Chapter 4 Case Study

"The seen is the changing, the unseen is the unchanging".

Plato

4.1 Introduction

Chapter Three provides an overview of the higher education landscape, indicating that the impact of technology on higher education is significant.

This chapter describes *process, product*, and *service* innovation of the virtual campus. The researcher draws on theory discussed in Chapter Two in order to apply theoretical concepts to the case. In turn, emerging knowledge generated by the case study is used to inform the theoretical fields discussed in Chapter Two. Figure 4.1 illustrates how Chapter Four fits into the structure of this thesis.

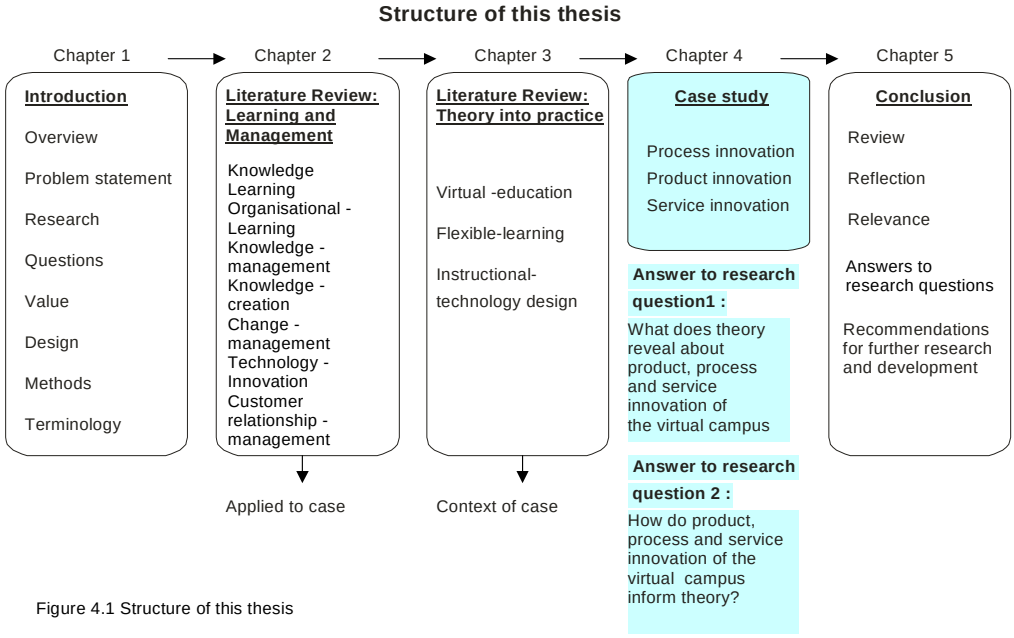


Figure 4.1 Structure of this thesis

As mentioned in Section 2.6, Nadler and Tushman (1995:55) propose that top management have to adhere to three challenges in times of discontinuous change, namely timeous recognition of external forces that could cause disequilibrium, making appropriate strategic choices to reposition the organisation and re-architecting the organisation.

The virtual campus was created in response to the following global changes:

- rapid changes in the economy as a result of the knowledge explosion and the consequent need for continuous reskilling fuel greater demands to flexible access to higher education and lifelong learning opportunities (Davis & Botkin, 1994:172)
- a rapid increase in world population, predicted to be 7.2 billion in 2015 and concomitant increased need for access to education (CIA, 2000). Massification of education and training to lifelong learning demand different approaches to teaching and learning from what is found in traditional universities (Gates, 1996)
- a new economy leading to a widening gap between developed and developing countries (Tapscott, 1996)
- a gradual decrease in government subsidies to higher education institutions as governments become reluctant to fund the increasing demand for higher education (Duderstadt, 1999:3)
- a change in student demographics - students are increasingly older and diverse in terms of race, gender, home language, nationality and economic background. They demand a higher degree of quality and relevance in their education (Mail & Guardian, 1997:12)
- the proliferation of information and communications technology is causing disintermediation (middleman falls away), resulting in business encroaching on the educational market. It also requires integration of technology into the learning experience (Twigg & Oblinger, 1996:4)

Although various technologies are used in virtual education, the Internet has proven to be the most powerful technology in terms of range, functionality, connectivity, access and cost (Tapscott, 1996). It is particularly suited to an institution-wide innovation.

Digital network and software solutions in a virtual organisation are typically used for:

- Course offering and delivery.
- Communication
- Management and provision of administrative student services such as academic records, payment and application for admission.
- Learner support e.g. enquiries and consultation.

(Farrell, 2001:2)

Based on the case, the researcher defines a virtual campus as a web-enabled product and service offering of an institution.

The design of the virtual campus of the University of Pretoria was integrated with existing technology architecture and functionality. The reasons are as follows:

- To avoid duplication. The University of Pretoria is a residential institution with a corresponding business model.
- To save costs.
- To service on campus and off campus students.

Section 4.2 provides the background of the virtual campus.

4.2 Background of the virtual campus

The University of Pretoria is committed to relevant quality teaching and research of the highest standard while pursuing internationalisation. The University has nine faculties, in which more than 500 programmes are offered - increasingly by means of a flexible educational model. It is the largest residential university in South Africa and provides training for approximately 50 000 students (of which 25 198 students are residential students).

The University of Pretoria moved into the arena of distance education in 1995 in order to provide more flexibility to learners. The move highlighted a need - and provided the impetus for developing a new, more appropriate education model.

For some time the University had practised a limited mixed mode of delivery, including broadcasting, videoconferencing, multimedia, and web-based courses combined with contact sessions. In July 1997 the University Council approved telematic education as a mainstream activity of the University and the Department of Telematic Education was established. *Telematics* is defined as the use of a range of technologies to support intra and interflexibility in the learning environment and to provide improved access and quality of course offerings (Van Harmelen, 1997). The mission of the telematic education initiative is to create flexible learning environments by making use of a wide range of delivery modes.

A new education model, based on a technology-enhanced flexible learning (telematic education) paradigm, was established in 1997. Telematic education is based on the innovative integration of contact tuition, paper-based distance education and electronic education. The correct combination of technology is determined through instructional design.

Staff at the Telematic Learning and Education Innovation department include instructional designers, photographers, graphic designers and video editors to audiovisual and

broadcasting experts. Project managers coordinate projects and the design, development and maintenance of programmes.

Electronic education is provided via the WWW and through the appropriate integration of various information and communication technologies (ICT) such as interactive multimedia, computer assisted assessment, interactive television and videoconferencing.

Although certain aspects of a virtual learning environment were present at the university in 1997, it was necessary to adopt an integrated strategy to ensure a streamlined, compatible and effective system that can be easily managed. At the time, limited strategy for the design and development of web-based courses existed and there was no infrastructure to support an institution-wide initiative. The researcher was appointed in 1998 as the project leader to establish the virtual campus. In order to create the required integrated infrastructure, five task teams were formed with representation by five support departments and faculties: Academic Information Services (Library), Information Technology, Academic Administration, Financial Administration, academia and Telematic Education.

The University of Pretoria developed a virtual campus [http://www.up.ac.za] that augments the physical campus by providing web-based access to integrated:

- administrative services such as web-based application and payment;
- web-based courseware and instructional materials;
- web-based academic services such as access to full text articles and electronic databases, student records, exam rosters and examination results; and
- web-based communication facilities allowing interaction between lecturers and students, as well as between fellow students.

The main contributing factors which led to a decision in 1998 to establish an integrated virtual campus at the University of Pretoria, relate to the above considerations. By an *integrated virtual campus* is meant that administration services such as payment and application are integrated with library, teaching and learning systems to be accessible via the Internet (Farrell, 1999; Lazenby, 1998). Hence an integrated product and service offering is provided. The strategic reasons behind the decision can be encapsulated in a sentence. Increased competition, decreased funding and a shift in global trends in higher education have made the risk of not moving in this direction a threat to remaining competitive (Tovstiga & Kaehler, 1998; Lazenby, 1998).

The virtual campus infrastructure, processes, products and services were created over a period of two years. More products and services continue to be developed.

Instead of implementing an expensive *ERP* system, portals were developed for staff and students that integrate with *WebCT*; providing access to legacy systems and enabling transactions via the web. The virtual campus renders some of the benefits of an *ERP* system, such as web-enabled, customer-focused services and information.

The University of Pretoria currently offers 70 web-enabled degree programmes and additionally, all registered students can make use of the virtual campus to access information about their studies and to conduct transactions. To date, 31908 students have made use of this service. Other supporting media such as *CDROM* and video create a richer learning environment.

Learning opportunities created by the virtual campus do not replace physical contact tuition. Contact learning opportunities are reduced but also enhanced and enriched to address the challenges of a learner centred teaching and learning approach in a context of growing student numbers.

At the University of Pretoria, scalability of software, adequate infrastructure (capital and human resources) and continuous improvement on current practice remain challenging. The biggest challenge is to bring about institution wide change in teaching and learning practice.

Section 4.3 explains how theories in Chapter Two are applied to the case of the virtual campus.

4.3 Selected theories

Figure 4.1 illustrates how the selected fields in Chapter Two are used to analyse the *process, product and service innovation* components of the virtual campus. The philosophical foundation of epistemology underlies all theories. The theories interface with one another, as was explained in Chapter Two; and each enriches the interpretation of *process*, *product* and *service* innovation. The products and services fan out of the cross-divisional spiral as shown in Figure 4.2.

Process innovation will be described and interpreted through document analysis of non-technical literature and the application of theory. *Service innovation* is mostly described by

means of statistics and by comparing practice discussed in Chapter Three. The researcher continues to describe and interpret *product innovation* through the application of theory, by means of descriptive statistics, and through questionnaires and interviews.

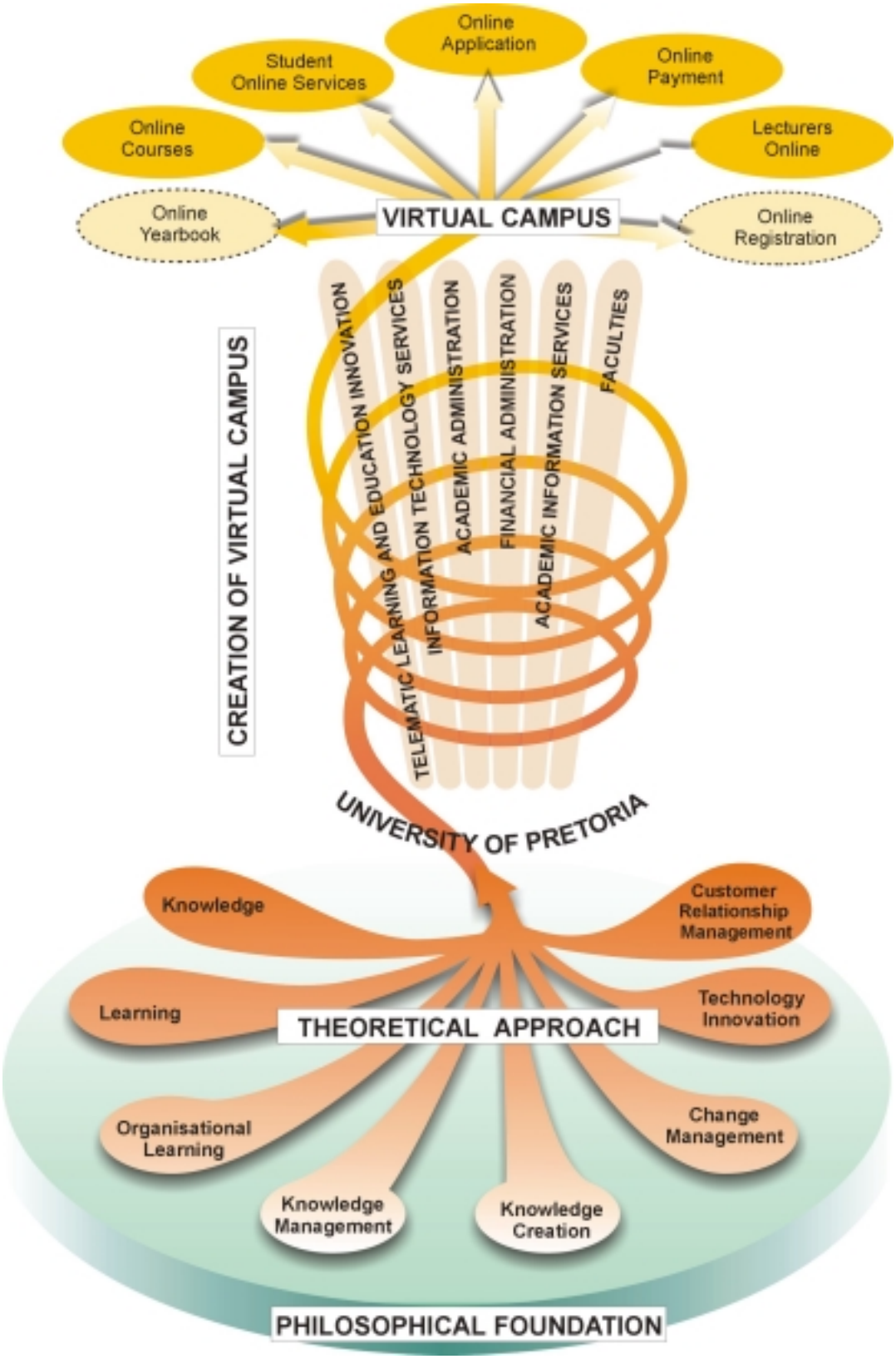


Figure 4.2: Fields used to analyse the creation of the virtual campus at the University of Pretoria

Table 4.1 indicates the products and services of the virtual campus.

Product	**Service**
Online courses	Student Online Services
Online yearbook and degree audit	Online Application
	Online Payment
	Lecturers Online
	Online Registration

Table 4.1 Products and services of the virtual campus

The *online yearbook* and *online registration* respectively are indicated in perforated lines in Figure 4.1 because they are failed objectives.
Processes established by the virtual campus project team refer to new processes that were established to offer the new services and products indicated in Table 4.1

As discussed in Chapter One, the theory in Chapter Two is applied to the case of the virtual campus to answer research question one and research question two:

<table>
<tr><td colspan="2">Research question 1 (Chapter Four)
What does theory reveal about process, product and service innovation of the virtual campus?
Method
Investigation of the creation and evolution of the virtual campus in terms of theory and practice.</td></tr>
<tr><td>Goal</td><td>Data collection methods</td></tr>
<tr><td>Action
(Using the theoretical framework as a tool to investigate the manifestation of its elements in the case study)</td><td>Qualitative methods:
Application of theory, interpretation of interviews, questionnaire surveys, document analysis of non-technical literature and content analysis of courses.</td></tr>
<tr><td></td><td>Quantitative methods:
Collection of quantitative survey data and limited statistical analysis.
Adoption rate of services.
Adoption rate of products.
Aspects of web-based courses.</td></tr>
<tr><td colspan="2">Research question 2 (Chapter Four)
How do process, product and service innovation of the virtual campus inform theory?
Method
Building more knowledge about innovation management and various theoretical fields.</td></tr>
</table>

Goal	*Data collection methods*
Development and interpretive	*Inductive methods and qualitative methods:* Examination of theories and practice being applied in practice, and induction of ways to implement them. Qualitative inquiry into how the theoretical elements function in different aspects of innovation. Qualitative inquiry of how the findings of the case study contribute to knowledge about innovation in higher education. Motivation: The interpretive design is characterised by subjectivity and the study of individual experience. In this study the theoretical approach is further informed by practice, tending to become grounded theory.

Table 4.2 Research questions and methods used to answer them

Table 4.2 shows that both qualitative and quantitative data collection methods are used to answer the two research questions.

Figure 4.3 is a framework for the management of educational innovation. It illustrates how the various theoretical constructs manifested in the creation of the virtual campus in its various components of *process, product*, and *service* innovation. Project management and change management are keys to innovation and are central to continuous knowledge creation enablers and conditions. It is a continuous cycle of learning though doing, accompanied by market adoption as time passes. Knowledge enablers and conditions for knowledge creation should be included as active steps in an educational innovation process.

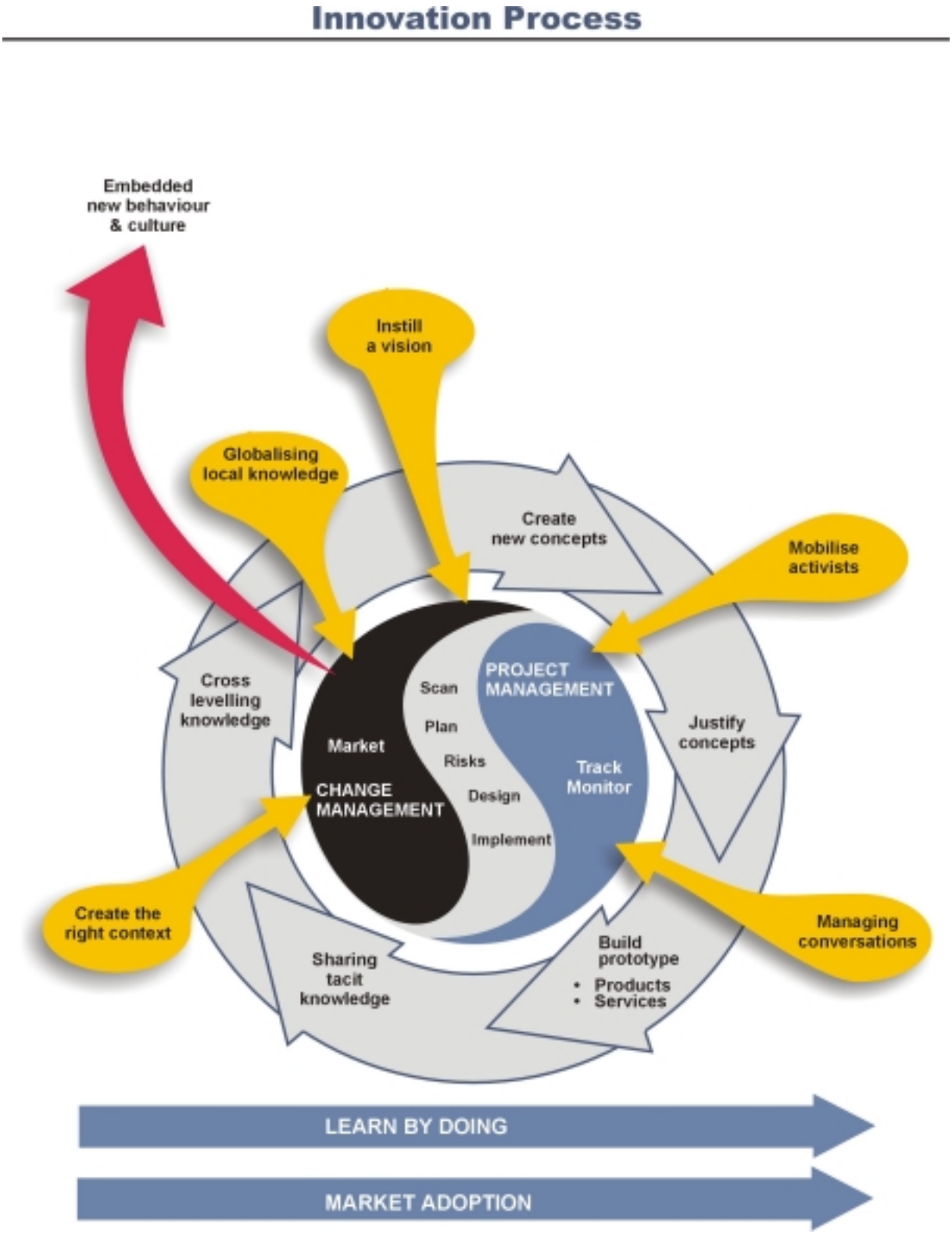


Figure 4.3 Framework for educational innovation management

Table 4.3 indicates which aspects of particular theories were used in the creation and management of the virtual campus.

Strategy	Knowledge creation	Change management	Project management	Technology innovation
Scan environment		x		x
Formulate response/strategy		x	x	x
Create a vision	x	x		x
Create a plan		x	x	x
Identify risks		x	x	
Sell concept	x	x		x
Identify key players	x	x	x	
Refine plan with key players	x		x	
Create teams	x	x	x	x
Implement plan	x	x	x	x
Monitor execution and test on experimental base	x	x	x	x
Adapt based on feedback of customers and process owners	x	x	x	x
Market	x	x		
Reflect on process	x	x		x

Table 4.3 Synthesis of intentional strategies used to create the virtual campus

Table 4.3 shows that most aspects or steps listed in the first column form part of the mentioned theories or strategies. In other words, the steps used to innovate are steps common to a variety of theoretical fields.

Section 4.4 is a document analysis of non-technical data.

4.4 Qualitative Analysis of process innovation

Section 4.4 of this chapter is a qualitative analysis of non-technical data (documents and reports) and focuses on *process innovation*. Non-technical data collected in the case study is analyzed and interpreted in light of knowledge creation, organizational learning, change management and innovation discussed in Chapter Two.

Section 4.4.1 commences by exploring the planning phase of the virtual campus.

4.4.1 Project charter

The researcher drafted a project charter. The project charter was distributed in April 1998 to Executive Management and Senior Management (Deans and Directors). The project charter provided a vision for the university, posed reasons why it was deemed necessary to establish the virtual campus and explained the various components of the virtual campus. The reason for its distribution was to introduce the concept and to initiate the alignment process.

Certain aspects of the project charter are mentioned in the following sections in order to explore them from a theoretical stance. The first month at the university was used to assimilate adequate knowledge about the institution. The newly assimilated knowledge, combined with experience and prior knowledge resulted in a plan on the development of the virtual campus for the university.

From a Change Management perspective, the project charter or project plan meets with some of the requirements of a change management plan provided by Senge *et al*. (1999) (as discussed in Section 2.6 and highlighted in frames). The original text of the project charter is in italics:

> A broad statement of purpose that articulates the organisation's ultimate goals and portrays what kind of organisation the change is intended to create.

Vision

To become an international leader in higher education through technologically advanced infrastructure, services and products.

> A description of core values that the organisation considers most important, such as quality, innovation and service.

> A statement of the core strategies, including a definition of businesses, markets, and offerings and a determination of particular bases for competition.

Project description

The virtual campus aims to establish a web-based platform that is integrated with the existing infrastructure of the University of Pretoria that will provide a range of administration services,

tuition and support to residential and remote students as well as an improved, streamlined service to both academic and administration staff.

What	• *To create a virtual UP campus that is integrated with the existing campus and that will improve existing services, support and products.*
Function	• *An integrated web-based system which incorporates an administration interface, communication with tutors/lecturers and courseware and which manages access to relevant information, knowledge and resources.* • *A communication tool within UP (Intranet and extranet), a global marketing tool (Internet) and an interface with other virtual campuses.*
Why	• *The need for a strategic enabler to provide a global market and competitive advantage.* • *The need for an integrated web-based system that offers quality support, renders excellent administrative service and a rich learning environment.* • *Integration of existing functions, infrastructures and expertise.*
Format	• *Virtual - UP will operate on a platform which is compatible with the existing IT systems (where possible), and products will be used as identified through benchmarking and action research.*

Objectives

- *to create the necessary mindshift (change management) among staff and learners to facilitate the successful implementation of the virtual campus, including new performance management measures,*
- *to train staff and students to utilise appropriate technologies,*
- *to provide easy access to workstations and networked information services,*
- *to register learners for on-line interactive courseware and to provide on-line registration and payment,*
- *to provide totally integrated on-line instruction, which includes assessment, tutoring and accreditation,*
- *to provide accelerated, self-paced learning, i.e. the learner can progress at his or her own pace, place and time and, consequently, can complete an instructional degree, diploma or short course more rapidly,*
- *to provide an integrated academic and administrative service to learners and to staff (simplified interfaces, procedures, and documentation for accessing networked information services).*

Operational performance: the actions that will be taken to improve the effectiveness of the core operations, including process redesign, quality, cost reduction and service and product innovation.

Ownership

The ownership of the virtual campus lies with the Faculties, Finance, Information Technology, Administration, Academic Information Services, Telematic Education and students.

> Organisation: a broad framework for the architecture of the enterprise – the structures, processes, and systems that will enable people to perform the work required by the strategy and vision.

Overall requirements

- *Adequate technology equipment for administrative and academic staff and networked instructional environment and secure access from anywhere.*
- *Integrated instructional technology unit to provide staff with instructional design and development and integrating technology into the curriculum.*
- *Technical support and maintenance (to support faculty with well-defined projects for experimenting with new technologies and innovative ways of employing them in the teaching, learning and research processes).*
- *Ownership by staff, students, Management, Information Technology, Academic Administration, Financial Administration and Academic Information Service.*
- *Monthly reporting line to management/vice-chancellor/representative committee.*
- *Structured project management and instructional design processes linked to relevant market research and environmental scanning.*

Although no human due diligence was conducted as recommended by Conner *et al*. (1998), the university underwent a restructuring and downsizing exercise at the time. No additional capacity was created – meaning that staff had to engage in the virtual campus project in addition to regular workloads.

