
- > [Senex Minutes - 19 March 2003](#)
- > [Senex Minutes - 30 April 2003](#)
- > [Senex Minutes - 18 June 2003](#)
- > [Senex Minutes - 6 August 2003](#)
- > [Senex Minutes - 7 October 2003](#)
- > [How Library Acquisitions](#)
- > [Current Research Policy](#)
- > [University Statistics](#)
- > [University Web Services](#)
- > [Senate and Council Policy and Procedures website](#)
- > [Senex, Senate and Council minutes website](#)
- > [First Aid List](#)
- > [ITQ Courses](#)
- > [HIV Needlestick Injury Policy](#)

Addendum 14: Display of Information link

University of Natal Intranet

user id :

password :

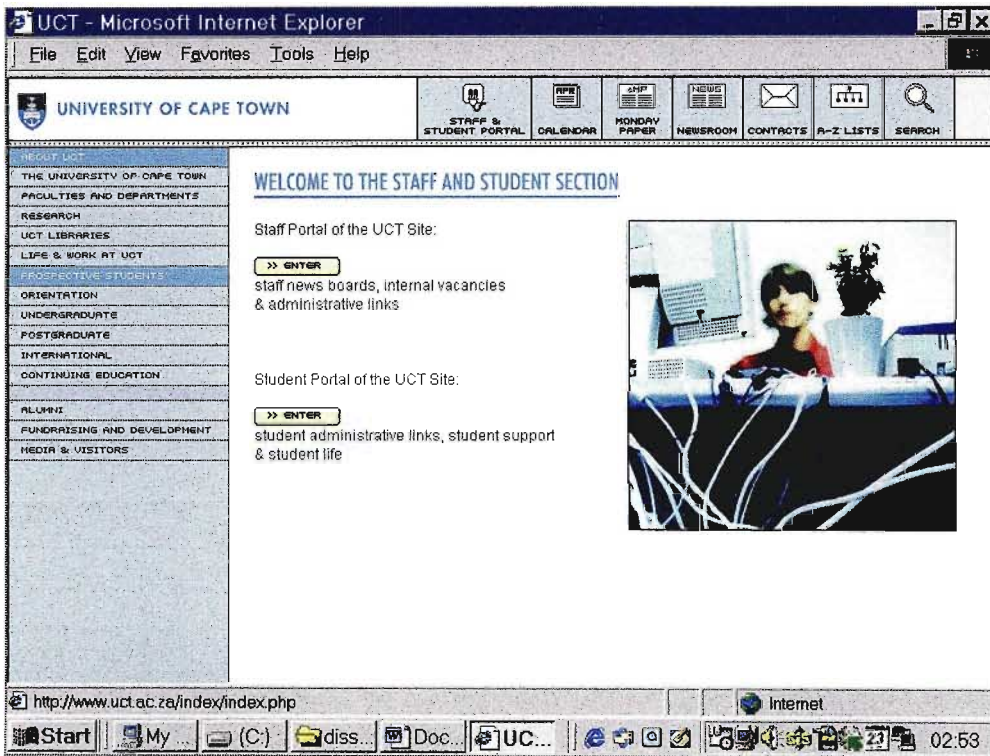
login

Administration | Academic Matters | Calendars | Directory Services | **Recreation** | Library |

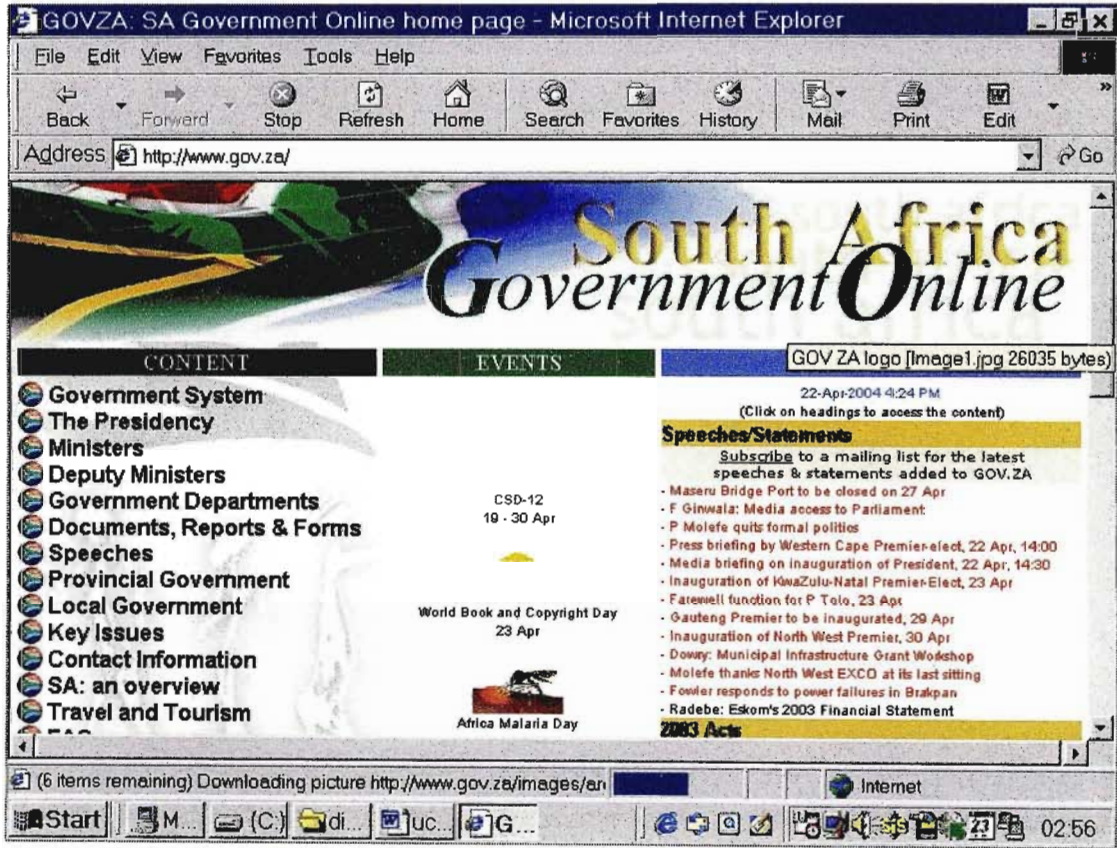
- Clubs
- Sports
- Societies
- Other events

Drop Down Menu

Addendum 8: Intranet interface layout which was proposed by two of the participants .



Addendum 6: University of Cape Town intranet screen capture.



Addendum 7: South African Government Website.