Returning to the work by Senge *et al*. (1999) the project plan is measured against qualities of important change initiatives in Table 4.4.

They are connected with real work goals and processes.	Yes. The products and services that were created are central to the university's core business.
They are connected with improving performance.	Not necessarily performance of people, but more effectiveness and efficiency and improved quality regarding products and services.
They involve people who have the power to take action regarding these goals.	Yes. In a sense the virtual campus team did not have the power to make strategic decisions, yet they were the only ones who could implement the changes due to them being the knowledge champions of the various domains.
They seek to balance action and reflection, connecting inquiry and experimentation.	Not sure. Short timelines left little time for reflection although it was a continuous process of building knowledge, implementing and adaptation based on experience.
They afford people an increased amount of 'white space': opportunities for people to think and reflect without pressure to make decisions.	No. In this project no additional capacity was created. Apart from their regular work they had to cope with additional pressure.
They are intended to increase people's capacity, individually and collectively.	Yes. In terms of building new knowledge and improving processes and systems.
They focus on learning about learning, in settings that matter.	Yes.

Table 4.4 Application of qualities of important change initiatives (Senge, *et al*., 1999)

If one reflects on the two main differences between theory and practice, the team members were not necessarily the most empowered group in terms of authority and status. Yet they had the ability to execute changes and their knowledge was central to product and service innovation. Furthermore there was no additional time or resources provided, which means that either people create their own 'white space' to reflect or it is not necessary to reflect on the changes. The researcher would postulate that reflection takes place in any case and that it is not a requirement to build white space into a change management plan. To support this it is important to emphasise *a sense of urgency* (Kotter, 1995:61) that is necessary to keep momentum.

Section 4.4.2 describes the reporting line of the project. The procedure by which the virtual campus project team was established as well as the tasks set out in the project plan are discussed and listed below.

4.4.2 Execution and implementation: procedures and processes

The researcher reported to the Director: Telematic Learning and Education Innovation in line function, and to the Vice-Chancellor and Principal in the capacity of an intrapreneur (Pinchot, 1985) during the first year of creating the virtual campus. In this light, the Director: Telematic Learning and Education Innovation acted as the *Sponsor* and the Vice-Chancellor and Principal as the *Protector*. The researcher is of the opinion that top management support was one of the critical success factors of the project.

Based on previous experience, the researcher decided to adopt a matrix management style for the project, in other words working horizontally across various departments and faculties. In Section 2.5 2 Von Krogh *et al*. (1998:133-136) note that an organisation's performance depends on the extent to which managers can mobilise knowledge resources held by individuals and turn these into value-creating activities, such as the creation of new knowledge. A strategy was followed to hand pick individuals with the most tacit knowledge from the departments, illustrated in Figure 4.2. Apart from being *knowledge champions*, some of them were also *middle managers* in their departments – the most important knowledge creators in an organisation - as discussed in Section 2.5.2 (Nonaka & Takeuchi, 1995:129).

The individuals were first approached by the researcher to get their buy-in to take part in the virtual campus project. As a next step, senior management was approached to permit the selected staff members to serve on the virtual campus project team. A total of twenty members served on the team, comprising four project managers and one project leader.

The virtual campus project team met on a monthly basis in the Council Hall opposite the Vice-Chancellor and Principal's office. This created an official and mandated environment for the project team and contributed to what is described in Section 2.5.3 as *ba* – an enabling context or place in which knowledge is shared, created and used. The meetings were used to discuss constraints and share detailed progress.

Using constructs proposed by Von Krogh *et al*. (2000:178) discussed in Section 2.5.3 the process followed by the project team was reminiscent of the four ways of creating *ba*:

Originating interaction.
Conversing.
Documenting.
Internalising.

The researcher used *MS Project* as the project management tool. The original high level work break down structure (WBS) and project overview of 1998 is provided in Annexure B. A detailed list of tasks was constructed by the project leader (Annexure C), based on the project charter and knowledge assimilated from project team members and key individuals in the university. Hence, the initial analysis and design phases were in place and the deliverables, or specific tasks served as a conceptual prototype or blueprint that could be implemented. Each deliverable was tightly scheduled by the project leader. This was a deliberate strategy to act as a push factor and create momentum. Kotter (1995:61), as discussed in Section 2.6, argues that *establishing a sense of urgency* is a strategy to create organisational change. Although it refers more to competitive realities, the short time lines contributed to a sense of urgency. The vision of becoming more competitive by means of creating a virtual campus was continually communicated. Each project manager had to report back in writing before the next meeting. The feedback was included in a status report that was distributed to members beforehand. This procedure ensured that members keep their momentum and assisted with the knowledge creation process. The report also served at the strategic technology committee of the university, on which the Vice-Chancellor and Principal have a seat – which was an implicit top-down strategy that encouraged members to keep to the stated deadlines. By providing frequent written feedback on tasks in progress, *explicit* knowledge was created from *tacit* knowledge then *justified* during the meetings. The resulting products and services can be interpreted as *explicit* knowledge, which in turn would be adapted on an ongoing basis as team members grew more comfortable in the innovation environment and learned through trial and error what worked best. It proved to be true *learning by doing*.

In the first status report the researcher wrote the following:

WE WILL HAVE TO ACCEPT THAT THE PROCESS IS TYPICAL OF WHAT IS TERMED 'CHAOS MANAGEMENT' BECAUSE OF THE NATURE OF THE FIELD AND THE FACT THAT AN INSTITUTION USED TO AN ORDERED AND PREDICTABLE WAY OF OPERATING HAS INADVERTENTLY BEEN PLUNGED INTO A PERPETUALLY CHANGING ENVIRONMENT.

If one applies the work of Nonaka and Takeuchi (1995: 74-83) the conditions for enabling knowledge creation, i.e. *intention*, *autonomy*, *fluctuation* and *chaos* were conditions that the project team was exposed to.

The cross-functional nature of the project team required project members to work across departments – a difficult task in an institution with a silo-based culture where people are accustomed to work vertically within their departments. This challenge, combined with having to cope with normal workloads caused interesting dynamics. As project leader, the researcher observed the following:

- Reactions to the change was individual-based, but often influenced by the culture of a particular department.
- Some middle managers on the team participated superficially, but never committed through action – it is the researcher's view that this occurred because of strong silo-based behaviour by their managers.
- A lack of resources in the Department of Information Technology led to the appointment of a programmer to create the necessary infrastructure required for the virtual campus.
- Some members worked against the initiative by duplicating the infrastructure without informing the team. This behaviour can be interpreted as positive in the sense that it indicated that they had bought into the vision – i.e. web-enablement of services and products. It also created *redundancy*, unfortunately not only of information, but also of systems. A negative interpretation is that they did not experience ownership of the project and resorted back to a silo-based culture because they did not feel comfortable working cross-divisionally.

In terms of the comparison between Japanese-style versus Western-style organisational knowledge creation discussed in Section 2.5.3, characteristics from both styles manifested in the virtual campus project. Table 4.5 illustrates which characteristics manifested.

Japanese style of knowledge creation	**Western style of knowledge creation**
Group based	Explicit knowledge orientated
Tacit knowledge orientated	Strong on externalisation and combination
Strong on socialisation and internalisation	Emphasis on analysis
Emphasis on experience	Less redundancy of information
Group autonomy	
Creative chaos through overlapping tasks	
Requisite variety through cross-functional teams	
Ambiguous organisational intention	

Table 4.5 Types of organisational knowledge creation in the virtual campus project

The reason why “ambiguous organisational intention” is listed is because the virtual campus as a concept was never propagated by the Vice-Chancellor from any public platform. He supported it in concept, through individual discussions and by giving resources, but it was never driven as a formal strategy of the university. It proved to be a good strategy. The researcher is of the opinion that, had the Vice-Chancellor officially driven the virtual campus, more institutional resistance would have emerged than was the case with the more subversive process.

A direct advantage was that the virtual campus project team made decisions based on their collaborative experience and then proceeded to implement without having to wait for approval by senior or executive management. It contributed to maintaining momentum and fostering motivation because the team felt empowered. This is consistent with Kotter (1995:61) who states that *assembling a group with enough power to lead the change effort* and *empowering others to act on the vision* ; are two success factors in organisational transformation.

The deliberate selection of project team members and academic champions to drive the pilot or lead projects are in line with the recommendation by Duderstadt (2000:268) to “identify key individuals at different levels who will buy into the transformation process and become active agents to drive it”. Futhermore, to focus them on different aspects of the transformation; as discussed in Section 2.7.3.

Table 4.6 shows an application of the innovation management process of Tidd *et al*. (1997:36) in creating the virtual campus.

Basic ability	**Contributing routines**
Recognising	The signals of virtualisation, lifelong learning, customer focus and globalisation triggered the decision to create a virtual campus.
Aligning	To ensure a good fit with the business model and strategy of the university, the virtual campus was integrated with existing infrastructure and not developed as an add-on fixture.
Acquiring	Owing to limited resources, *WebCT* was selected by combining forces with two other institutions. Therefore an off-the shelf product was bought instead of developing an in-house developed system.
Generating	The university created the capacity to build the virtual campus architecture in-house, mainly because of the need for a customised interface with legacy systems.

Basic ability	Contributing routines
Choosing	It was decided to initiate the use of *WebCT* on a postgraduate level, primarily because postgraduates are thought to be more independent learners and possibly have better access to Internet technology than undergraduates because most of them are employed.
Executing	The project team of the virtual campus fulfilled the function of managing the development of products, services and processes from the initial idea through to the final launch.
Implementing	The project leader held numerous information sessions to ensure acceptance and effective use of the virtual campus. Although diffusion has occurred, it is the researcher's opinion that change management, of which marketing is a component, was not adequate.
Learning	The process of evaluating and reflecting upon the innovation process of the virtual campus and identification of lessons for improvement in management routines is a continual process.
Developing the organisation	New structures, processes, procedures and policy have been embedded into the institution.

Table 4.6 Application of innovation management model to virtual campus (adapted from Tidd, *et al*., 1997:36)

Through the two-year process of working cross divisionally some of the project team members acquired *generic knowledge*, i.e. knowledge about change (Section 2.7.3). The team brought together talent and views from across the organisation, while at the same time moving outside their silos. The experience equipped them to better understand and deal with change.

The tasks were assembled during the first two months with the responsibilities listed below each department. Many of the tasks required cross-functional activity. The deliverables (tasks and outcomes) were first drafted by the project leader and then discussed and negotiated with team members. The documentation is original and has not been altered since 1998 in terms of content, but only in terms of format for the purpose of this study. Standing items on the agenda of the project team are also included as non-technical data (framed). A ✓or **x** is shown next to deliverables/tasks to indicate success or failure (Annexure C).

Section 4.5 describes the architecture of the virtual campus.

4.5 Virtual campus architecture (process innovation)

The Information Technology members had the task of creating the required infrastructure to support the virtual campus. This entailed an adequate network backbone and secure access to the virtual campus from anywhere in the world. Furthermore, additional infrastructure had to be created on campus to improve accessibility. The department had to take responsibility for the hardware (servers) of the virtual campus and the abovementioned infrastructure. A critical responsibility was to integrate processes across departments – specifically the library (Academic Information Services), Academic Administration and Finance to ensure that students have seamless access to relevant information and to transactions. An important task was to assist Finance to identify correct protocol for e-commerce (credit card payment on the Internet) transactions.

In 1998 two facilities (*PC Anywhere and Netblazer*) were available for especially support staff to access the mainframe and e-mail from home. The project manager of the IT component of the project team initiated a subproject to investigate the possibility of a better solution. A contract for dial-up facilities from home (*Icon*) was signed in May 1999 and implemented. The Internet Service Provider (ISP), *Internet Solutions* remains the contractor to date.

The virtual campus server was implemented in December 1998 and *WebCT*, the selected web-based teaching and learning solution described in Section 4.10 was installed.

In February 1999 a dedicated programmer was appointed on contract to develop the interface between *WebCT*, Student Administration, Student Accounts and Academic Administration and Academic Information Services. The virtual campus architecture is illustrated in Diagrams 4.1 – 4.4. In effect the virtual campus architecture provides the functionalities of an *ERP* system by means of integration on the front-end. In other words, a portal architecture was created that provide integrated access to personalised information and secure transactions via the web.

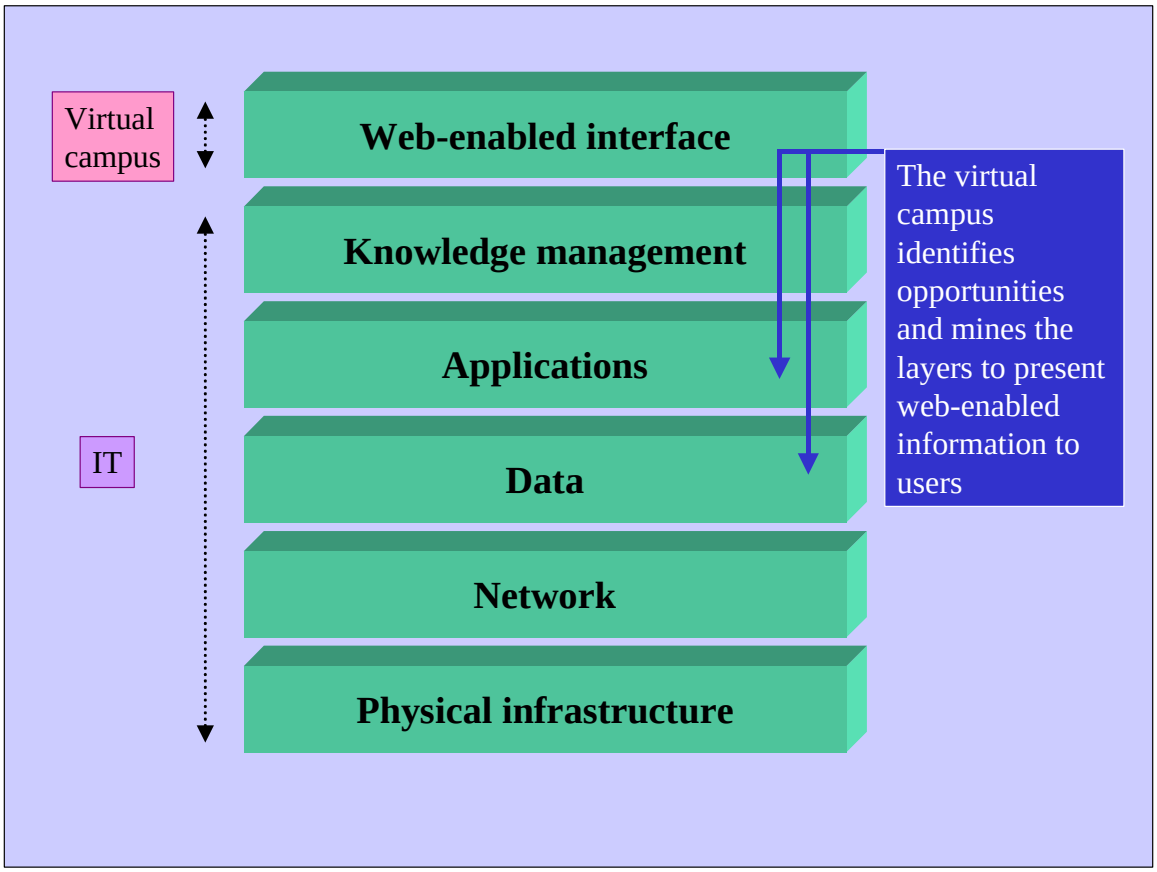


Diagram 4.1 Illustration how the virtual campus provides a view of data otherwise not accessible

This diagram illustrates how the virtual campus provides a view of data otherwise not accessible to customers. This relates specifically to student administration and student accounts on the mainframe; *WebCT* course access and access to information sources on various databases.

What is important to note is that the virtual campus architecture was not a duplication of infrastructure, but merely integrated distributed data to provide a seamless client interface for lecturers and especially students.

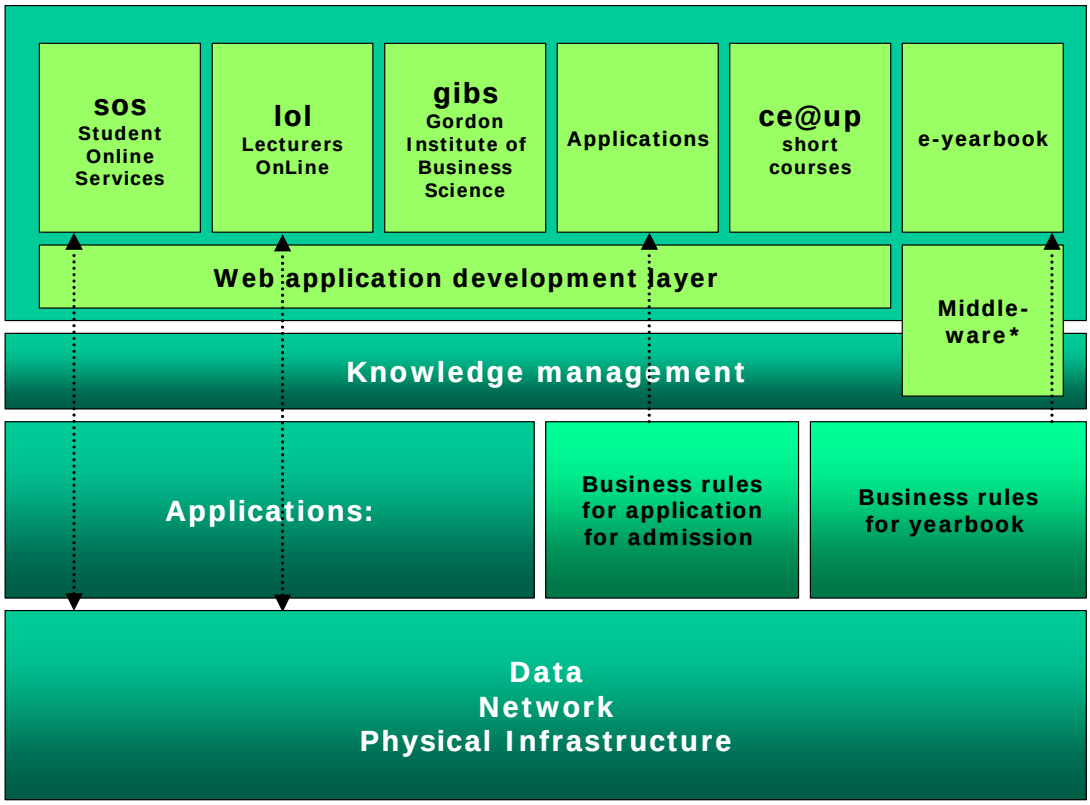


Diagram 4.2 Service applications of the virtual campus

The top layer of the diagram shows the service applications of the virtual campus. *WebCT* was also implemented at the Gordon Institute of Business Science, an affiliate of the university, and at CE@UP - Continuing Education at the University of Pretoria.

The virtual campus architecture is based on a data warehouse concept in the sense that it mines data from various databases and makes it accessible to users via the web. This is made possible through a *MySQL* database. The virtual campus server runs on Linux as the operating system.

A recent addition to assist with writing back to the *Natural Adabas* databases on the mainframe is middleware, called *Broker*. It is possible to use the system, which runs on an *NT* server, to execute queries initiated from a web page by proxy through the main database engine and return web-formatted results to the user.

The following section will demonstrate the portals that have been created as part of the virtual campus.

The architecture of the web application development domain

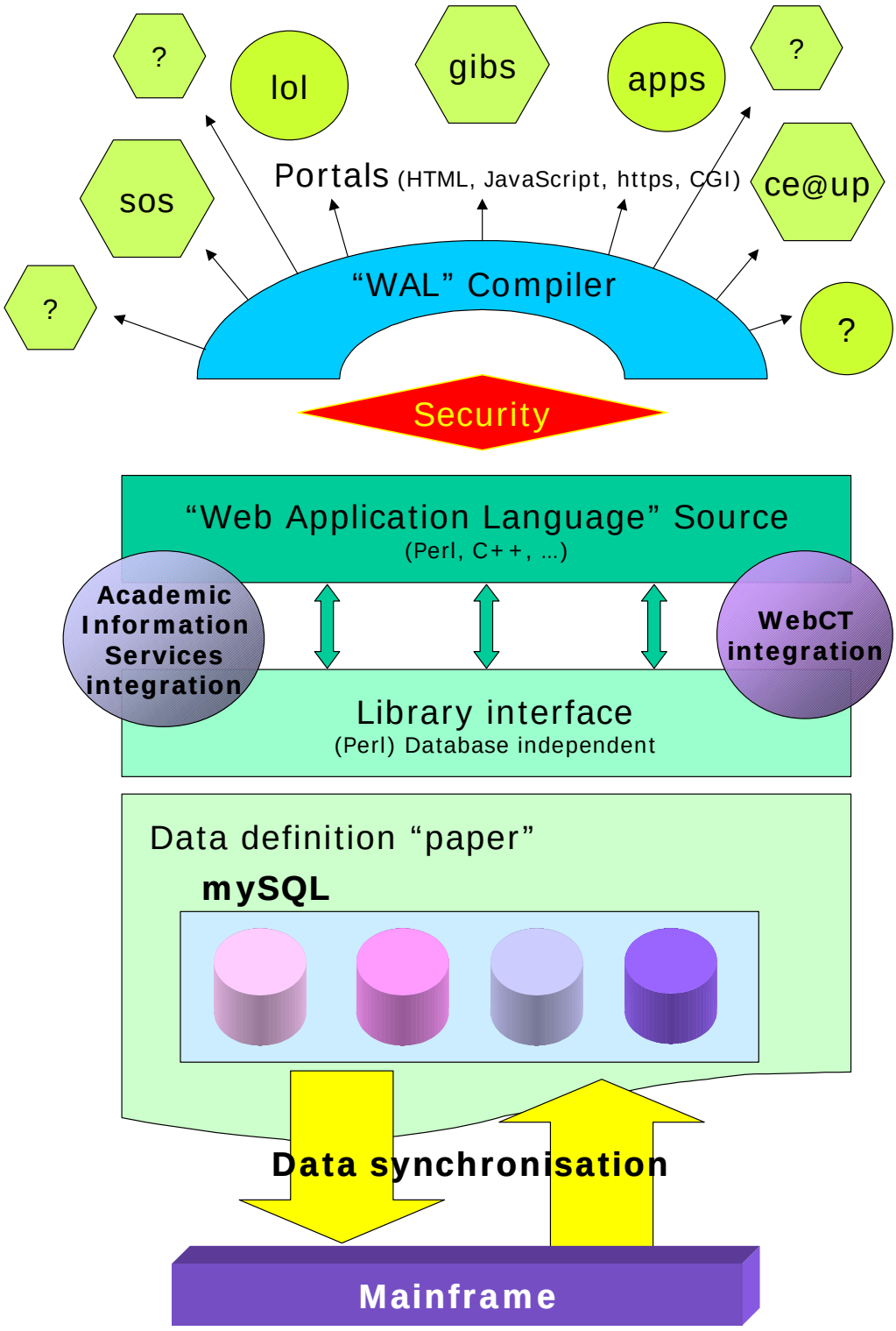


Diagram 4.3: How the Web application development domain functions

Diagram 4.3 shows how the diverse components work together to web-enable enterprise transactions. The virtual campus component runs on a set of Unix servers, using *SQL* database technology, married with *CGI* and *Perl* scripts providing web ready output. The

system receives daily updates from the repository on the mainframe and supplies student results and payment details in return. The different portals aim to give users universal access points to the full variety of services the enterprise supports. This meets the requirement of an Open Data Base Connectivity (*ODBC*) architecture.

The system's development has been highly cost effective, since open source techniques were used and almost no licensing fees had to be paid to any party for any of the software. The portability of the system is assured by its usage of standard web technologies, i.e. *Perl* and generated *HTML*. In terms of function, the usage patterns show the way, since almost all students at the university have at one or other time used it. The fact that a single programmer did all the work in a span of less than one year is evidence of rapid, cost-effective deployment. A detailed diagram of the virtual campus architecture is provided in Annexure D.

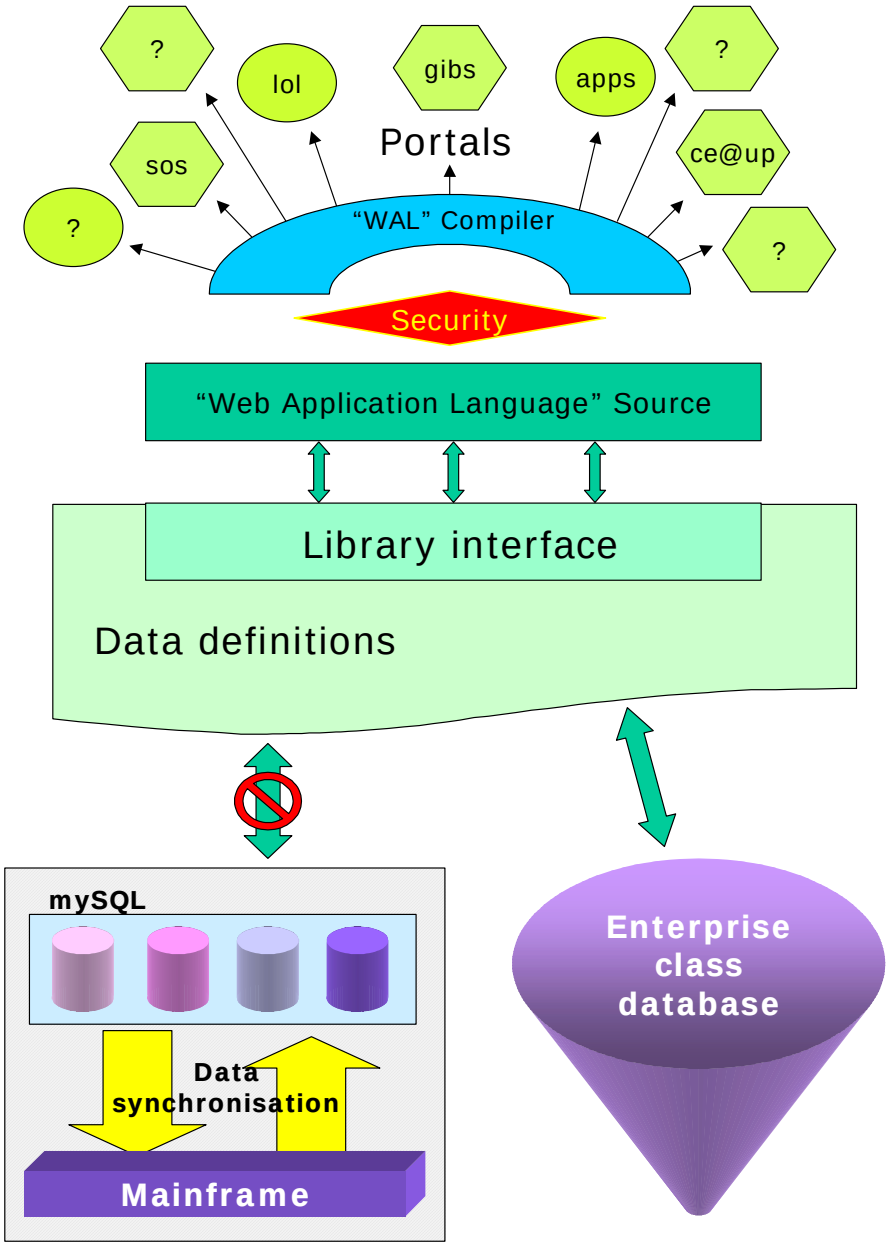


Diagram 4.4 Data mining procedure

The above example shows the wisdom of having chosen a solution that meets the classical criteria for information technology deployment; i.e. cost effectiveness, functionality, rapid rate of deployment and portability. It also happens to meet the stated requirements of a solution proposed by an IBM report (IBM, 2000), since the present problem with data duplication will be eliminated by improved data-warehousing techniques.

In terms of information technology, emphasis has always been placed on the ability to maintain continuity with existing systems, while at the same time keeping open several possibilities of action. The advantage this brings becomes clearly evident when one studies recommendations made by IBM in 2000 (IBM, 2000). The list of recommendations follows:

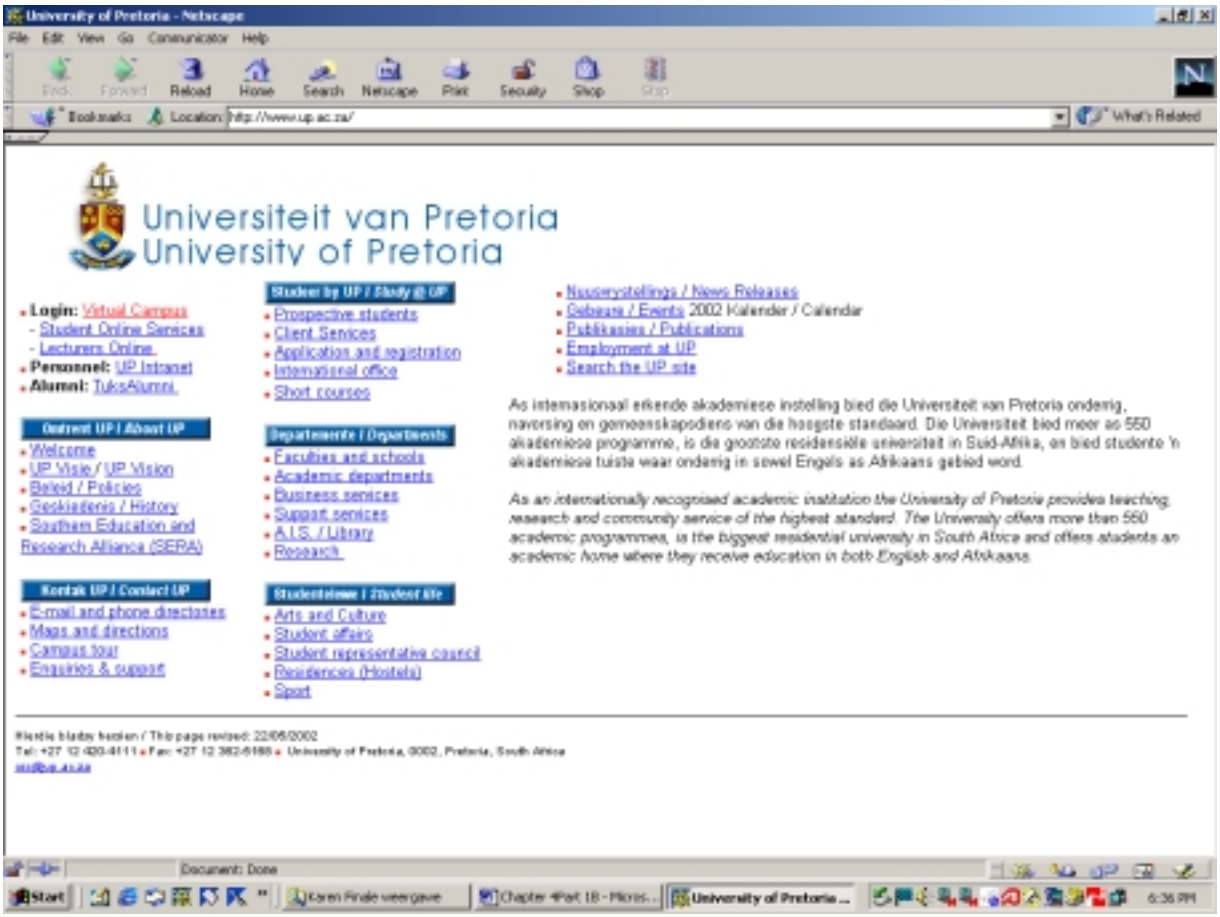
- Move towards an open architecture and open standards
- One primary logical database
- Data must be captured once only
- Asynchronous transaction completion must be possible
- Applications should separate business logic, presentation and data

Some of the key findings of the report are as follows:

- Internet enabled systems and solutions are required & evolve rapidly
  - New access channels such as kiosks and handheld devices soon to be supported
  - Network computers / Thin clients
  - Rapid growth in telematic education and the virtual campus concept
- There is a need for data warehousing, data marts and business intelligence

The virtual campus web site serves as a universal access point for both students and personnel. As envisaged, its role will expand to include the full student life cycle. Unfortunately the scope of this study does not allow the inclusion of the Client Service Centre, which has evolved from the virtual campus – covering a wider range of services to students via multimedia contact channels.

Screen capture 4.1 illustrates the current access point to the virtual campus on the home page of the University of Pretoria.



Screen capture 4.1 Login to the virtual campus on the home page of the University of Pretoria

The virtual campus was marketed to staff by means of numerous presentations and information sessions. A formal launch was held on 21 October 1999, with guests ranging from the Mayor of Pretoria to Vice-Chancellors of Universities and Technikons in South Africa. However, the researcher is of the opinion that more marketing was required – especially among students. Very little was done in terms of marketing to primary user groups.

The design and development of all components of the virtual campus was complete by September 1999, consisting of the following products and services:

4.6 Student Online Services (service innovation)

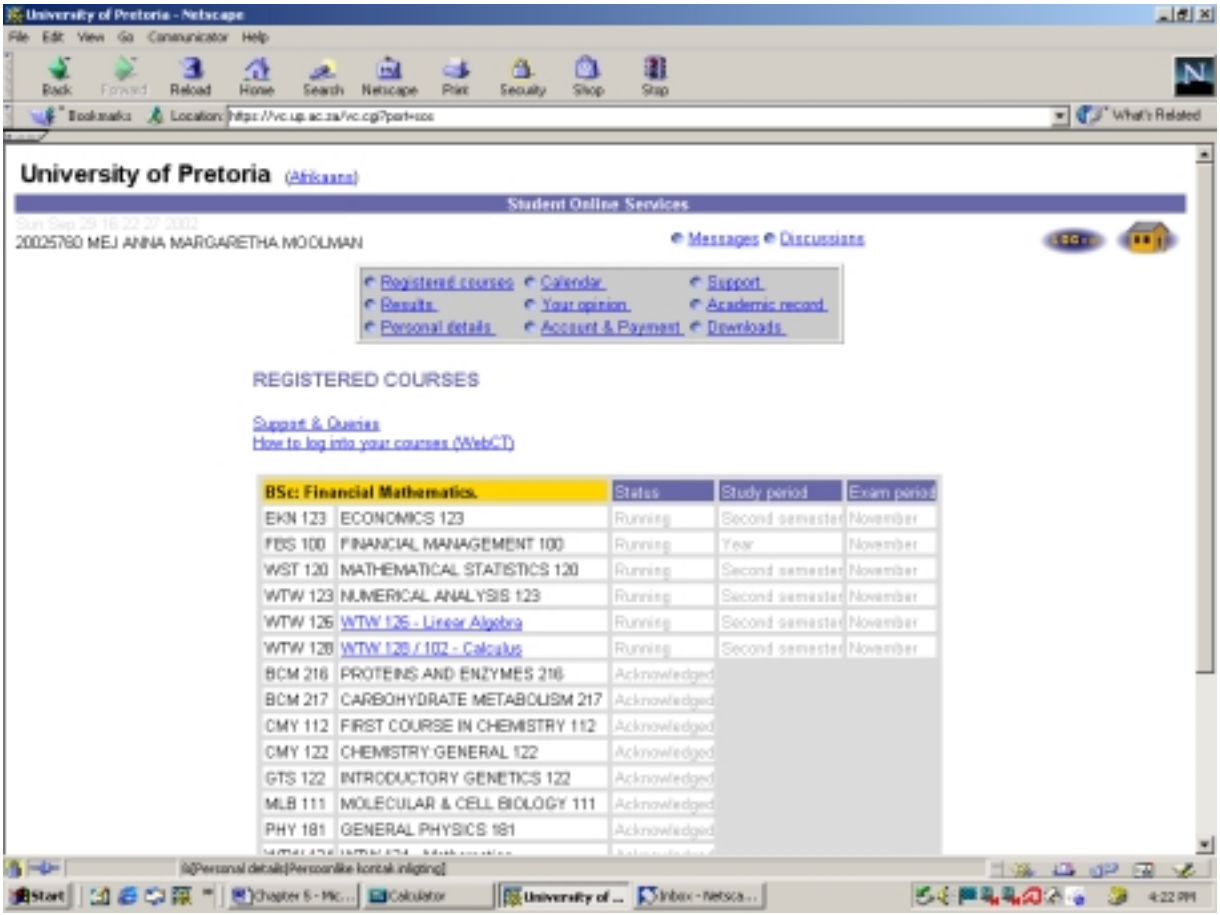
A web portal for all registered students at the university was developed where they have secure access to their unique profile regarding the following aspects:

- Courses
- Exam results
- Academic records
- Rosters
- Account statements
- Credit card payment facility
- Biographical information

This portal allows any registered student at the university to log into the system and commence with supported transactions.

In terms of CRM, Student Online Services has given students great flexibility in terms of place and time of accessing relevant information and doing transactions. The institutional benefit is that administration person-hours are reduced significantly because students self-service.

Screen capture 4.2 illustrates Student Online Services. Web-enabled courses in *WebCT* are hyper-linked for easy access, as in the cases of WTW 126 and WTW 128 in the illustration.



Screen capture 4.2 Student Online Services

The development process followed the knowledge creation steps provided by Nonaka and Takeuchi (1995:84), also illustrated in Figure 4.3.

The new concept of a virtual campus that will provide seamless access to information and transactions fits the step of *create new concepts. Justification* of the concept occurred by means of continuous presentations and discussions – the latter mostly held during project team meetings. This phase assisted with diffusion of the new idea by building awareness, understanding and in some instances, commitment. A *prototype* was developed, based on numerous conversations and workshops with various process owners. The prototype was implemented and activated without pilot testing the services. Supporting these new processes, products and services led to sharing of tacit knowledge as cross-divisional teams worked together in a new environment. *Knowledge management* resulted though *cross-levelling of knowledge* – i.e. making new knowledge gained by experience (tacit knowledge) flow by *sharing tacit knowledge*.

Market adoption took place without resistance – probably because of a captured market requiring access to the particular products and services. Another possible factor is the *ease of use* of Student Online Services. The system is user- friendly, which is a contributing factor

to successful adoption as discussed in Section 2.6.2 (Davis, 1989, Rogers, 1995) and Section 2.6.7 (Collis, *et al*., 2000).

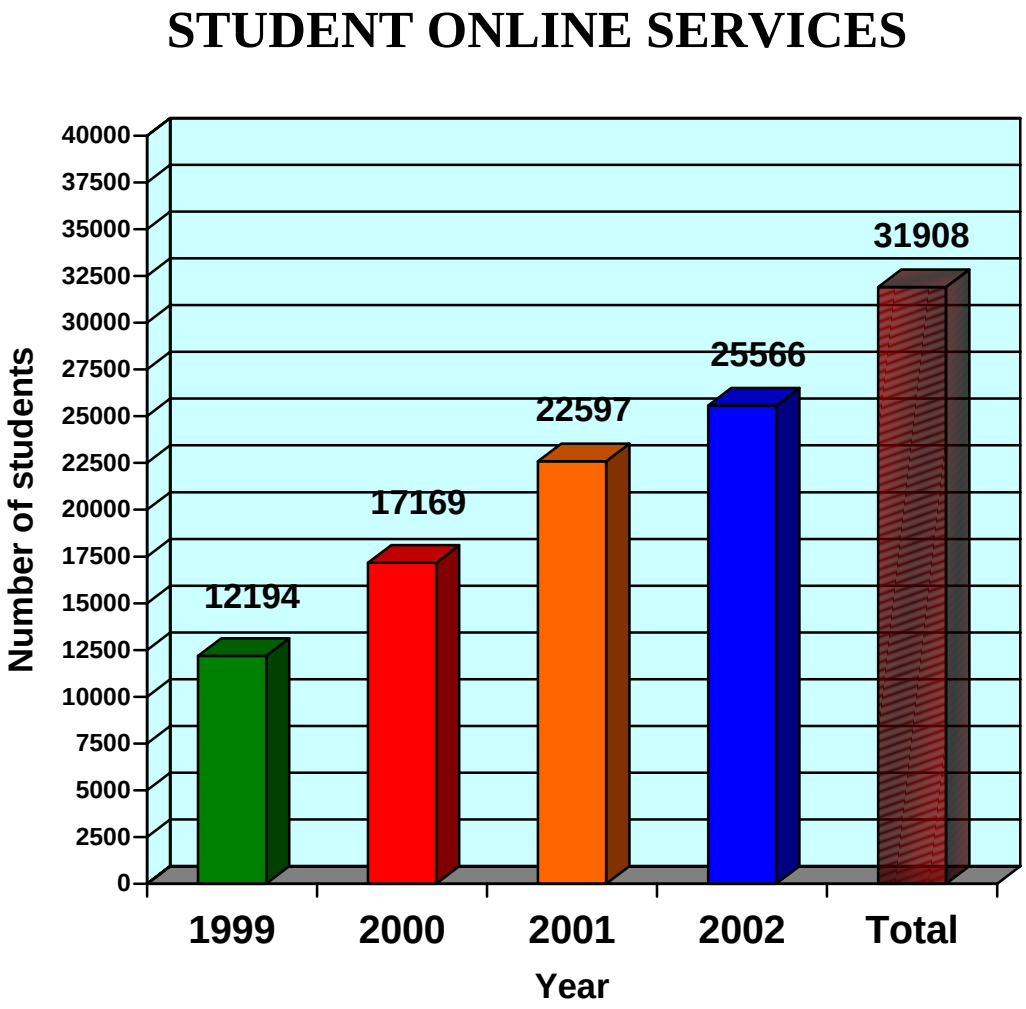


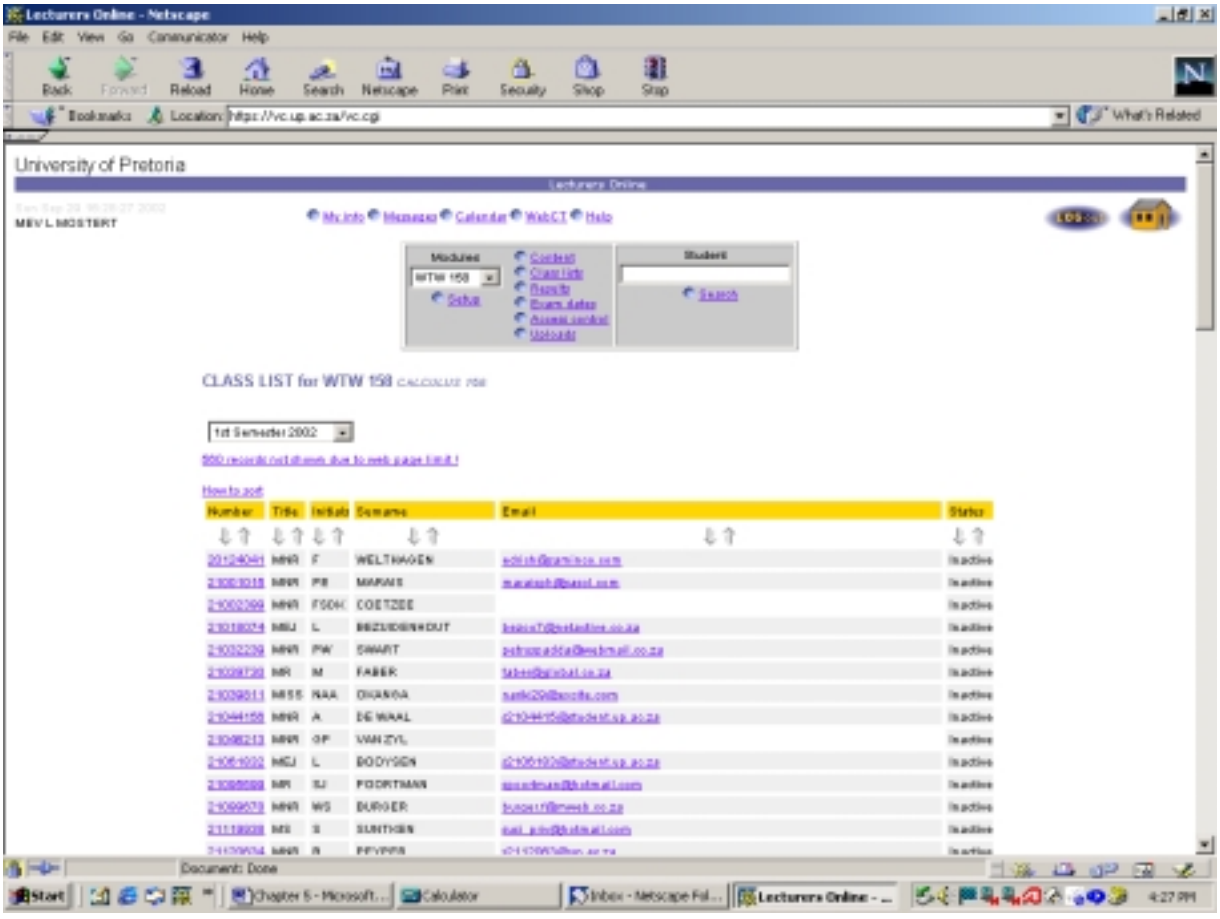
Figure 4.4 Student Online Services – total unique student users to date

Figure 4.4 shows the classic 'S'-curve which will probably reach a saturation point as the majority of students (captured market) use it. Yet an increase in the use of the system will depend on added functionality. Almost four years have passed without making major adjustments to the system. New functionality will be required to remain innovative.
The total of 31908 students refers to individual students who have accessed the system. A cumulative total would be inaccurate because the same users access the system until they graduate.

Section 4.7 describes Lecturers Online as a service innovation.

4.7 Lecturers Online (service innovation)

Lecturers Online is a web interface for all lecturers to view student information and manipulate class lists. It is linked to *WebCT* but is also available for lecturers who do not use *WebCT*. The initial specification was that lecturers would be able to upload student marks to the mainframe system via this interface. This effort never succeeded for two reasons. A duplicate system with more functionality was released a year later by Academic Administration. The additional functionality was possible because they are the owners of the student administration data. Unfortunately the new system was not linked to *WebCT,* because the particular developers did not collaborate with the project team stakeholders. The two systems created confusion among lecturers and impacted negatively on the diffusion of Lecturers Online. Both Lecturers Online and Student Online Services receive data from the mainframe and Student Online Services also updates data on the mainframe. Screen capture 4.3 is an example of a class list. Each student name has an active link to student specific information.



Screen capture 4.3 Lecturers Online

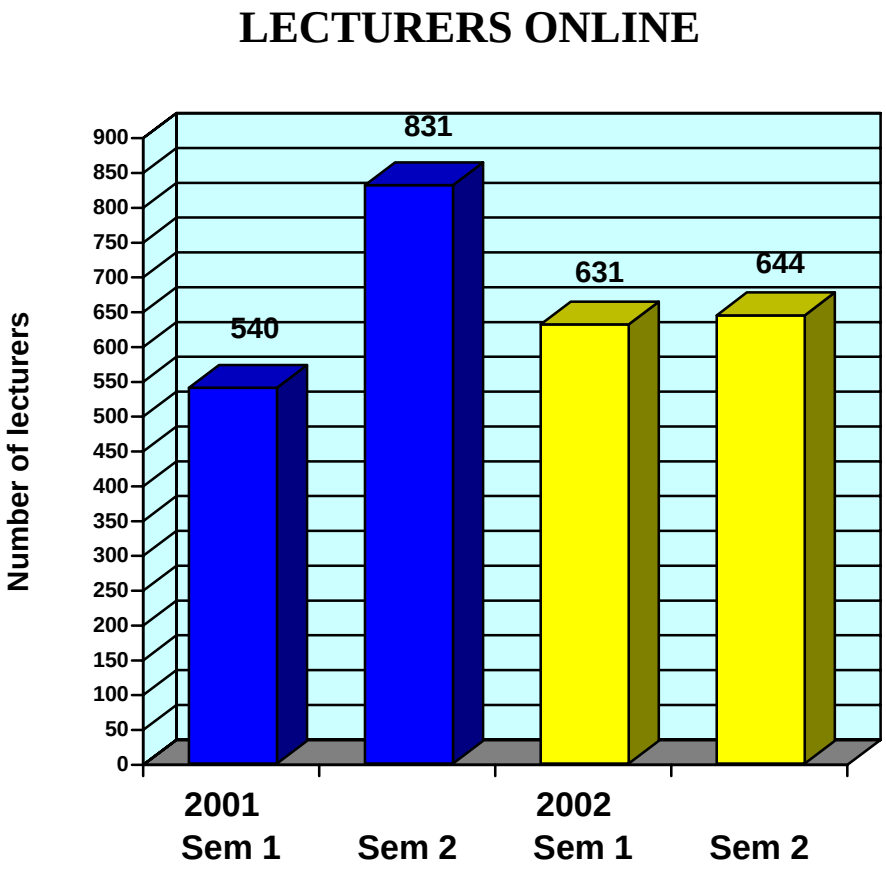


Figure 4.5 Usage of Lecturers Online

Figure 4.5 shows a slow adoption rate of Lecturers Online, which could be attributed to a duplicate system (that causes confusion) and a lack of marketing.

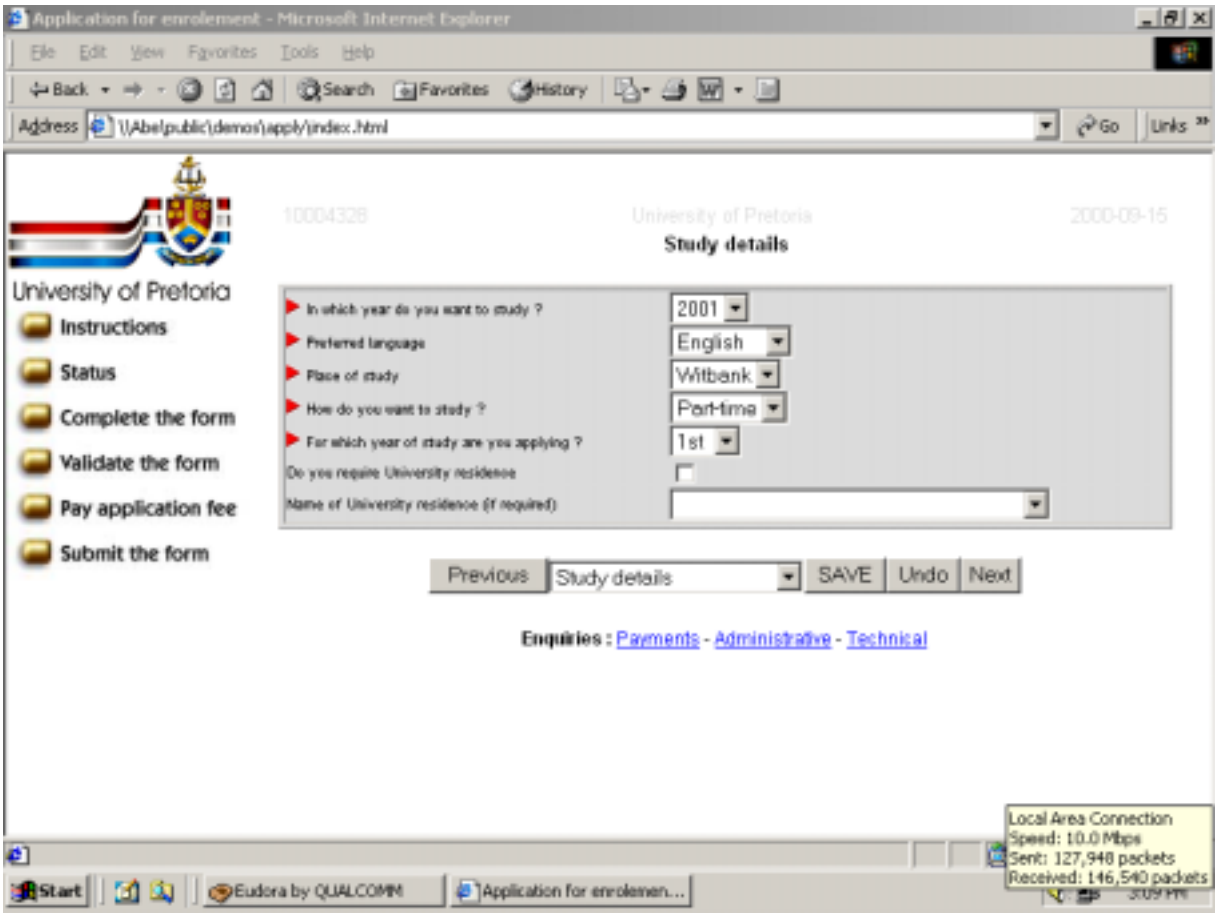
Section 4.8 describes the web-based application system as a service innovation.

4.8 Web-based application system (service and process innovation)

The main task of Academic Administration was to integrate the student administration database on the mainframe with the virtual campus so that students can access their profiles via the web. It included the development of a more sophisticated yearbook and degree audit as well as registration via the web.

An analysis that continued over a year pointed to the difficulty of developing a web-based registration system. The main constraint is that business rules in faculties are complex and change – requiring sophisticated expert systems to web enable this service. The *application for admission* business process proved to be simple enough to be coded. Consequently, an

interactive web-based application system was developed. In the past, students had to complete a hard copy and either post it to the university along with a cheque payment or had to physically go to the campus to hand in the application form. The constraints of such processes for employed and international students are obvious. Academic Administration was closely involved in providing the business requirements of the new system. It now constitutes 10% of applications received by the university.



Screen capture 4.4 Application for admission system

Students can apply online for admission via the web-based application system. It is not simply a form, but a dynamic system that verifies compulsory fields, linked to the online payment system. The design of the system, however, is outdated and needs to become more intuitive. Another limitation is that it was never integrated at the 'back-end' with the mainframe, because Academic Administration felt that student data belong to them. This kind of silo-based thinking has jeopardised the quality of new services.

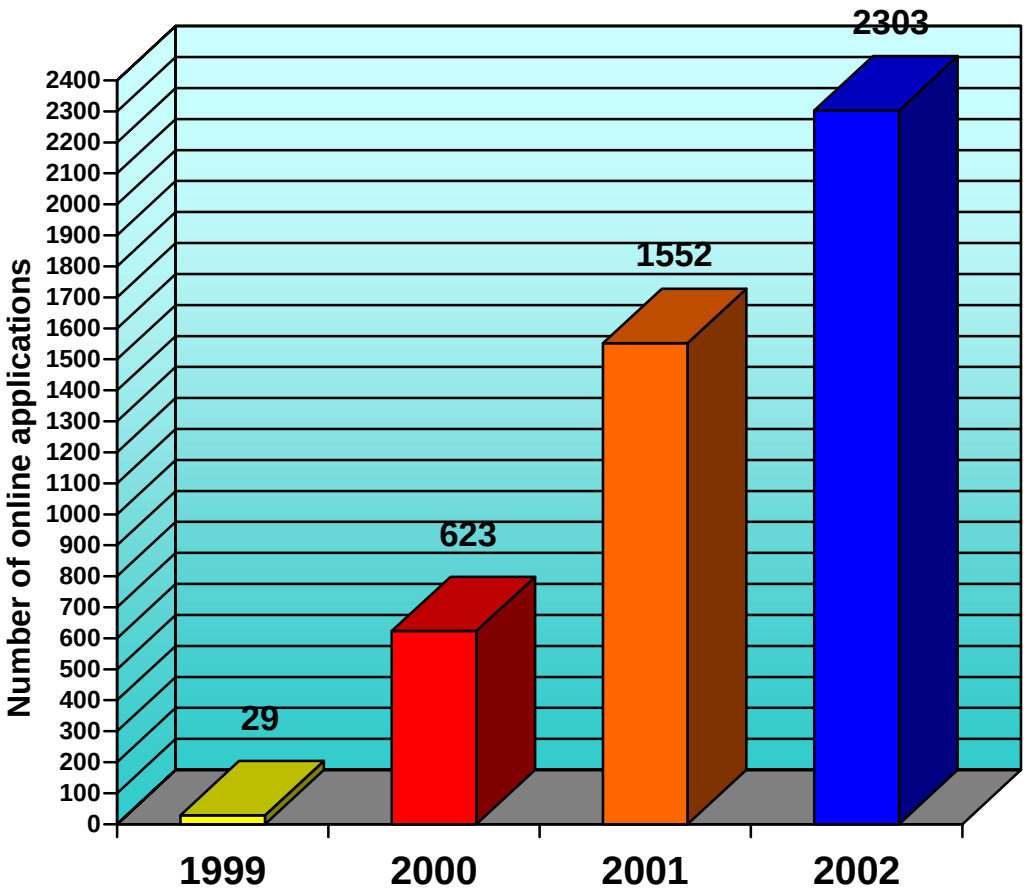


Figure 4.6 Web-based applications

Figure 4.6 shows an exponential growth rate – resembling the 'S'-curve. As mentioned before, it constitutes 10% of applications received by the university. If the system goes down during an application, it saves the transaction so that the user can resume where he or she left off.

Figure 4.7 depicts the new process that was created to support the service innovation.

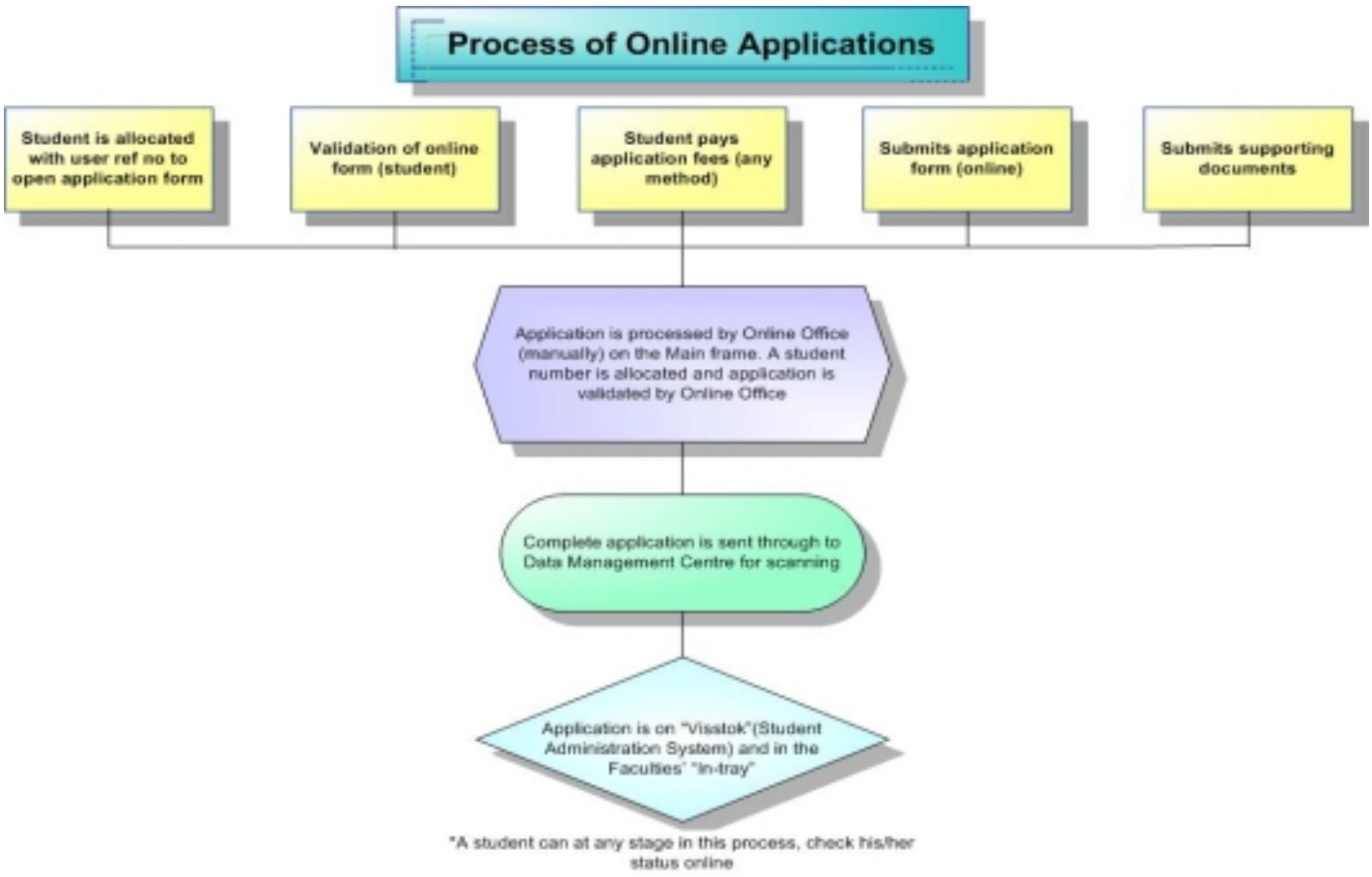


Figure 4.7 Web-based application process

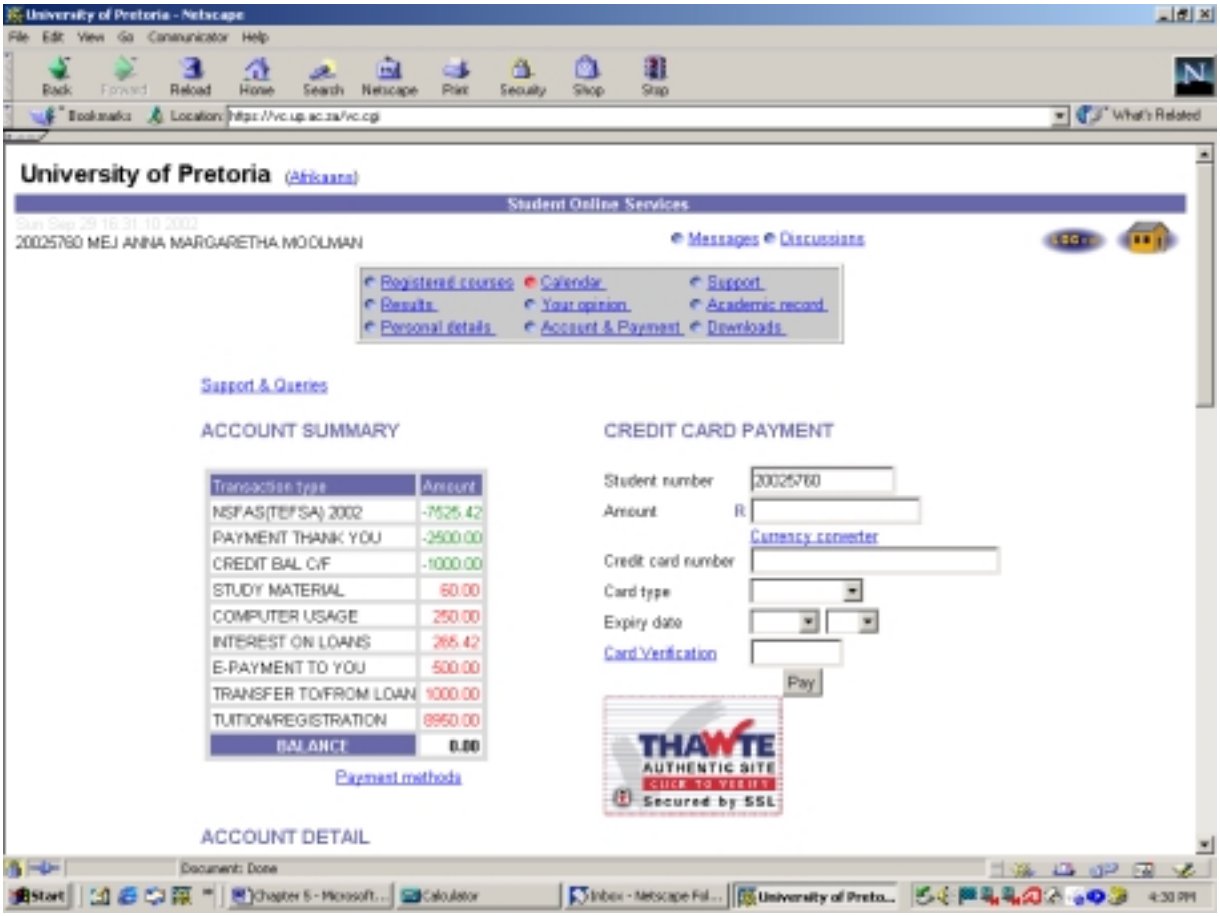
The central admissions office was decentralised in 2002 so that Faculties take responsibility for admissions. Hence, the online application process feeds into another process whereby all applications are scanned centrally by the Data Management Centre and are then made accessible to Faculties to proceed with the admissions process. A time lag is often experienced when payment is outstanding or when additional information is required from the student before the application form may be scanned, such as proof of identification. These outstanding documents are normally faxed to the Online Applications officer.

Section 4.9 discusses the web-based credit card payment system.

4.9 Web-based credit card payment (service and process innovation)

The web-based credit card system has been a successful service innovation. A decision was made to outsource the functionality to an e-commerce company. The university has moved to a different e-commerce company than the particular company used at the launch of the service. Fortunately the transition was seamless enough and did no harm the adoption rate. The Finance Department - specifically Student Accounts - was responsible to investigate, evaluate and implement online banking, investigate how tuition fees for online courses should be structured and to integrate student accounts with the virtual campus.

An extensive process was followed to provide specifications to banking institutions and to select the best e-commerce company. Although students could conduct Internet banking at the time, i.e. pay an amount into a bank account of the university over the Internet, the new service immediately confirms payment and allows the student to proceed with transactions or of accessing information and services.



Screen capture 4.5 Credit card payment

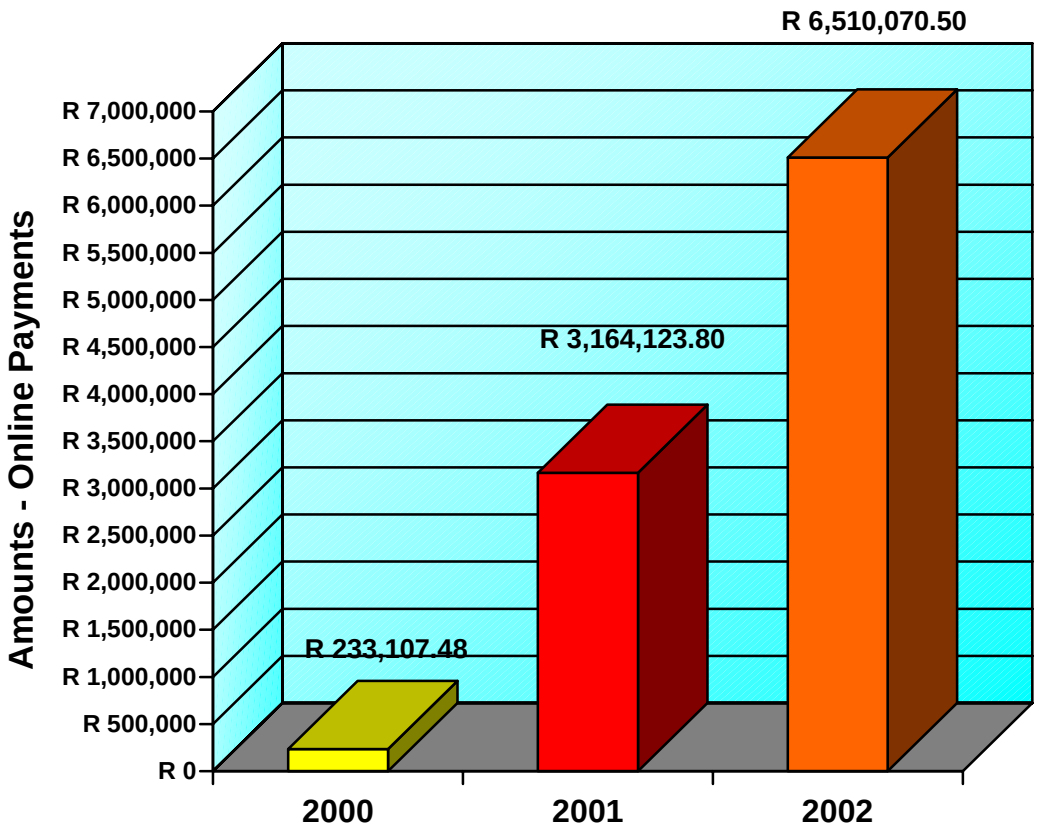


Figure 4.8 Web-based payments

Figure 4.8 shows a tremendous growth in web-based credit card payment. It is encouraging to see this trend because it means that clients (students and parents) find it an easy and fast service to use. The benefit of the payment functionality in Student Online Services is that the there is contingency – the debit amount is shown and can be credited immediately without having to wait for an account statement in the post. Setcom is the e-commerce service provider that the University uses.

Figure 4.9 illustrates the process that supports web-based credit card payment.

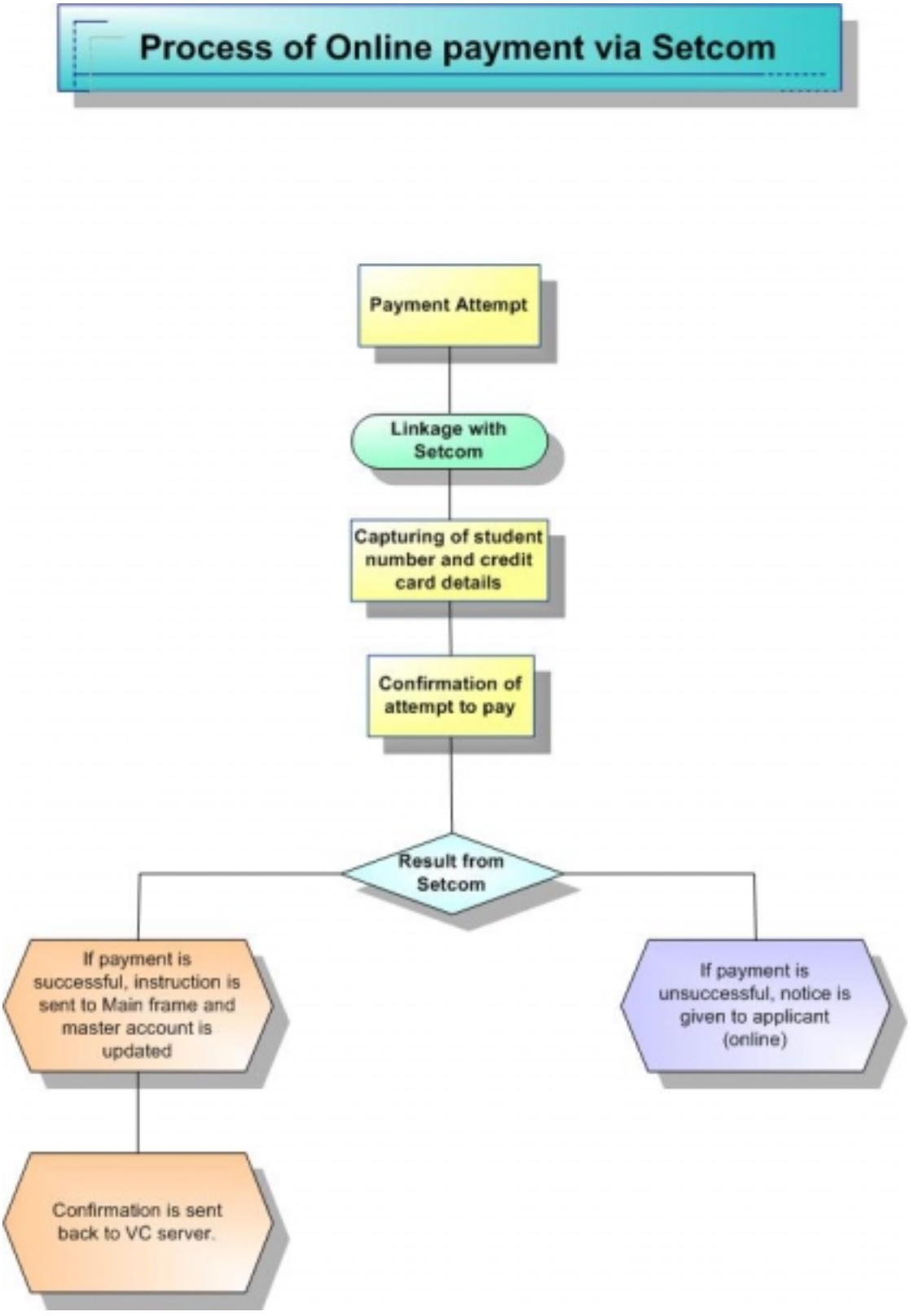


Figure 4.9 Web-based credit card payment process

4.10 Web-supported courses *(*product and process innovation)

A decision was made to choose a pilot project in terms of a web course management solution. The reason was to follow an incremental technology innovation strategy (Tidd *et al*., 1997:58-63), discussed in Section 2.6.9 and to gain a short term win (Kotter, 1995:61) discussed in Section 2.5.

4.10.1 Collaboration with other universities

From the onset, the aim was to create an integrated virtual campus. Therefore the new web-based course management solution had to interface with the existing student administration and student accounts systems of the university. At the time, the university, the University of Potchefstroom and the University of Stellenbosch, used a shared system called Unikom. Consequently, workshops were held with the universities to create shared infrastructure. The workshops revealed that shared infrastructure regarding online application, registration and student accounts would prove too complex. It was subsequently decided to join forces to select an appropriate web-based teaching/learning management system. At the time, all three universities were in the process of investigating such solutions. Cross - institutional project teams were constituted with the researcher as the project leader of the team responsible to evaluate and select a web-based course management solution.

4.10.2 Selection of Web course management system

A panel representative of all three universities was involved in determining how the appropriate system will be evaluated. It was agreed that the instrument containing the specifications would be used by a smaller group to accomplish an initial elimination of systems that do not meet with the specifications. Remaining systems would be further tested by a questionnaire that had to be completed by the relevant company/supplier, upon which piloting would take place (evaluation copy implemented and tested). The list of solutions that were evaluated is as follows:

Lotus Learning Space, SERF, WebCT, TopClass, Librarian, Online Learning, Personal Learning System and *Course info (Blackboard).*

A rigorous evaluation process was used and additional team members were co-opted, for example the student representative body and certain lecturers were included at the University of Pretoria.

4.10.3 Evaluation criteria

A list of criteria, including functional and strategic considerations was drawn up, after which weights were attached to each section. A core team consisting of IT and telematic staff from the three institutions spent four weeks evaluating three solutions at the respective institutions. The main elements of the criteria are provided in Table 4.7.

Criteria	**Sub criteria**
Learning- and learner centeredness	Intuitive user interface (easy to use); Functional navigation (simple and effective); Off-line facility Easy communication (student-lecturer; student-student en group communication); Evaluation (monitor own progress) Constructivist elements / learner control
Lecturer-friendliness (user friendliness)	Intuitive user interface (easy to use); Use standard, familiar tools for development; Support flexibility in terms of instructional design; Text in user interface adaptable concerning language / terminology; Easy communication (lecturer-student; lecturer-group communication); Limited support to lecturer / developer in terms of maintenance and delivery of programmes / course units; Relative easy / simple micro-administration (grouping of students, moderation of chat forums, assignments, administration of marks);
Conform to IMS/certification by IMS (medium-term potential)	Possible exchangeability / re-usability of learning objectives; Protection of investment in development.
Integration with local information architecture	Transparent integration with student administration system Transparency of electronic communication Adjustable functionality
Affordability	Client software should be affordable Cost effective support of total environment necessary License prerequisites Student license Centre license Support costs
Supplier	
Software engineering	

Table 4.7 Criteria used for comparative evaluation of Web-based course management solutions

Each category and criteria was weighted by means of an instrument according to strategic importance and the respective institutions evaluated the solutions according to this instrument. The comparative evaluation resulted in a process of elimination illustrated in Table 4.8.

Process of elimination by applying the evaluation criteria:	
Successful	**Unsuccessful**
Course info (*Blackboard*) (install and test)	*Lotus Learning Space*
WebCT (install and test)	*Librarian*
Online Learning (investigate)	*Personal Learning System*
	Manager's Edge
	Oracle Learning Architecture
	TopClass
	SERF

Table 4.8 Selecting the top three Web course management solutions

WebCT scored the highest in all three evaluations, primarily due to price effectiveness and robustness.

On 17 November 1998 *WebCT* was recommended to the Directors of IT and Telematic Education at the three institutions and *WebCT* version 3 was installed at the University of Pretoria in December 1998.

The University of Stellenbosch and University of Pretoria implemented *WebCT*, whereas Potchefstroom University decided to develop their own system, called *Varsity*.

WebCT is used by 2654 institutions worldwide (*WebCT*, 2002).

Since the implementation, many other higher education institutions have implemented *WebCT* and it has become the dominant design in South Africa. This has resulted in new knowledge creation in the field of e-learning in South Africa. A *WebCT* forum with 120 delegates was held in September 2002 at University of Pretoria in order to share experience. The University of Pretoria migrated to *WebCT* version 3.1 in 2000 and plan to migrate to *WebCT* version 3.8 in 2003. The continued use of *WebCT* at the University of Pretoria will be reconsidered in three years' time. Table 4.9 shows the current number of *WebCT* courses of each institution. A request about the number of *WebCT* courses was sent to

individuals responsible for e-learning at various institutions that appear on the South African *WebCT* database (held by the local suppliers – Lighthouse Digital).

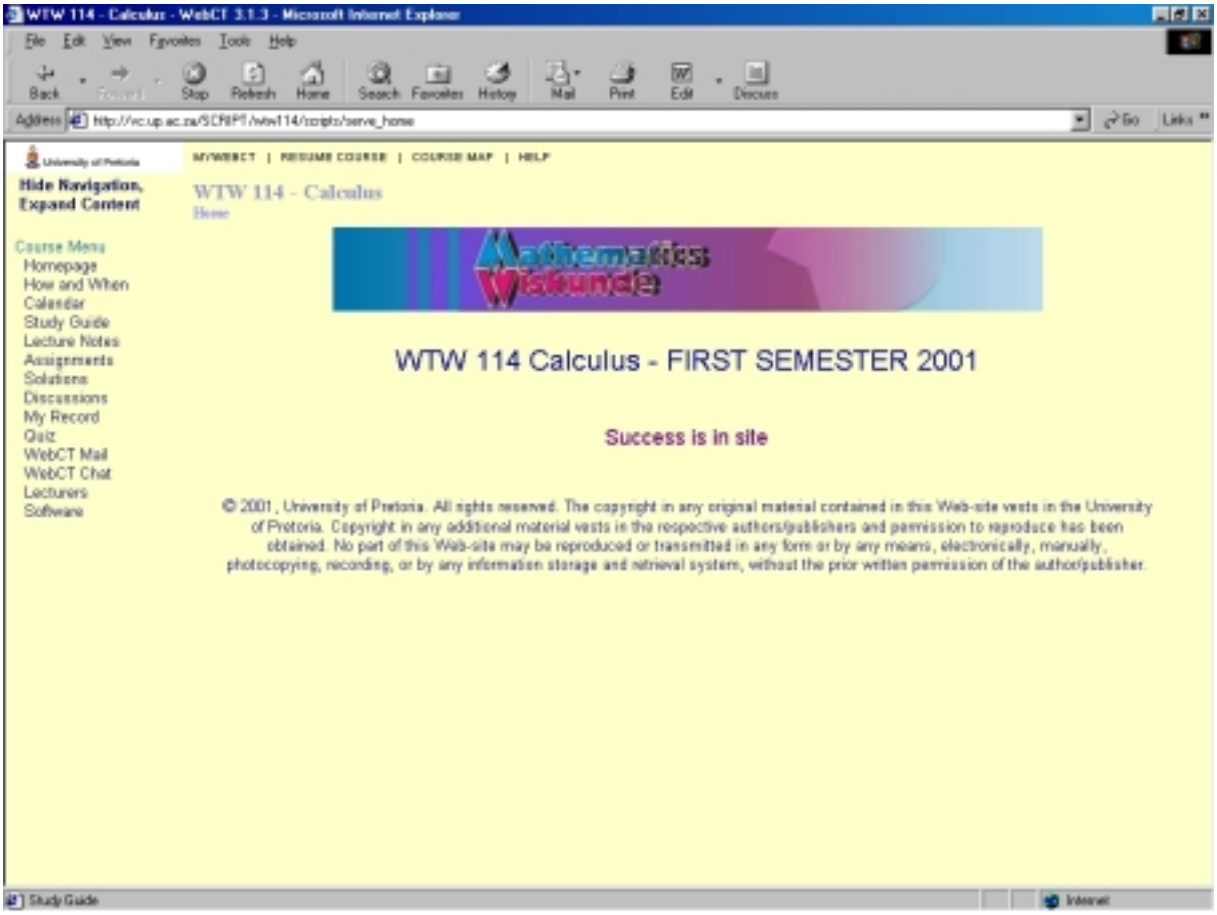
List of higher education institutions using *WebCT*:	
Institution	Number of *WebCT* courses
Natal Technikon	27
Free State Technikon	41
Cape Technikon	developing 74 courses – no active courses
Pretoria Technikon	1749 courses – unknown how many are active
Rand Afrikaans University	310
Cape Town University	130
Stellenbosch University	534
University Orange Free State	75
University of Zululand	112
University of the North	1
University of Natal	200
University of Pretoria	509

Table 4.9 Diffusion of *WebCT* in South Africa

The table is not necessarily complete as it reflects only cases where a particular institution responded to the researcher.

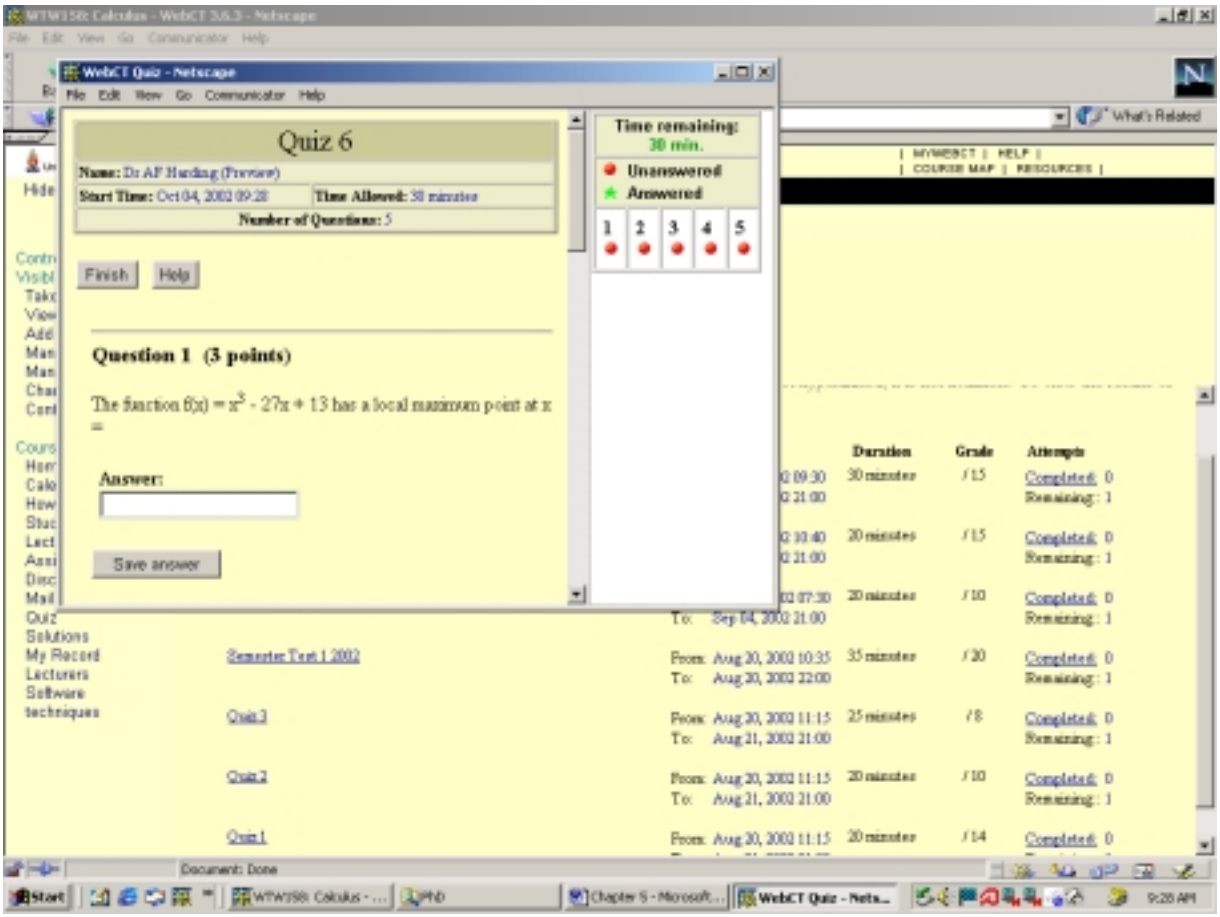
WebCT was integrated with enterprise systems. It was a deliberate strategy to provide students with integrated access to learning and administrative products and services. As a *knowledge management* strategy it has proven to be successful in giving customers (students) access to information and knowledge at their convenience. It also assists management and preservation of the University's Intellectual Capital. Lecturing notes and materials are normally not available in digital format or in hard copy. This causes a lack of continuity if a lecturer resigns and leads to the loss of knowledge. The fact that the study guide, assignments, evaluation policy, references and often content are available in *WebCT* makes it a depository of Intellectual Property.

The following screen captures illustrate two of the university's web-based mathematics courses that have been functional for longer than two years.



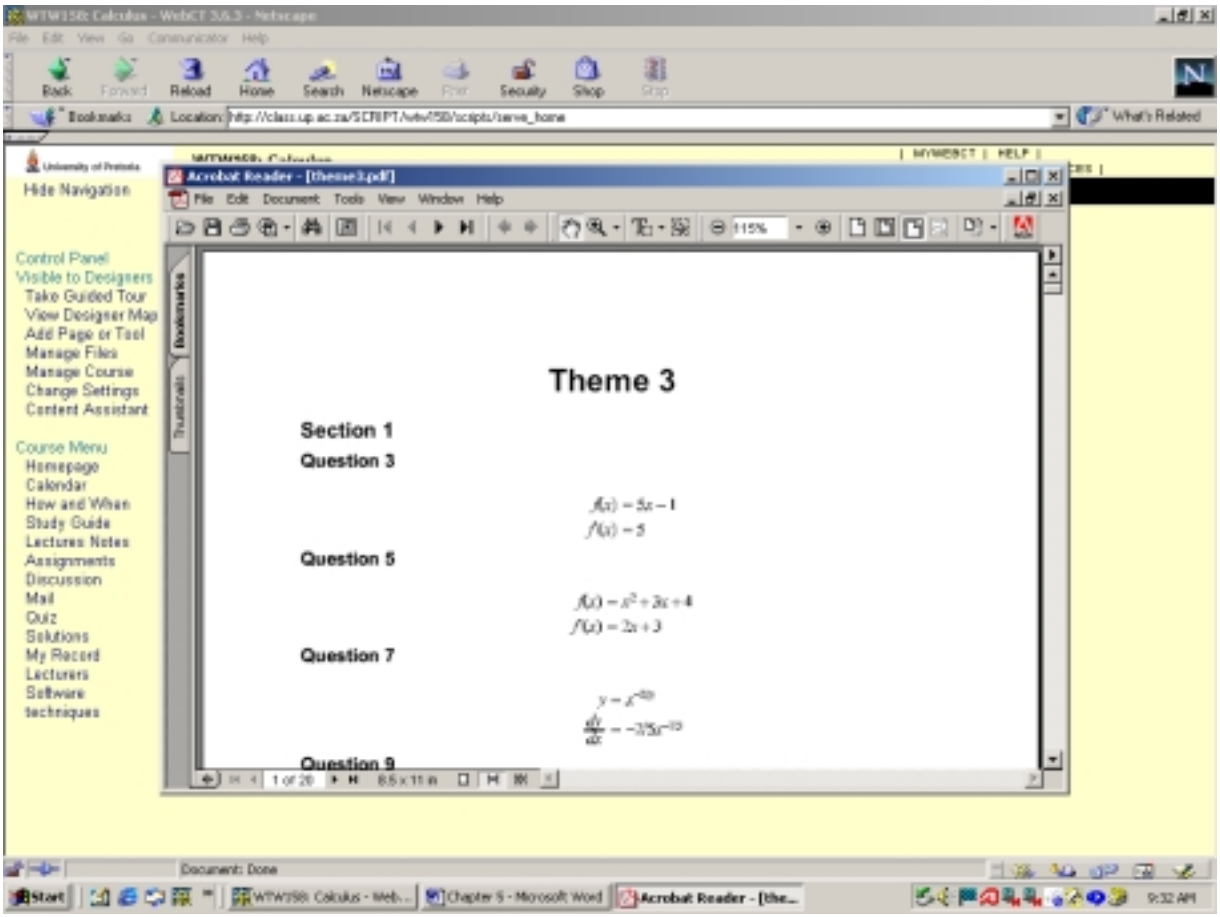
Screen capture 4.6 Calculus course (WTW 114)

Calculus is one of the champion courses at the university, in which more than a thousand first year students make use of it every year since 2000. The particular lecturers refer to a *thin WebCT* course versus a *thick WebCT* course. The former contains mostly contact elements and *WebCT* is used as support. This model is used in 9 undergraduate mathematics courses. *Thick WebCT* courses pertain to a *WebCT*-based model where it forms the bulk of the course with one one-hour contact session per week. The latter model is used in 6 undergraduate courses, for students who have failed their course. Their findings over the past three years include that the attrition rate has stayed the same in both models; that there are fewer students with distinctions; and that students prefer the flexibility offered by the web-based model (Harding & Engelbrecht, 2001:1-9). Research into a possible relation between the use of the web in education and academic maturity of students is being conducted by Dr Harding and Prof Engelbrecht. They pose that the use of the web leads to more academic mature and independent learners.



Screen capture 4.7 Quiz in Calculus (WTW 158)

The concerned lecturers have been very innovative in terms of their use of *WebCT*. Screen Capture 4.7 shows a Quiz in WTW 158. Screen capture 4.8 shows how they provide solutions to problems via *WebCT*.



Screen capture 4.8 Solutions to problems provided via WebCT

The benefit of this model is that students have to first solve problems on their own or in groups and then have access to the solutions that are posted after they have submitted their own solutions.

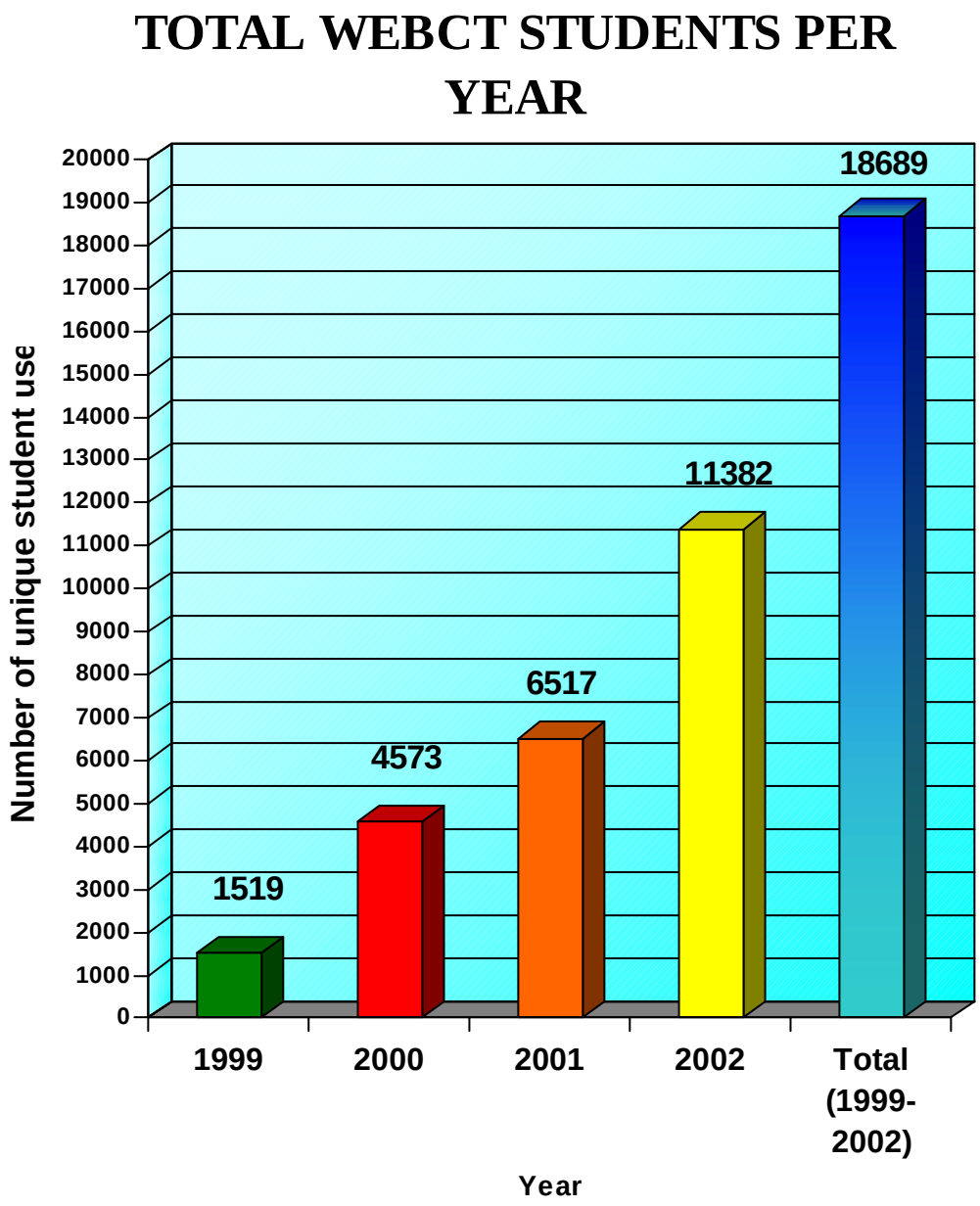


Figure 4.10 Total unique *WebCT* students per year

Figure 4.10 Illustrates that a total number of 18689 students have used *WebCT* since its implementation. As the strategy shifts towards more undergraduate courses the numbers will show exponential growth. The graph clearly illustrates the 'S'-curve.

A total of 17 148 students are currently registered for courses supported by *WebCT*, although as indicated in Figure 4.10 only 11382 of these students use *WebCT*. This means that 34% of students who are registered for a *WebCT* supported course have never accessed *WebCT*. The diagram below indicates the actual student users, i.e. unique students/users who have logged onto *WebCT*.

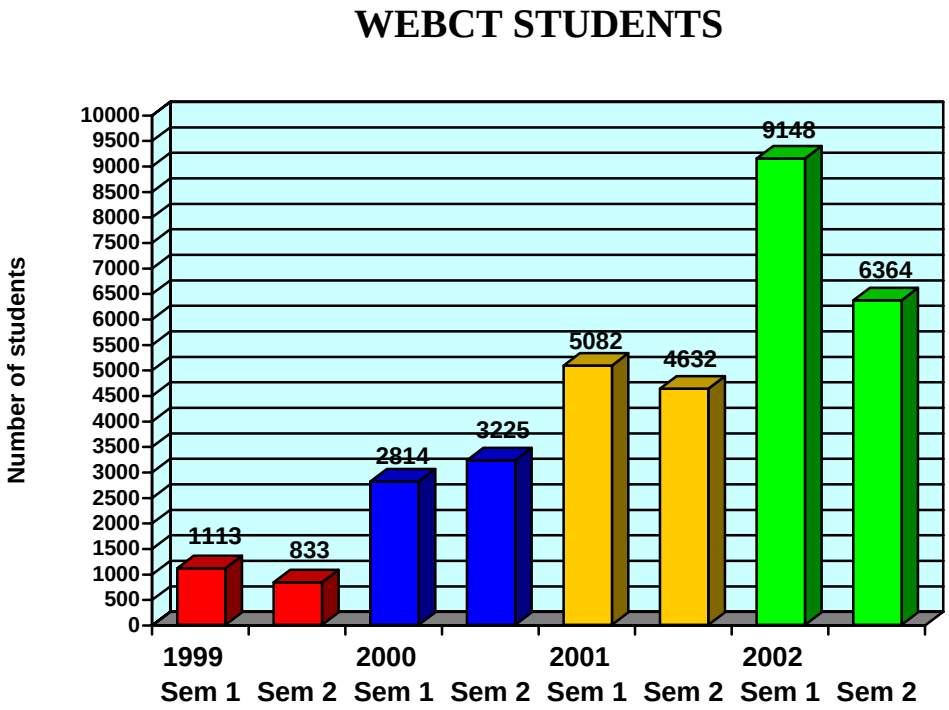


Figure 4.11 *WebCT* students per semester

It should be pointed out that it is problematic to present accurate statistics because of semester shifts and different cycles of courses.

Figure 4.12 illustrates the total number of *WebCT* courses.

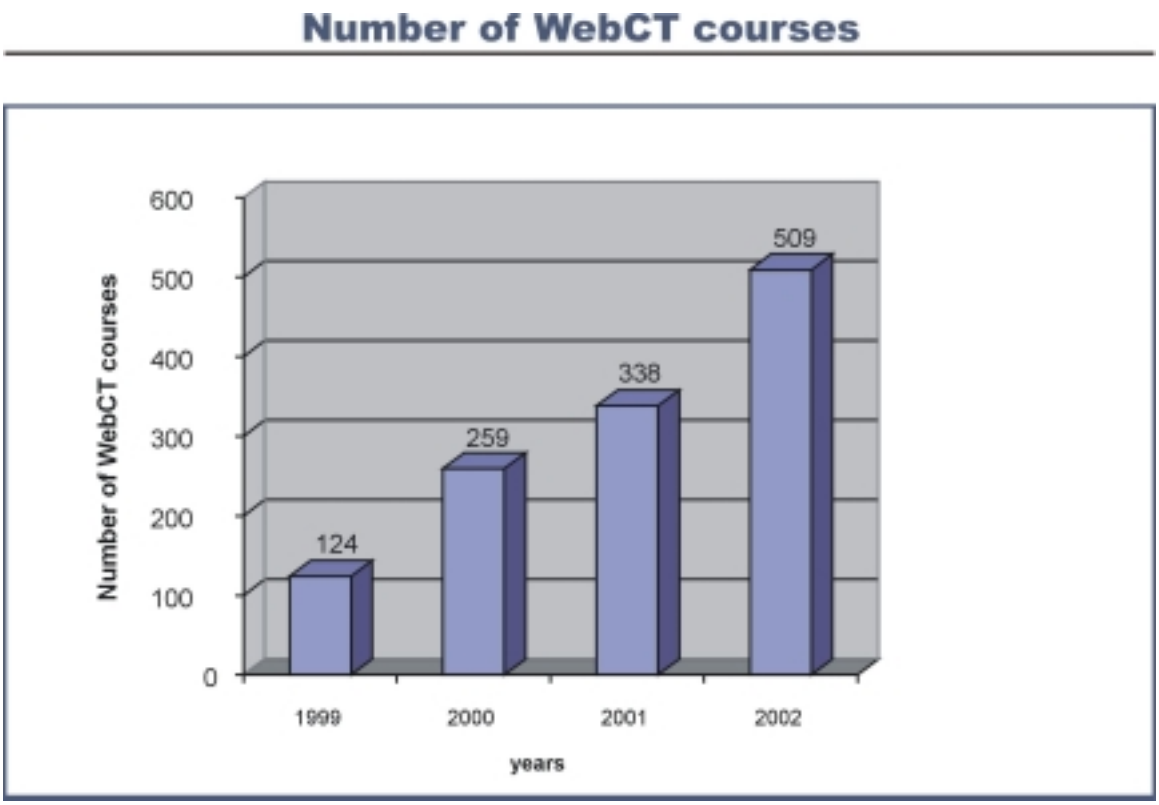


Figure 4.12 Number of *WebCT* courses

There are currently 70 programmes (degrees or diplomas) running in *WebCT*. If one uses the web continuum model by Bonk *et al.* (2000) it means that 70 programmes at the University of Pretoria resort on the highest level (level 10) in which courses are integrated and part of a larger and complete programme offering. Most of them are post-graduate programmes. In addition many lecturers opt to offer only certain modules/subjects via *WebCT*. The total number of courses making use of *WebCT* stands at 509. The 'S'-curve is clearly visible.

Section 4.11 explores the instructional design and development model in light of process innovation.

4.11 Instructional design and development (product and process innovation)

Most lecturers at the university are familiar with contact education while the creation of courseware is foreign to them. The virtual campus requires a paradigm shift in terms of a move away from lecture-based teaching methodologies to the adoption of learner-centred approaches.

The Telematic Education department operates according to project management (Bates, 2000) principles. It manages to deliver products and services due to its ability to mobilise resources on-demand, whilst at the same time being continually involved in numerous official (registered as a project and funded by the university) telematic programmes. Role players include project managers, instructional designers, educational advisers, Web-programmers, computer-based testing experts, graphic artists and photographers. In many cases an individual is multi-skilled and works on a variety of products simultaneously. A project manager spearheads projects through consultation sessions with relevant lecturers, from which project proposals are generated and approved or disapproved by management. Since the creation of the virtual campus in 1999, six instructional designers have been appointed to assist with web-based course design and development. The time it takes to design and develop a course can range from a couple of days to a couple of weeks, depending on the magnitude of the elements that lecturers include and depending on the quality of the information and format provided.

Over the past year development has changed from providing study guides in *html* to providing them and other course content in *PDF (Portable Document Format)*. The reason is that most students continue to print their online materials and *PDF* provides a better quality printed product. Hence the considerable research on learning benefits via *html* that is discussed in Section 3.4 is no longer appropriate in this specific context.

Section 4.11.1 describes the project proposal as an important component of the instructional design and development process.

4.11.1 Project proposals

Project proposals are written according to the following guidelines:

- Market for the project
- Student profile
- Additional students generated by offering a programme telematically
- Identification of the need for offering a programme telematically
- Identification of the modules and lecturers involved in the project
- Budget
- Return on investment
- Assistance required from Telematic Learning and Education Innovation

The Department of Telematic Learning and Education Innovation assists faculty members to draft project proposals. Project proposals are then submitted to top management for approval. Funding for successful project proposals are paid to academic departments in two instalments a year, depending on the duration and progress of the project.

4.11.2 Project management

As the number of *WebCT* courses increased in 1999, a project management process for *WebCT* courses was developed. The process was again refined in 2000, as indicated in Figure 4.13.

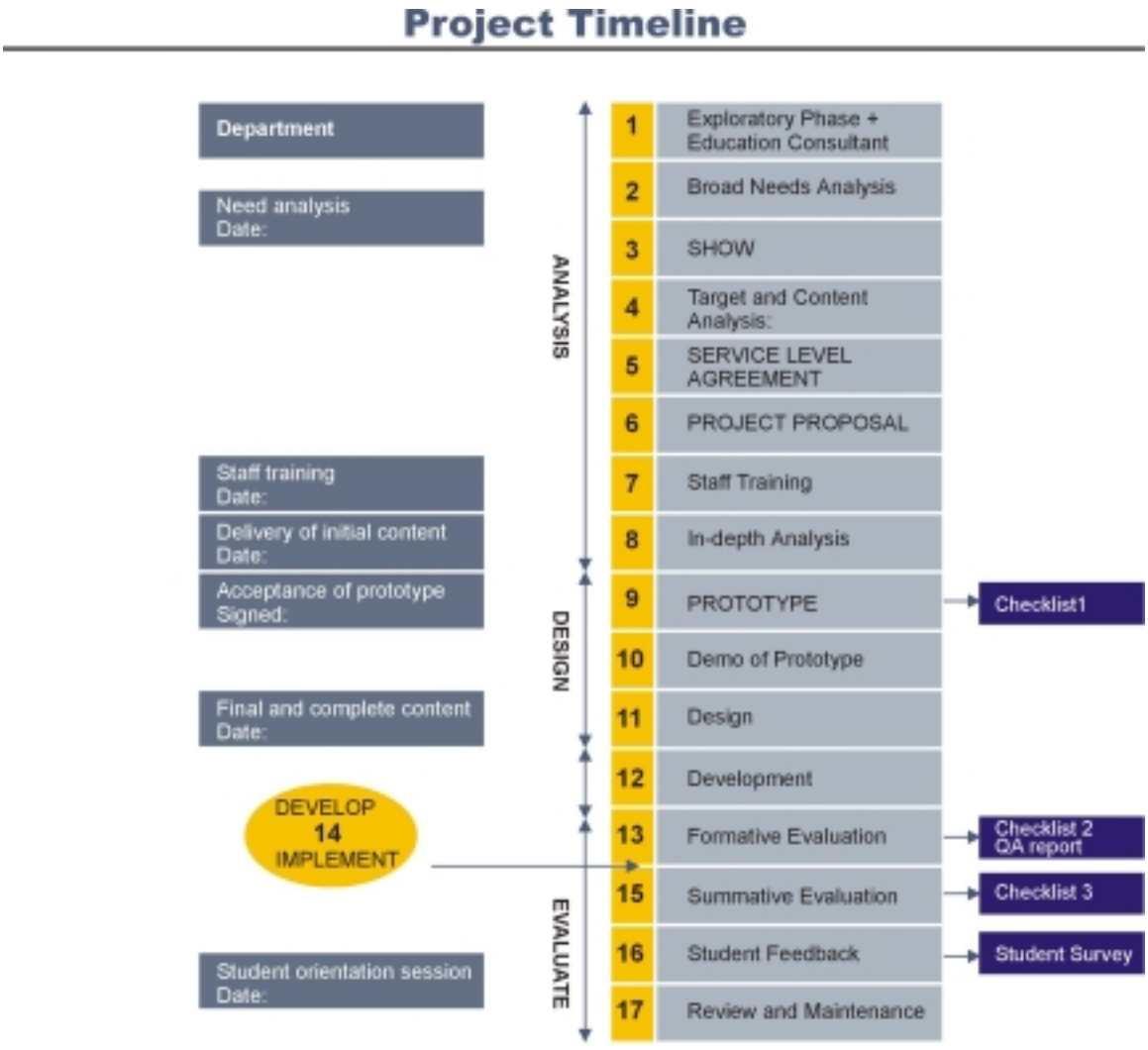


Figure 4.13 Project time line (Telematic Learning and Education Innovation, 2000a).

In Section 3.5.5 Bates (2000:72) recommends that project management should not be too bureaucratic and that it should fit the culture of an institution. The researcher is of the opinion that the project time line is rigorous but that it also provides sufficient flexibility. The rigour is necessary to ensure a quality product and a corporate image.

4.11.3 Service Level Agreement and roles

It was soon realised that a more structured approach needed to be followed in order to ensure that the various stakeholders involved in a *WebCT* project keep to their responsibilities and also understand the different roles. As a result a Service Level Agreement (SLA) form was created in 2000. Service Level Agreements are signed by programme leaders and the project manager. The Service Level Agreement and roles are shown in Annexure E.

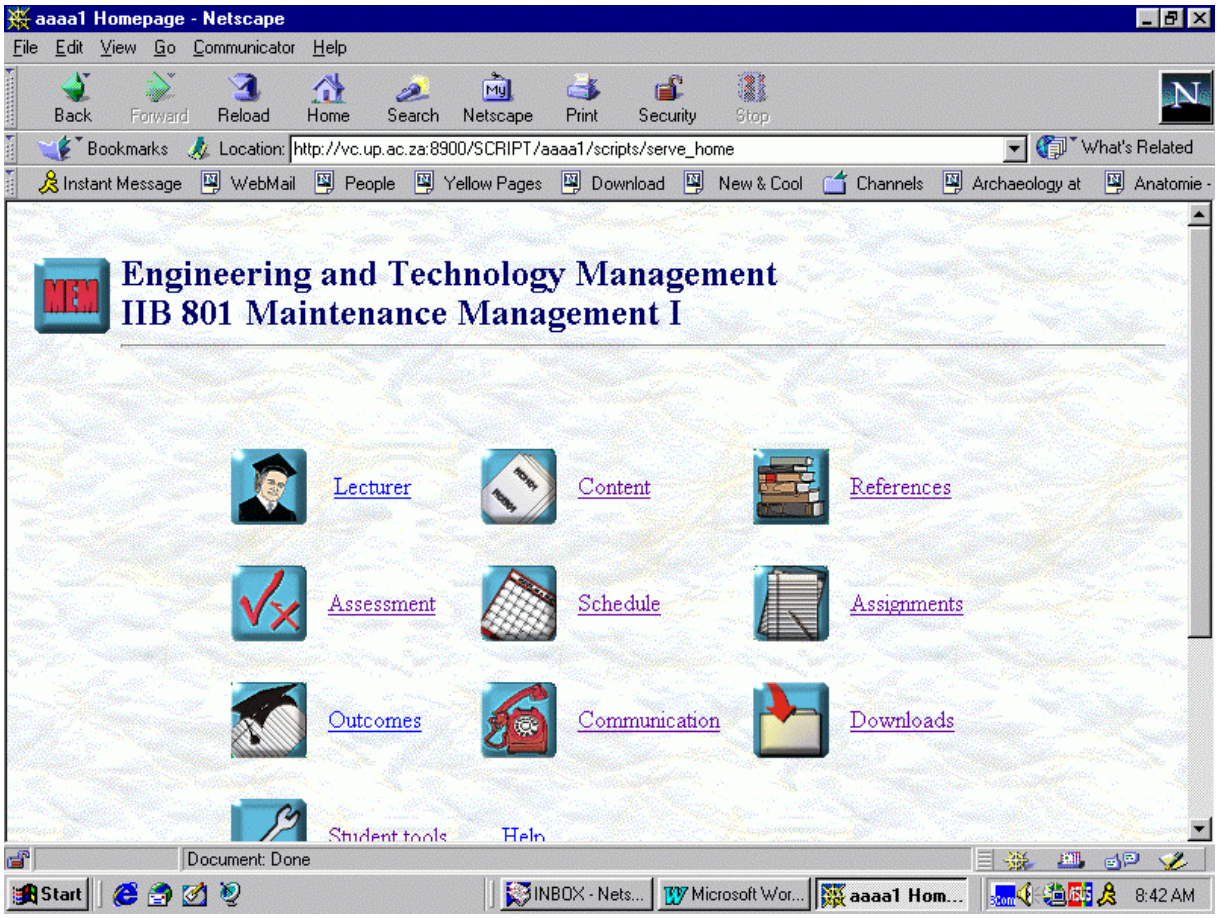
4.11.4 Minimum requirements for web-based courses

In 1998 Prof K Visser, one of the champion lecturers spearheading *WebCT* in the Masters in Egineering Management (MEM) programme, compiled minimum requirements for a *WebCT* course. A decision was made that the minimum requirements should consist of the study guide that is used in contact tuition. The reason for this decision was two-fold:

- A phased-in or incremental approach was used by starting out with the study guide and gradually adding full-text references and content, followed by an increasing use of *WebCT* communication facilities.
- The study guide is useful in providing students with clear information about aspects of their course.

Format requirements and processes for the design and development of *WebCT* courses were then designed and implemented in collaboration with faculty members. It remains the basis of the minimum requirements provided to lecturers. The minimum requirements are shown in Annexure F. The benefit of making a study guide a minimum requirement is that it aids preparation and planning by the lecturer in advance. Another advantage is that it provides learners with a comprehensive overview of what is expected of them before the course resumes.

Screen capture 4.9 shows one of Prof Visser's courses – Maintenance Management. It further illustrates the initial design for the look and feel of the MEM programme.



Screen capture 4.9 One of the first *WebCT* courses

These requirements, along with the Service Level Agreement and Project Timeline, contribute to quality assurance. It points to the benefit of a centralised design and development support department such as Telematic Education.

The researcher is of the opinion that any successful institution wide initiative requires centralised leadership, coordination, training and support, whereas especially institutions in the United States started out with the 'lone ranger' model where every lecturer who got the notion of offering a course online designed a web site (Bates, 2000). The Campus Computing Project Survey of Green (2001) shows that 53% public and 70% private universities in the United States use a course management system. Institutions such as the Rand Afrikaans University in South Africa headed out without a design and development team and have come to realise (after 310 courses) that lecturers require design and development support. Stellenbosch University provides training and support and lecturers do

their own development. The model followed by the University of Pretoria is flexible in that lecturers can choose whether they would like to do their own design and development within the requirements of the department.

Section 4.12 gives an overview of training and support over the past four years. In light of the adoption curve, the early majority require considerable support before they will adopt new technology. Consequently, market acceptance in innovation is dependent on a model that provides sufficient support to the early majority. Especially quality assurance could pose a risk if every lecturer is free to do as pleases. The model used at the University of Pretoria is increasingly being followed by institutions globally as indicated in the international case studies in Section 3.6.

4.12 Training and support (process innovation)

Adequate training and support is required for successful market adoption and subsequently for innovation to take place. Section 4.12.1 reports on a learning process that commenced in 1998, indicating how training was adapted based on feedback from lecturers. It echoes the process of *learning by doing*.

4.12.1 Training

Seven telematic staff members were trained in mid-December 1998 and in the first week of January 1999. In February, a person was appointed, wearing the hat of *WebCT* administrator and technical support person for students and lecturers. It was the same person as the virtual campus programmer. Since 1998, close to 500 lecturers have been trained to use *WebCT*. Initially, two types of training courses were offered, namely the orientation course (two-day hands-on) and the development course (four-day hands-on workshop). These workshops are offered by Lighthouse Digital (the South African supplier of *WebCT*) in collaboration with staff members from Telematic Learning and Education Innovation. The development course covered authoring on the first day, learning how to use the communication tools on the second day, use of the file manager and path editor on the third day and the fourth day deals with student and course management. All workshops on *WebCT* are fully subsidised as an incentive to lecturers to innovate.

The initial objective in 1999 was to train only those lecturers who had submitted project proposals for funding (seed money), but the interest of lecturers was such, that it was decided to accommodate those with formal projects as well as those who want to do their own development without additional funding. The training courses have been adapted over

the years. It was found that lecturers could not spend four days away from class. The courses and attendance for 2001 and 2002 (to date) are provided in Table 4.10.

Type of course	**Number of lecturers 2001**	**Number of lecturers 2002**
High Impact course (one day) Presented at the last Monday of the month. Focuses on learning facilitation.	132	46
FrontPage course (one day) design principles using different media, e.g. FrontPage, PDF, etc. Presented 4 times a year	25	11
Intermediate course How to do maintenance on an existing *WebCT* course Presented 4 times a year	Course not offered in 2001	8
WebCT Designer course (two days)	30	5
Total	187	70

Table 4.10 *WebCT* training attendance

There is a significant decrease in the numbers of lecturers who attended training courses in 2002. It could indicate that diffusion is not progressing to early majority stage.

4.12.2 Support

The support mechanisms for *WebCT* include online support to students by which queries are routed to either the lecturer, *WebCT* administrator, instructional designer or Academic Information Services, depending on the type of enquiry. Where possible, face-to-face sessions are held with students to give them orientation in the use of *WebCT* and to obtain feedback after a trial-run period.

Instructional designers support lecturers continuously, provided that it occurs in terms of the Service Level Agreement. A site was created in 2000, called the Online Resource Centre (ORC). It is located on the intranet and accessible via Lecturers Online and *WebCT.* The ORC provides rich resources and links about e-learning and particularly web-supported teaching and learning environments.

Apart from the workshops and face-tot-face support, a list-serv was created in 1999 for all lecturers offering their courses through *WebCT*. It evolved into a means of informing lecturers of the utilisation of new features in *WebCT*, IT-related information, and information about training courses. However, lecturers did not share experience via the listserv, which shows that knowledge creation regarding e-learning amongst lecturers was not successful.

A South African listserv is in the process of being created and will be hosted at the University of Pretoria. Many *WebCT* users in South Africa make use of the international *WebCT* listserv.

Section 4.13 explains the innovation process at Academic Information Services (AIS).

4.13 Academic Information Services (service and process innovation)

Academic Information Services had to align the electronic Academic Information Service project with the virtual campus and add certain functions, services and infrastructure to support *WebCT*-supported courses.

An important task was to clarify copyright procedures and policies regarding electronic sources. Another was to provide seamless access to information sources in various databases and to full text articles. Part of the virtual campus budget was used to create a cyber space in Academic Information Services (where students can access Student Online Services) and to purchase a high quality scanner to scan full text articles.

Academic Information Services' infrastructure is in place and provides copyright clearance and scanning of information sources in *WebCT*. The Service Level Agreement between the Academic Information Services and Telematic Education can be seen in Annexure G.

A concern about simply giving students access to full text articles was raised by lecturers, because they felt that especially postgraduate students have to acquire the skill of searching for and identifying relevant sources. The concern was addressed by providing access to search in electronic databases and to give access to the library catalogue online. To date a total of 10 050 full text articles have been scanned.

A shift has taken place from a notion of multiple copies to multiple sources.
Figure 4.14 illustrates the process flow of the scanning of articles for *WebCT* courses. Being a new process that supports an innovation and that has been embedded in the institution, it is regarded as process *innovation*.

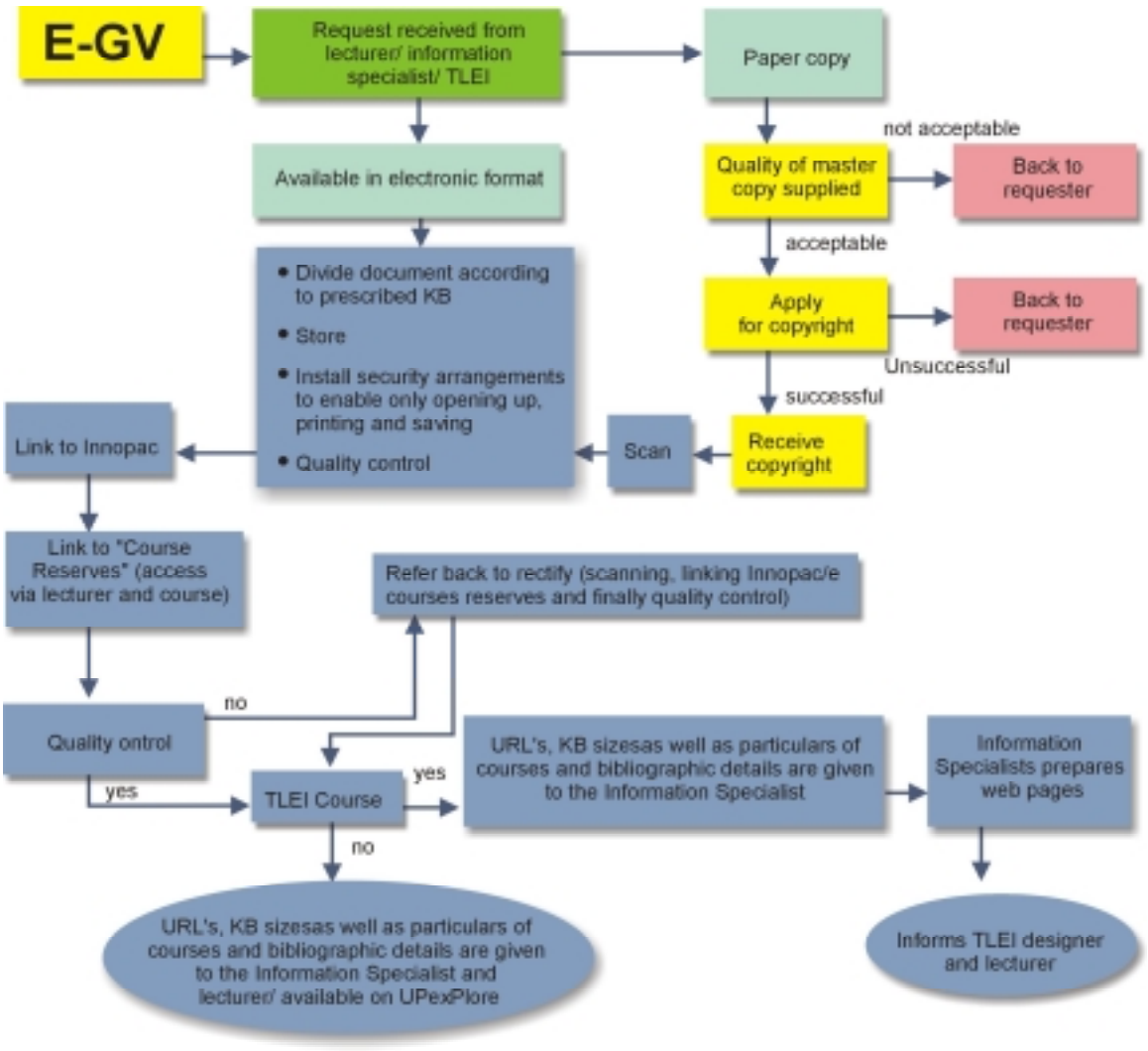
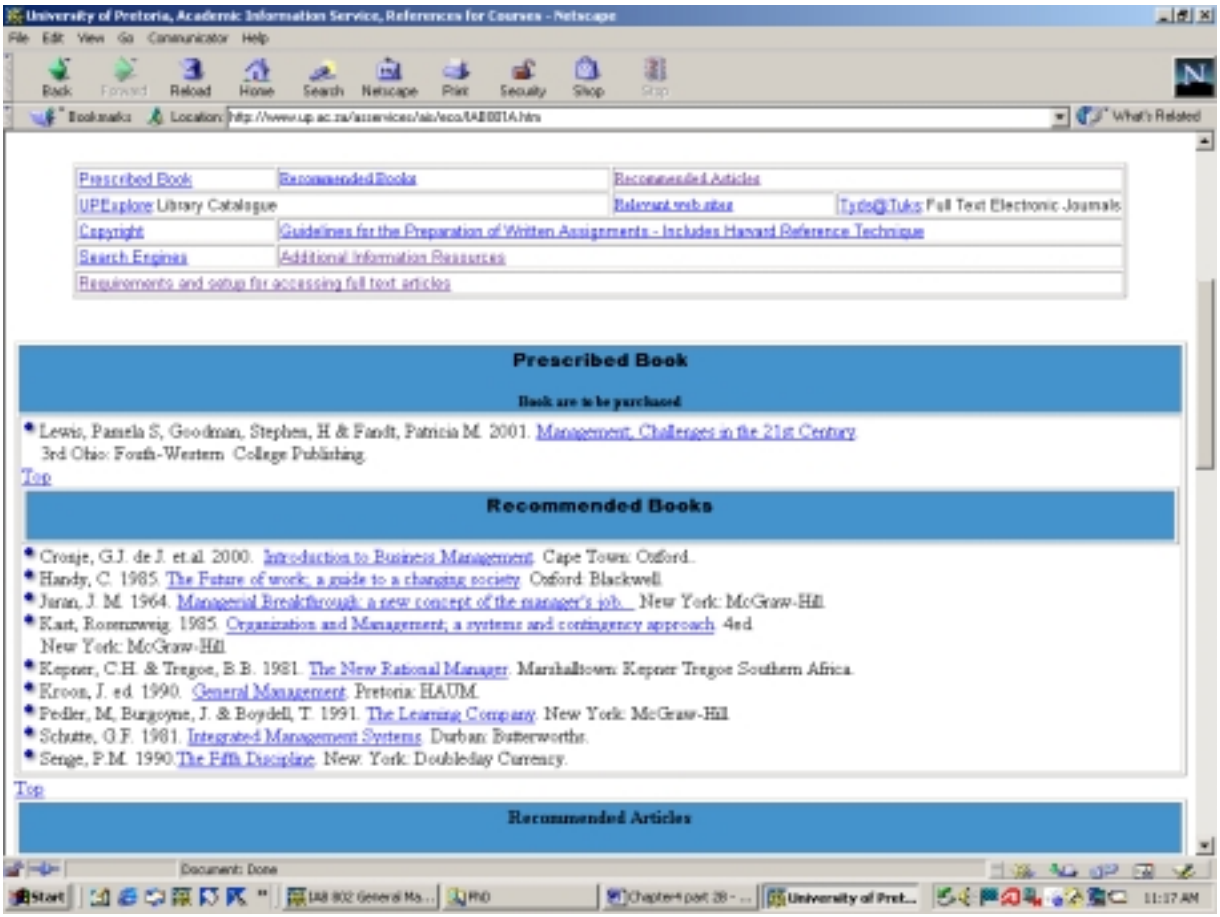
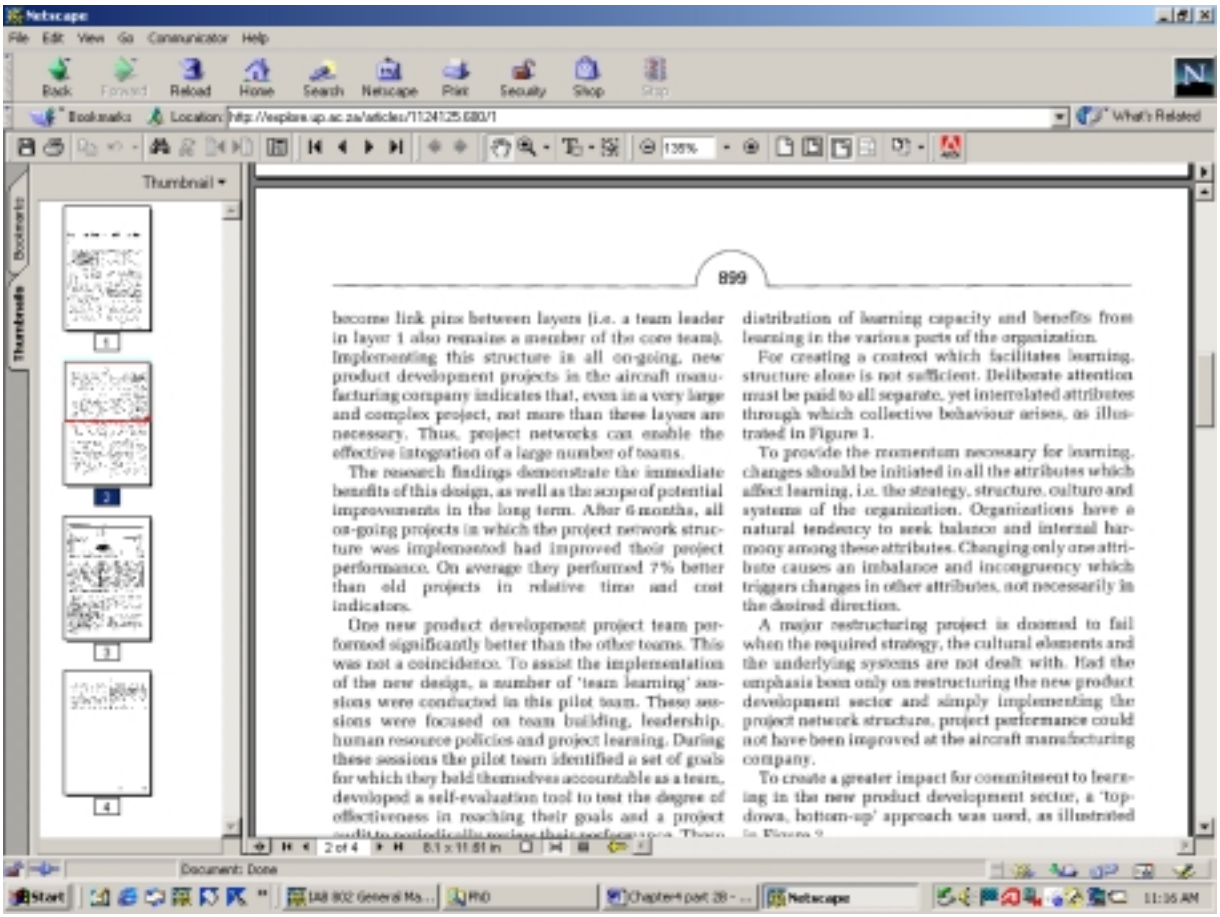


Figure 4.14 Process flow for scanning of articles (Academic Information Services, 2000).



Screen capture 4.10 References of General Management

The references are integrated with other components of a *WebCT* course in order to create contiguity and consistency.



Screen capture 4.11 Full-text articles of General Management

Full-text articles provide flexibility to learners regarding access. Learners are often not able to pay a physical visit to a library and subsequently access to full-text articles eliminates frustration.

4.14 Synthesis

If one considers the critical success factors for technology innovation in an educational context (Laurillard, discussed in Section 2.6.9), it is clear that the majority of critical success factors were addressed:

- The Department of Telematic Learning and Education Innovation has an innovative process in place that ensures synergy among all aspects involved in a flexible education model.
- The project management time line of Telematic Learning and Education Innovation is responsive to curriculum development and allows for creative team-based collaboration.

- The Telematic Learning and Education Innovation department provides a staff development programme that supports academic and production staff in their exploration of ways of utilising technology for teaching and learning.
- The Telematic Learning and Education Innovation department assists faculty with seed funding to grow new educational models. Resource planning and activity costing procedures are embedded in the costing model of the department.
- A technical infrastructure is provided in collaboration with the IT Department to support all learners and staff.
- Quality assurance mechanisms have been put in place.
- Collaborative partnerships are few, but more are being explored.

Table 4.11 applies the types of innovation to *process*, *product* and *service* innovation of the virtual campus.

Service or product	**Virtual campus**	Student Online Services	Lecturers Online	Online application	Online Payment	WebCT-Supported courses
Type of innovation						
Radical/revolutionary	x	x	x	x	x	x
Incremental/evolutionary	x	x	x	x	x	x
Disruptive						
Sustaining	x	x	x	x	x	x
System	x	x	x	x	x	x
Architectural	x				x	x
Modular						
Process/procedure	x	x	x	x	x	x
Product/service	x	x	x	x	x	x
Market pull	x	x	x	x	x	x
Market push	x	x	x	x	x	x

Table 4.11 Application of types of innovation to virtual campus

If one considers the virtual campus in totality, then it could be classified as both radical and evolutionary innovation. It is radical in the sense that it has established a dominant design, which is embodied in components that are linked together in a new architecture and which have led to organisation-wide competitive advantage. It has also changed consumer behaviour of students – in that adoption rates show that students and staff increasingly make use of the virtual campus components.

A predominantly incremental or evolutionary innovation strategy was followed regarding technology architecture.

Section 4.15 combines qualitative and quantitative analysis of selected products of the virtual campus over the past four years.

4.15 Quantitative and qualitative analysis of product innovation

4.15.1 Feedback (1999-2001)

In February and March 1999 the main complaint from students was that they struggled to access their online courses from work and home (Lazenby, 1999:299). At the time, the University experienced difficulties with its *ATM* network backbone. A decision was made to connect the virtual campus server with *Fast Ethernet* rather than the *ATM* backbone. Subsequently, fewer complaints were received. Other complaints included *JavaScript* errors that appeared in *WebCT*, which were solved in collaboration with the local suppliers. On several occasions students accessing their courses from work were denied access by their companies' local firewalls.

Students initially complained about the communication features in *WebCT*. They found it too cumbersome to access the various communication tools in every course to see if a message had been posted. This frustration was exacerbated during the network problems. The complaint was addressed for students taking the Master's in Engineering Management (MEM) by creating a cross-course e-mail facility on the home page in *WebCT*.

Certain lecturers almost withdrew their courses during the network crises. Understandably they had to cope with high frustration levels of students, some of whom were threatening to cancel their courses, and most of the time they could not do their course development or communicate with their students. Although the network has stabilised, infrastructure remains a concern.

A series of three focus-group interviews was held with lecturers who offered courses via *WebCT* and those who started out doing so (Lazenby, 1999). Each focus group had seven lecturers from various departments. The departments of Psychology, Information Science, Archaeology, Electronic Engineering, Engineering Management and Social Science were represented). Data analyses revealed the following themes:

WebCT

- Lecturers felt that the interface of *WebCT* is “clumsy” and not intuitive enough.
- Lecturers disliked the spreadsheet in *WebCT* that is used for student marks.
- Lecturers mentioned that the synchronous communication facilities do not work.

Innovation adoption is more probable if new technology is easy to use, as discussed in Section 2.7.2. An added constraint is that the *perceived usefulness* (Davis, 1989) of the technology was negative.

Computer literacy of students

- Lecturers indicated that engineering students are not necessarily computer literate.
- Lecturers felt that the orientation course was inadequate and that it was essential to attend the development course to get ownership – even if a telematic staff member is responsible for development.

Change management

- Some lecturers felt that they had no choice but to go the route of Web-based courses and found it a difficult process to make the transition while attempting to remain experts in their research fields.
- Some lecturers felt that contact education accommodates (rightly or wrongly) an external locus of control of students, but Web-based learning often does not.
- Some pioneering lecturers preferred to preserve their existing Web sites and felt that *WebCT* was “in the way”.

This could indicate negativity in the phase of *Persuasion* (Rogers, 1995) although they had already made the decision to use the new technology. It also reflects the notion of *Complexity* – the degree to which an innovation is perceived to be difficult to understand.

Infrastructure

- Lecturers pointed out that students often struggle to access *WebCT* due to port problems.

Culture

- Some lecturers conveyed frustration that their students don't regard books as an investment, let alone a computer. A culture change is necessary among students to realise that the computer skills they will acquire by following a Web-based course are life skills and furthermore that a computer is an investment.

A master's dissertation study on organizational transformation and information technology at the University of Pretoria (Vercueil, 2001:126-129) found that those lecturers using *WebCT* felt more competent (p_< 0,01) and were more positive about the virtual campus. Vercueil posited that this could indicate that training contributes significantly to increased feelings of competence and also an increased ability and confidence to use IT for communication purposes.

Section 4.15.12 analyzes *WebCT*-supported learning environments from the perspective of lecturers.

4.15.2 Questionnaire for *WebCT* lecturers

The purpose of this section is to explore certain aspects of *WebCT*-supported learning environments from the perpective of lecturers.

As explained in Chapter One, an interpretive case study entails that the researcher analyzes, interprets and theorises about the phenomenon against the backdrop of a theoretical framework. It is important to emphasise the systems perspective, in that both the researcher and respondents are subjective and create meaning in the expression of their world view by means of language. Also, language is used to construct the meaning co-construted by the researcher and the respondents.

The research procedures followed in this section will subsequently be described.

4.15.3 Population

The population consists of lecturers at the University of Pretoria who have been using *WebCT* for one year and longer.

4.15.4 Sampling procedure

As was indicated in Section 1.5.6, purposeful sampling is used when the researcher selects a sample from which the most can be learned (Merriam, 1998:31). In this instance the sample was drawn in August 2002 from a database of lecturers using *WebCT*. Only those who have been using *WebCT* for a year and longer were included in the population. A purposeful sampling was then made of the population group.

4.15.5 Sample size

The bigger population of lecturers who currently use *WebCT* is approximatley 260. This means that approximately half of lecturers who have been trained use *WebCT*. Of these approximately 170 have been using *WebCT* for a year and longer. Only a further 60 of these have been using *WebCT* frequently. This was calculated by selecting lecturers who, on the *WebCT* database, accessed their courses at least 100 times during 2001. Hence the population for this section is 60. The smaller the population, the larger the sampling ratio that is needed for a high degree of accuracy. Consequently, a convenience sample of 40 was chosen, which can be seen as adequate for a population of 60. The sample therefore represents 67% of lecturers who have been using *WebCT* frequently for one year and longer. All forty respondents completed the questionnaire. Some of their courses are illustrated in Annexure J.

4.15.6 Instrument

A questionnaire (Annexure H) was developed to investigate aspects of web-supported learning environments from a lecturer's perspective. The theoretical basis for the selection of the questionnaire items was a thematic analysis. The questions are based on the extensive literature study conducted in Chapter Two and on the experience of the researcher. Certain constructs emerged around which the researcher formulated the questions. The constructs are listed below.

a) Support and benefit in terms of flexibility to students.
b) Constraints experienced.
c) Learning/teaching model used.
d) Role of the lecturer.

A total of 19 questions were included in the questionnaire, which was sent to the respondents via e-mail.

The questions of the six constructs appear in random order in the questionnaire and can be categorised as follows:

Section A: Support and benefit in terms of flexibility to students
Questions 1 – 2

Section B: Constraints experienced
Question 3

Section C: Learning/teaching model used
Questions 4 – 17

Section D: Role of the lecturer
Questions 18 - 19

Responses to open ended questions were clustered according to themes that were generated in the answers. Therefore, individual experiences were classified into experiential categories. Descriptions were then made of the shared experiences as a way of creating a pattern of ideas and experiences. These were in turn clustered into themes to which meaning was ascribed, based on the researcher's understanding, knowledge and experience of web-based education.

4.15.7 Open ended analysis

Section A: Support and benefit in terms of flexibility to students

95% (38) of respondents indicated that the use of *WebCT* provides more flexibility to students, especially on a postgraduate level. One respondent pointed out that the following variables dictate the flexibility of a course:

- Nature of the course.
- Approach and methodology of the lecturer.
- Levels and degree of computer literacy of the lecturer and students.

This response indicates that lecturers realise the strategic benefit of using *WebCT* or any similar tool to enable flexible education.

One respondent mentioned that *WebCT* is an appropriate tool for certain subjects and that it should blend with other modes. The respondent warned against regarding it as the solution to all educational problems.

One respondent indicated that it promotes experiential learning. This comment is encouraging because it means that a high level of learning can be facilitated via *WebCT*.

Section B: Constraints experienced

Individual respondents mentioned the following constraints that have been categorised into themes:

Bandwidth and infrastructure

Bandwidth and reaction time make it impossible to use certain applications on the internet.
Lack of IT/network support is a constraint "When I'm uploading commentary on a topic and responding to student assignments, I cannot afford to send a 'one stop' request that takes over 24 hours to get a response".
Lab access on campus should be improved. "Supervisors of the *WebCT* lab are not always keen and the lab is often locked".
Internet and bandwidth limitations of off-campus students.
Students don't have regular access or have unreliable servers.

The emergence of this theme is consistent over the past three years. It relates to *ease of use* that is lacking, in the sense that the infrastructure to support the innovation is not perceived as adequate. It could threaten diffusion between the *early adopter* and *early majority* stages.

Design and development

One lecturer would prefer physical proximity of instructional designers, i.e. a designer per School or Department. This confirms the recommendation by Bates (2000:106) that instructional designers and technical support staff should be close in proximity to lecturers, as discussed in Section 3.4.5.

The freedom to design and develop web pages without prescriptions from the University was expressed as a need. The user interface of *WebCT* emerged as a barrier:
"Even though I have done the courses, the occasions when I actualy design a new page are few and far between. Consequently, when it comes around to doing it again – let's say after a break of 6 months – I will have forgotten the little "tricks" that are an everyday issue for the regular programmers/designers". This means that *WebCT* is not sufficiently user friendly. If one takes into account the four E-model (Collis *et al*., 2000) then the *ease of use* critical success factor is lacking. The importance of ease of use in adoption is also emphasised in Section 2.6.2 (Davis, 1989, Rogers, 1995). The *ease of use* factor is a recurring theme in the analysis.
One lecturer felt that the turn around time to get study guides on *WebCT* takes too long. In other words the project time line, or the particular part of the time line is experienced as laborious. This aspect relates to the notions of *Relative advantage* and *Compatibility* provided by Rogers (1989) and indicates that *WebCT* is not perceived to be better than the practice it supersedes, that it does not fit the particular lecturer's needs.

Training of students and student attitudes

Variation in level of computing competence of students is a problem. This aspect could be grouped with the theme of **computer literacy of students** that emerged from the focus group interview in 1999.
"Students do not participate regularly in the process – they are just concerned with the submission of assignments". From a change management perspective it could indicate that students have to shift to a different paradigm, i.e. from passive learning to active learning. Another lecturer repeated this concern "Reluctance among students to optimally utilise the possibilities of *WebCT"*. It is interesting that the same lecturer posed that their reluctance could be ascribed to e-mail, because e-mail is so much easier to use. It resonates with the critical success factor of "ease of use" mentioned by Davis (1989) and Collis *et al*. (2000). One lecturer points out that "Students tend to communicate outside *WebCT* because it takes longer to log into *WebCT* than to use e-mail or send an SMS". Yet another states "Some students never use *WebCT*".
A recommendation was made that more training and experiential learning should take place before students will really start using the system.

WebCT

One lecturer stated that "*WebCT* is rigid in terms of down loading student information, calculation of marks, handling groups". It is similar to the theme of ***WebCT***, that emerged

from the focus group interview in 1999 i.e. that it is not easy to use. It is a concern that will hopefully be addressed by the latest version 3.8 of *WebCT*. If this is not the case it could prevent the *early majority* from adopting *WebCT* and as a consequence diffusion will not be successful.

One lecturer indicated that "I do not experience specific problems". This means that what Collis *et al*. (2000) refer to as *Engagement* was successful.

Another lecturer mentioned that discussion and chat functions are rarely used because "direct e-mail is easier and better". In terms of diffusion it could be problematic that another technology, i.e. e-mail is in effect hindering adoption of *WebCT*. It will be important to address the user interface of *WebCT* to ensure diffusion among the *early majority*. The following statements build on the theme of a lack of user friendliness:

"Uploading and downloading of assignments is a laboursome process".

"The way in which one has to open sequences of messages is laboursome".

WebCT integration with legacy systems

"Integration of registering students on the student administration system (mainframe) is not in sync with registering students on *WebCT*. Students often have to start working in *WebCT* before they have paid and have been formally registered at the University – we should look at more flexible business rules". This is a business rule issue that poses a financial risk to the University if it is not followed, but which has been discussed with Finance in an attempt to resolve the frustration of students and staff.

Change management

On a positive note, two lecturers noted respectively that "Initial resistance should be resisted because it is a natural response to change" and "the demand from students is greater than the capacity of academics to supply".

Resources

A noteworthy comment was that the "Biggest constraint is people, not technology". It possibly indicates that the lack of user friendliness of *WebCT* could be overcome by enthusiasm. It possibly indicates that the factor of *Engagement* weighs more than the factor of *Ease of use* where diffusion is concerned. Another lecturer mentioned that departments with limited staff struggle to put in sufficient time to go through the process of redesigning and in some cases designing content from scratch. He suggested the contracting of

postgraduate students for content expertise/design. This statement reflects a lack of *Compatibility*.
One lecturer emphasised time constraints in the sense that there are too many student discussions to respond to: “I need a tutor or assistant to take responsibility for the online part of a flexilearning programme – I can’t manage the assessment and feedback”. This statement reflects a lack of *Relative advantage* and *Compatibility*.

What is important to take cognisance of is that some lecturers experience limited resources in terms of content expertise and typical activities of a lecturer, i.e. assessment and feedback. Hence it could indicate that technology and instructional design and development support is adequate, but additional cademic support is required.

Educational model and learning facilitation

A lecturer noted that the use of “*WebCT* by both parties [lecturers and students] is required, otherwise it reduces to little more than a document delivery system”. A concern and yet another example of a technology interfering with the diffusion of an innovation is the following statement: “CD’s enhance convenience, but students ignore *WebCT* once they have the CD”. One should consider all the pros and cons when determining the selection of technologies used in a course – particularly the way it is used. A benefit of the CD is that it lowers frustration levels of students who experience access problems. Yet it causes serious damage to the strategic focus on quality flexible learning. The fact that students ignore *WebCT* once they have the CD means that they then forfeit rich communication and possible high level learning interactions via *WebCT*.

A statement of “It is difficult to focus if one offers *WebCT* courses and regular lectures in other courses” points either to the lack of a consolidated educational model or strategy, or to the fact that diffusion has not reached early majority level. In other words some of the courses that the lecturer offers do not make use of *WebCT* yet.

A positive comment was that “Online discussions in *WebCT* add value to learning”. Also that it facilitates “group work, discussions, case studies and simulations”. Another appreciates the fact that it expedites feedback to students, “answering as quickly as possible”.

When asked for what activities they use *WebCT* the following educational model emerged:

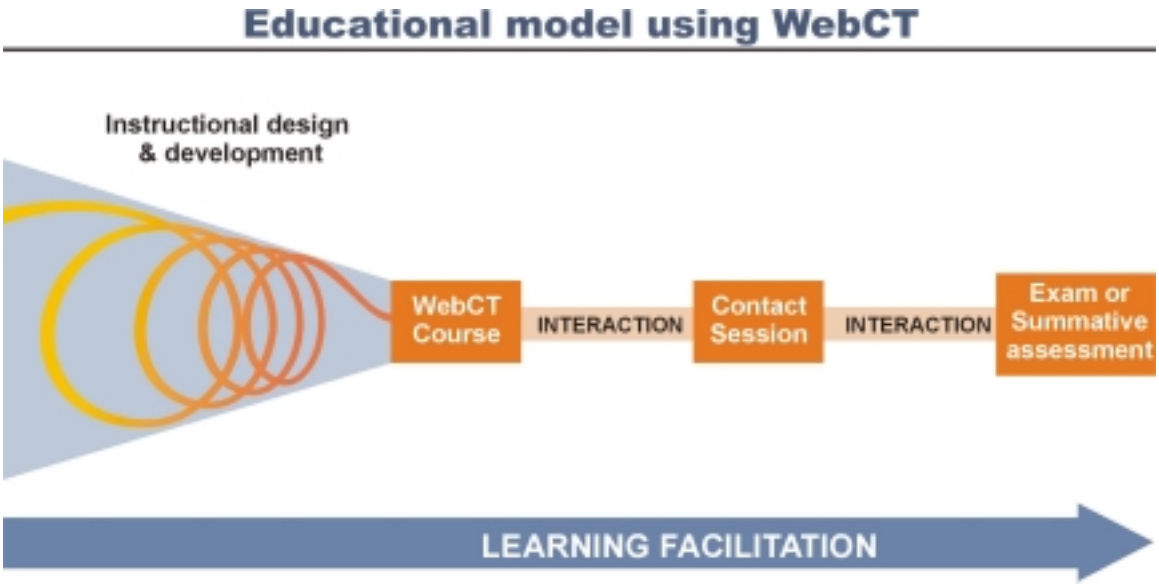


Figure 4.15 Prevalent model used for *WebCT* supported courses

The spiral depicts the educational model followed by the lecturer, Telematic Learning and Education Innovation and Aademic Information Services to reate a course. Once it is activated, certain lecturers provide activities that learners have to complete before the first face-to-face contact session. Interactions take place during this time via *WebCT*, telephone, e-mail, fax and cell phone.

The contact session is used for particular activities as reported on in the following section. Thereafter interactions take place again, but seemingly less than between the activitation of the course and the first contact session. Finally, a contact session is used for examination purposes. This model varies based on a specific programme or course. In some courses regular contact sessions are held on a weekly basis. In others, only two contact sessions are held a year.

The following provides an overview of activities before students come to contact sessions:

Before contact sessions:

Students have to do preparation on topics. “Students have to achieve assigned tasks for which content is not available on the site, but in various electronic databases”.

Students have to complete group assignment reports.
Students are trained on the use of *WebCT*.
Listserv communication takes place (Outside *WebCT*).

Practise runs and information sessions are held by the lecturer regarding assignments.
Group assignments and information are given.
Multiple choice tests and case study preparation prepare students.

The descriptions below indicate that *WebCT* is used to prepare students before they come to contact sessions. This is done in various ways, as discussed below.

Minimum requirements

Providing the minimum requirements of outcomes, schedule, assignments, references and assessment criteria prepare students and gives them a mental model of everything that is expected of them. “Students are guided in doing their assignments and additional information is posted on the Web for their use and follow-up. They are also expected to communicate with each other on assignments and other learning material”.

Course content

Content in the form of case studies, *Power Point* slides or lecture notes are provided.
“Case studies are provided and they are asked to analyse and synthesise using skills acquired by performing certain reading/review tasks”. “Notes and power point slides”.

Links to other web sites

Links are often available to important sites. “Links to internet resources, asynchronous communication”.

Self assessment

In some instances students have to complete self-assessment activities before coming to contact sessions. “Self evaluation and feedback”.

Other descriptions of activities before contact sessions include the following:

“Students are given an article written by a world expert (with permission), which is not quite up to date. They are then asked to update/improve it and the expert becomes an external evaluator of the product”.

Problem solving and discussion

“Facilitate problem solving through online discussions and debates”.
“I communicate a least three times a week with my students and provide a recording of a discussion between myself and Prof Britz online for them to listen to”.

40% (16) of respondents indicated that they use *WebCT* as a content delivery tool only”.

Contact sessions:

The researcher attempted to quantify the percentage of lecturers who use contact sessions for specific activities:
lectures (90%) (36), group assignments (60%) (24), group presentations (13%) (5), simulations (7%) (3), practicals (13%) (5), discussions (20%) (8), case study analysis, guest speakers (7%) (3), feedback on assignments (17%) (7) evaluating online discussions (7%) (3), class tests (53%) (21).

Figure 4.16 is a graphic representation of the descriptive statistics above.

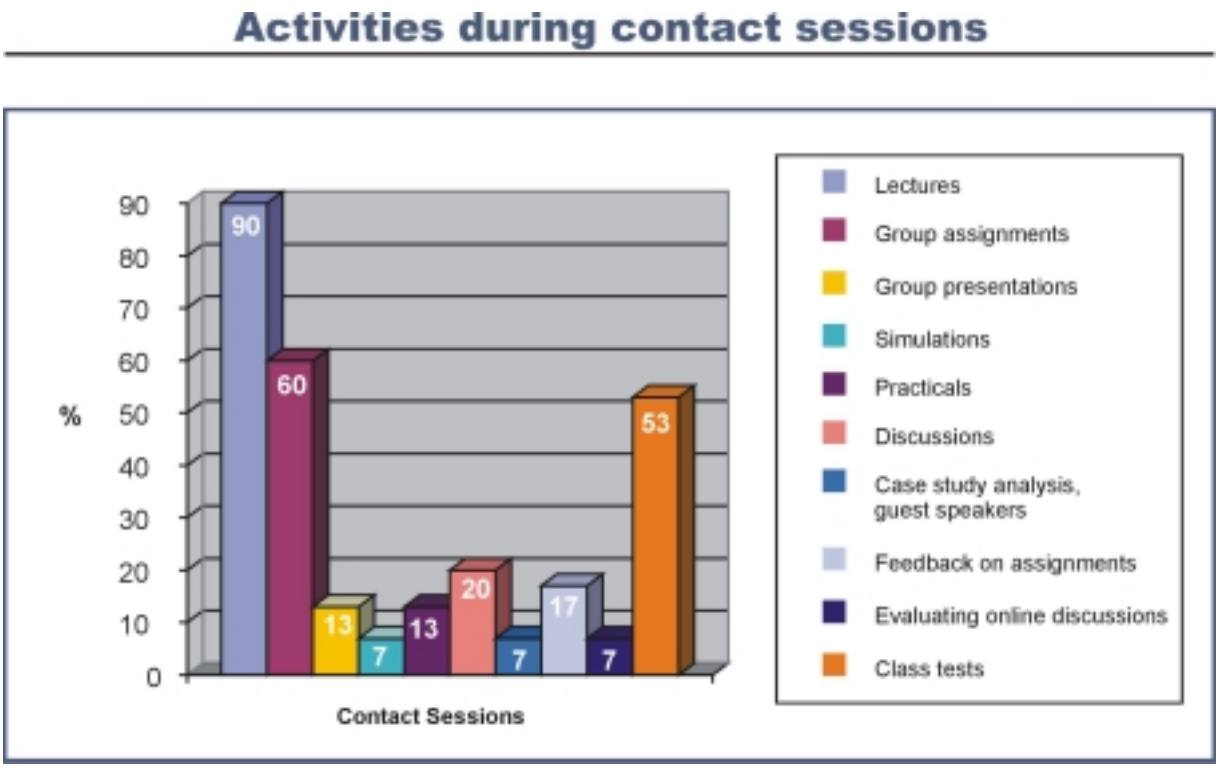


Figure 4.16 Learning and teaching activities during contact or block sessions

What is clear from the statistics is that an objectivist/behavioural model prevails in spite of the introduction of a web-supported model. As shown, 90% of lecturers use contact sessions to lecture. Interestingly a percentage of 60% lecturers use contact sessions for group assignments – which indicates a relatively high level of cooperative learning. It must be noted that the statistics are not mutually exclusive in that the same lecturer could have indicated that she makes use of contact sessions to give lectures and to facilitate group work. It seems that assessment, i.e. *Class tests* scores 53% which possibly indicates that contact sessions remain the preferred opportunity for formal assessment. The percentages of other activities are not significant enough to interpret.

The following section analyzes what kinds of activities lecturers engage in after contact sessions.

After contact sessions:

Students are given group assignments to complete and have to start with examination preparation. Some lecturers give students a research report to complete. Others do nothing: “None”.

The section below quantifies respondents answers.

Peer assessment

10% (4) of respondents use peer (student) evaluation as formal assessment, which is significant and contributes to the strong presence of cooperative learning in the educational model.

Usage of *WebCT* interaction/communication functions:

90 % (36) of respondents believe that interactions between them and students between block/contact sessions is important. This is significant because it indicates realisation of the need for learning facilitation and communication.

The percentage use of various functionalities of *WebCT* are provided below.

Bulletin board: 20 % (8)
Chat: 7% (3)

Messaging: 40% (16)
Multiple choice: 13% (5)
Case studies: 60% (24)

Although *messaging* is 40%, it is outweighed by *case studies*. In terms of a constructivist model the case studies point to a significant level of problem solving present in the educational model. Yet the communication component of constructivist learning is quite low. It should be mentioned that communication between students and lecturers takes place via e-mail as well, thus it would not be a valid inference to conclude that too little communication takes place in *WebCT*-supported courses.

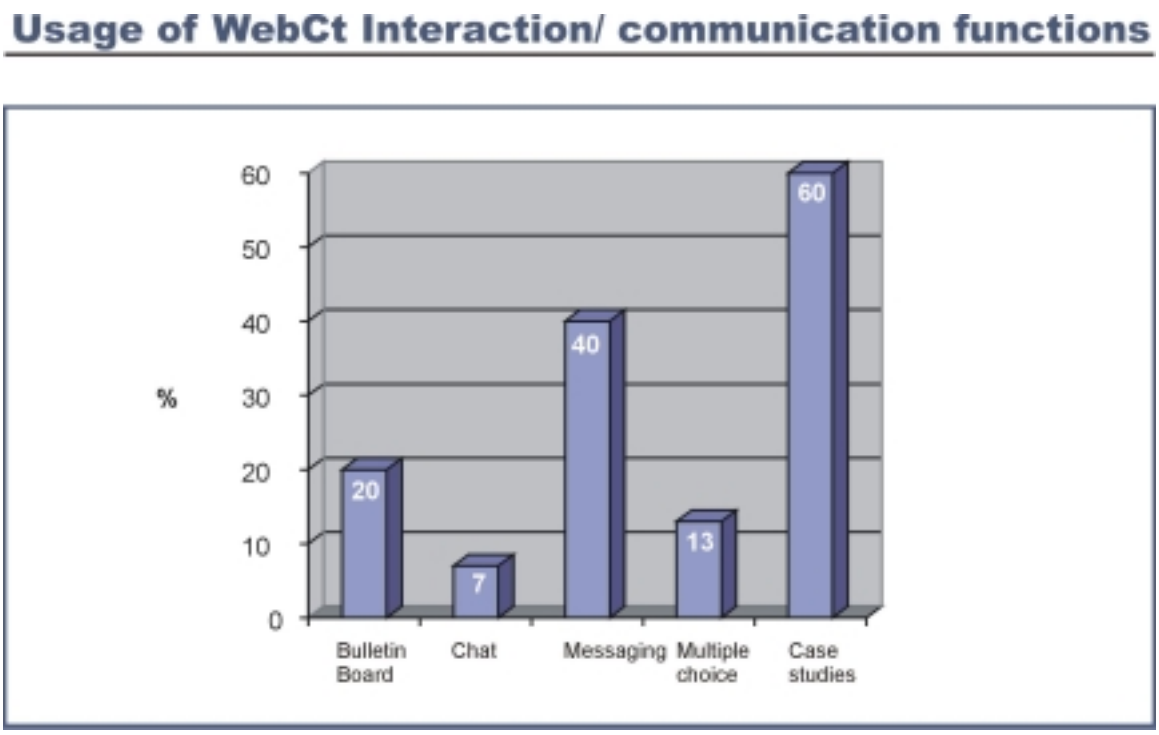


Figure 4.17 Frequency of communication facilities used in *WebCT*

Lecturers were asked about the turnaround time of feedback on assignments. The reason is that effective feedback (timely, constructive, positive) contributes to effective learning (Section 2.3.10)

Turnaround time of feedback on assignments:

One week: 33% (13)
Two weeks: 33% (13)
Three weeks: 13% (5)
Four weeks: 7% (3)

One month: 7%(3)
Two months: 3% (1)
Marked as not applicable: 3% (1)

The turn around time is acceptable if one considers that 66% of lecturers provide feedback within one or two weeks. Two weeks could be considered too slow for a web environment. To return an assignment after a month or longer leaves too wide a gap between the student's engagement with the knowledge constructs and the time when feedback is given.

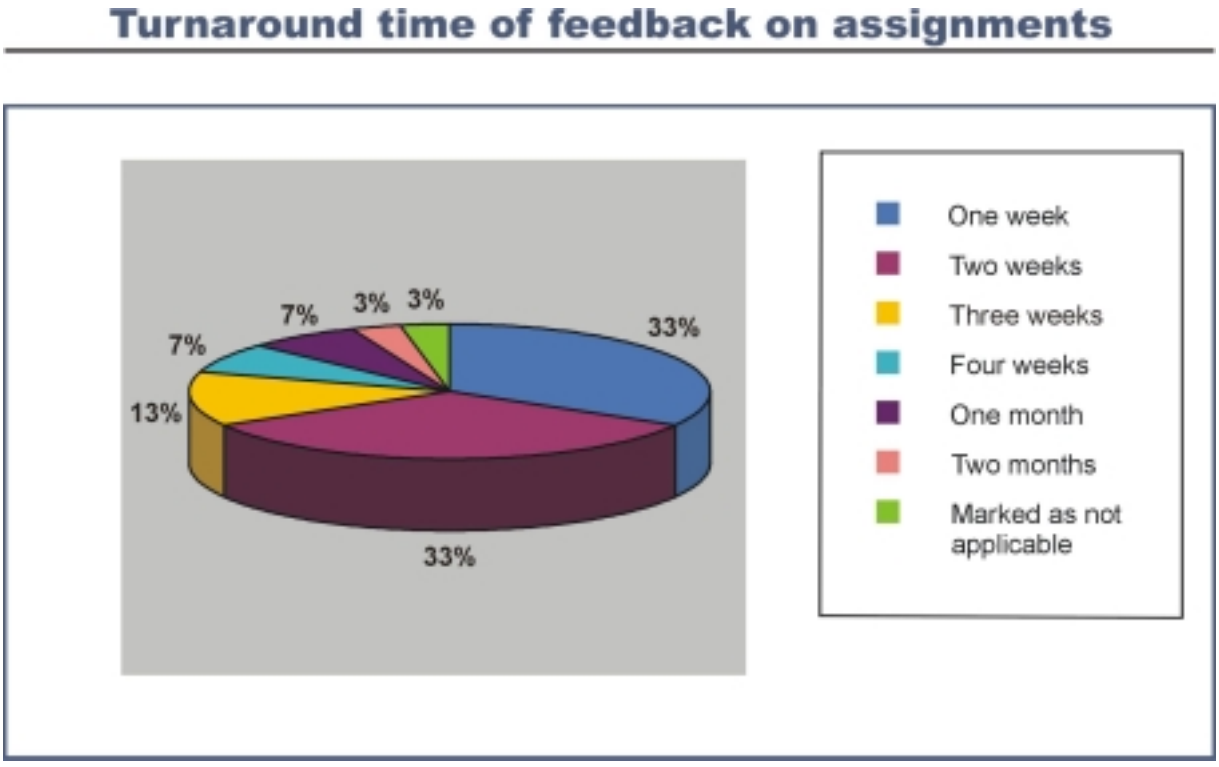


Figure 4.18 Turn around time of assignments

Other themes that emerged from the respondents' answers are discussed below.

Knowledge creation

Some feel there is a lack of knowledge and skills of lecturers and students. This is a concern that could be addressed by means of innovative training and, at best, increased knowledge sharing among lecturers and their peers and among students. This is echoed by two other statements: "Lecturers don't share experiences of what works and what doesn't".
"Lecturers should be trained to use various interactivity options".

The researcher used characteristics of a web lecturer listed by Bonk & Wisher (2000:11) in Question 18.

The important characteristics of a lecturer as perceived by respondents are give in Table 4.12.

Important characteristics of a lecturer from a lecturer's perspective

Characteristic	**Mean**	**Std Dev**	**Rating** (1 as most important and 12 as least important)
Enthusiasm	3.2	2.4	1
Responsive	3.7	2.2	2
Expertise	4.9	3.2	3
Flexible	5.1	2.4	4
Clarity	5.3	2.8	5
Positive	5.7	3.4	6
Web-smart	5.9	3.6	7
Empathy	7.7	3.6	8
Patience	7.8	3.3	9
Caring	7.9	2.4	10
Friendly	8.2	2.6	11
Cultural responsiveness	9.8	2.9	12

Table 4.12 Rating by lecturers of important characteristics of a web lecturer

The rating indicates that the majority of lecturers regard *Enthusiasm* as the most important characteristic of a web lecturer, followed by *Responsiveness* and *Expertise*. The latter relates to subject expertise.

The results of the question about the most appropriate roles of the lecturer in a web environment indicate that those of *Facilitator*, *Mentor*, *Provocateur*, *Observer* and *Participant* were marked most often.

Section 4.15.8 provides results of individual interviews with the virtual campus project team.

4.15.8 Interviews with virtual campus project team

Individual interviews were held with members of the virtual campus project team. An open interview structure was followed, in other words no agenda was used with specific questions. The project team officially disbanded towards the end of 2000. Smaller groupings of members continue to meet frequently to further deploy and sustain projects that have been implemented. The original team consisted of 25 members, of which 20 were core members, including four project managers and the researcher. Two members have left the University and three members initially attended and then left. Taking the above into account, the population is 19. A convenience sample of 17 was chosen, which yields a representation of 95%.

The emerging patterns and themes that emerged from the interviews are as follows:

Knowledge creation and organisational learning

Interviewees indicated that the virtual campus led to new knowledge and that "Knowledge creation speeded up as time passed"and "Problem solving and knowledge creation took place in the project team".

One interviewee felt that the "Blueprint helped for alignment, but can never be too specific because of the impact of the human factor". The Blueprint refers to the original project charter and tasks. The majority of respondents said that the virtual campus project team meetings highlighted commonalities that stakeholders were not aware of and that it broadened the institutional knowledge base. It was also valuable to promote horizontal, cross functional collaboration. A positive and important comment was that "Communication networks that were created still continue and were sustainable". Three members from Academic Information Services mentioned that full text articles and online sources that resulted from the virtual campus enriched the offering to students and led to knowledge creation amongst librarians.

Competitive advantage

All interviewees thought that the virtual campus adds to the competitive advantage of the University of Pretoria and that it led to significant changes at the University.
One interviewee regarded it as a "Necessary and appropriate project".
One interviewee described it as a "Lead project within the university".

Several pointed out that the virtual campus was an international leader in 1999 in terms of the scale of integrated products and services via the Internet.

Change management

A benefit pointed out by several interviewees was that the virtual campus aligned various departments and that it made a start to breaking down silo-based culture.
It made a difference organisation wide and gave impetus to further institution-wide initiatives like the Client Service Centre – a project that the scope of this thesis does not allow to describe. Several interviewees pointed out that it was beneficial to drive the virtual campus at operational level because it would not have succeeded on senior managerial level. It acted as catalyst and created a competitive environment – leading to healthy competition amongst departments. Unfortunately the competitive environment resulted in unnecessary duplication in one instance. The duplication resulted in distrust among certain team members and confused users because over a period of a year two similar systems were created on which they were trained by different parties. In terms of change management it was driven holistically, but not enough was communicated to the University of Pretoria at large – more demos and information sessions would have influenced the adoption rate positively. Responsibilities for certain tasks have settled within various departments but more resources are necessary to maintain momentum. A concern was expressed that executive management have lost the cross-functional view of the virtual campus now that its various components have settled into the line responsibility of departments.

Constraints

Four interviewees commented on the fact that the pressure was high and the time scale short. Further that members had to produce results on top of a regular work load. It was also pointed out by a member from the IT department that the technology architecture was not ready at the time. Further that the interim development served the purpose well, but that it was necessary to migrate the virtual campus to a new technology architecture.

Project management

Interviewees indicated that the project team was representative of stakeholders and the formal reporting was effective.
Small cross-functional groups worked well together and the project team served a very good function of coordinating cross-cutting tasks. It also provided information and facilitated communication well. The project had a significant outcome with a remarkably low budget.

One member felt that it could have worked even better if strategic decisions were separated from operational tasks. Another pointed out that it worked well because the operational level made decisions quickly without delaying implementation by beaurocratic procedures. The operational level was more in touch of what could be done and there was sufficient strategic guidance from the researcher. Moreover, several middle managers served on the team which ensured communication to their senior managers.

Several members pointed out that the aggressive energy and push of the researcher was necessary to overcome lethargy and to accomplish the deliverables in time.
The project team disbanded at the right time (after three years) since which time smaller groups continue to meet on a regular basis. All interviewees indicated that the planning and project management was good.

Innovation

Some interviewees felt that the 'underground' strategy combined with top-down support worked well. In terms of innovation it is considered a good decision at the time to create a more integrated administration system and to link it with *WebCT* as it was the first successful attempt to integrate student services. Three members indicated that the virtual campus project team accelerated innovation at Academic Information Services (library).
All interviewees felt that the growth in adoption rate of products and services is significant. The spiral/iterative or incremental development worked well in that the *WebCT* pilot projects served as success factors for further deployment. It was pointed out, however, that a chasm still exists between administration staff and academic staff. In terms of success rate most of the original objectives have been reached, but others have failed, such as online registration.

Critical success factors VC:

Interviewees provided the following critical success factors of the virtual campus project:

- The vision and drive of the researcher.
- The support from executive management.
- The *Sponsor* (Director: Telematic Learning and Education Innovation) understood the university well (being the former Registrar).
- The fact that it was driven mostly at tactical and operational level.
- The incremental innovation strategy worked well to reduce risk, to allow for mobility regarding changes in technology architecture and to adapt, based on experience.

Critical success factors *WebCT*:

In terms of the *WebCT* component of the virtual campus, interviewees provided the following critical success factors:

- "Diffusion has to reach a point where needs are created and where dependency on the use of the web is such that you can't do without it (dominant design on 'S'-curve)".
- The attitude, example and drive of the academic project leader of the pilot projects: MEM and MPM.
- Academic project leaders must know how to manage diffusion.
- The ability to create an enabling context and culture in students.
- User-friendliness of the system used.
- Support of Telematic Learning and Education Innovation.

Suggestions:

Some members made suggestions for the way forward:

- Training by experienced lecturers/champions as opposed to training only by telematic staff.
- More marketing is needed.
- Seize opportunities that have been created, such as international collaboration.
- If no support is given in matrix management, for example in an interdisciplinary programme – substitute resources at a cost y contracting in external resources.
- More lecturers should be appointed on contract and a core pool of academics should remain on permanent basis to sustain the research pool.
- More research is required about the needs of lecturers.

An interpretation of the themes follows.

4.15.8.1 Interpretation

Knowledge creation

A significant finding is that knowledge creation speeded up as time passed. This adds a new dimension to knowledge creation theory. It indicates that *time* is a factor of acceleration of

knowledge creation when small teams learn together. The longer the team work together, the faster they create knowledge. This could possibly be ascribed to a similar mental model that develops among team members. The similar mental model probably aligns thinking and accelerates implementation as less justification and negotiation is required. It could also be contributed to collaborative knowledge that grows exponentially as time passes.

Mental model

Emerging knowledge about *innovation strategy* and *knowledge creation* is that a blueprint or project charter facilitates knowledge creation by creating a mental model of what the outcome of the innovation should look like and strategies of how to get there. As pointed out by one of the interviewees – a blueprint cannot be completely accurate where innovation is concerned. The reason is that it has never been done before and one can only attempt to give general thrusts of what the deliverables should be. In the case of the virtual campus, the foreseen deliverables were very specific. It could be argued that specific deliverables limit creativity. Yet the researcher is of the opinion that the specific deliverables assisted to make the mental model of team members more concrete. During the innovation process team members used their own creativity and tacit knowledge to reach the deliverables. It is posed that in order to create a blueprint, the *intrapreneur* or *innovator* requires an ability to first combine explicit knowledge in the organisation, i.e. the models of *combination* and making tacit knowledge explicit i.e. *externalisation* (described in Section 2.5.1) are used before the design of deliverables can take place. During the design phase the innovator needs to be creative enough to make the vision concrete. This is done by imagining the foreseen outcomes (such as new products and services) and working backwards to map them onto existing knowledge. Through this process of problem solving it is possible to provide specific strategies and deliverables.

Competitive advantage

If sufficient working relationships develop in a matrix project team the likelihood of sustainable innovation increases. In this case the team achieved enough synergy to embed new institutional processes that are sustainable and that are continuously improved upon. The virtual campus project was therefore successful in converting human capital into new products and services – regarded in Section 2.5 by Quinn *et al*. (1992:181), Tapscott (1996:43) and Von Krogh (1998:133-136) as one of the biggest competitive advantages of an organisation. Furthermore, it has led to organisational learning. Products and services have been improved through better knowledge and understanding (Fiol & Lyles, 1985); the range of potential behaviours of employees have changed (Huber, 1991); and new mental models

have been created (Stata, 1989). It also positioned the university as an international leader in virtual education as early as 1999.

Change management

Change management took place, discussed in Section 2.6, in that business processes were redesigned to utilise the benefit of a new technology – the Internet (Conner, 1998:100). Business processes were also redesigned around the needs of customers – students. The virtual campus is an example of an organisation that has been re-architected (Nadler & Tushman, 1995), in terms of technology architecture, business processes, the educational model and administrative services. The recognition of the impact of technology on the higher education landscape and the changing needs of customers was acted upon rapidly enough to reposition the institution and make it more competitive. It indicates that the University of Pretoria is a nimble institution, in other words it is sufficiently mobile to respond to change. In itself this is a competitive advantage, considering how large the institution is.

A significant finding is that a predominantly bottom-up change management strategy was successful in a cross-cutting project. The remark that it would not have been successful, had it been driven at senior managerial level, is interpreted by the researcher as an indication that power bases are stronger on a senior level and hence more resistance is experienced if a horizontal, institution wide project is attempted at that level. In a certain sense the senior management level (Directors and Deans) was by-passed. The reason why this statement is made is because the project was supported by the top level of management, i.e. the Vice-Chancellor in person in the role of *Protector*, and decisions were made and implemented on a middle managerial and operational level.

Competition resulted from the project, which led to an accelerated pace of knowledge creation and innovation. On the down side, duplication occurred that resulted in confusion among users. The duplication can be ascribed to a lack of ownership experienced by the particular team members. It only occurred in one Department though, which indicates that the relevant Director and team members probably resisted the change to such an extent that the competition changed from healthy inter-departmental competition to destructive competition that actually harms the institution, as discussed in Section 2.6 (Crego & Schiffrin, 1995:69).

Support from top management emerged as another critical success factor. However, the researcher finds it necessary to emphasise the fact that it was not formal support in the sense that almost no decisions were taken by top management regarding the virtual campus.

Neither was it propagated publically by the Vice-Chancellor. The advantage of this strategy was that people felt less threatened and as a result less resistance was experienced. Yet the project team was allowed enough scope and power to make decisions and implement major changes. Top management support, or rather the support of the Vice-Chancellor was implicit but adequate – the fact that the status report served at the Strategic Technology Committee, with presentation by the Vice-Chancellor indicated a sufficient level of support. As project leader the researcher found it frustrating at the time that it was never included in the strategic plan of the university as a strategic focus. Then again, a very formal launch was held and university publications reported on the virtual campus. Furthermore, the researcher was given several opportunities to give information sessions to which the entire university was invited. These took place at so - called Telematic forums and Marketing forums. Both are regular forums to which every staff member receives an invitation by e-mail and by letter (hard copy). In hindsight, it could have contributed to a lack of ownership because the researcher resided in the Department of Telematic Learning and Education Innovation and all the presentations on the virtual campus were done under the auspices of this department. Hence the question arises whether a more independent identity should have been created for the virtual campus project team – being a cross-divisional team.

A comment about a continued chasm between academic staff and administrative staff reflect not only upon the virtual campus project, but also on the culture of the university.

Marketing

The point about the lack of adequate marketing and information sessions is important for future innovations. It reveals that there can never be enough discussions, information sessions, demos and marketing campaigns when one deals with organisational innovation.

Resources for sustainability

An important concern that has emerged is the possibility that the vision is becoming fragmented again now that new products and services have been embedded in specific departments. Also that an integrated or consolidated strategy is required to inform top management of the links between budgetary requests by individual departments to sustain the innovation of the virtual campus.

An interesting suggestion is that resources – specifically lecturing staff – should be contracted if a lack of support is experienced in a matrix management project. Many postgraduate progammes are managed in matrix fashion because they are interdisciplinary.

Both the MEM and MPM are interdisciplinary programmes and consist of courses offered by different departments and even different faculties. A further recommendation is to contract in more lecturers and to keep a core of permanent lecturers to focus on research. This could lead to better performance. If a lecturer is contracted in to offer a *WebCT*-supported course, he or she will be contractually bound to use it effectively and successfully. Unfortunately many lecturers are permanent staff members and are reluctant to change their teaching model.

Project management

The short time span was experienced by team members as a constraint, but the researcher is of the opinion that it created the sense of urgency and tension that was necessary to mobilise people and maintain momentum.

From a project management perspective, the team functioned successfully and was critical in coordinating a wide spectrum of tasks.

Innovation strategy

The results of the interviews support the researcher's view of the incremental or evolutionary strategy that was followed. Yet it caused radical changes to the university's way of doing business – especially in terms of services but also in terms of products. Additionally, that it was a sound decision to focus on the knowledge champions in terms of representation on the project team, and not the senior managerial level. The decision to integrate *WebCT* with existing administration systems was visionary. This is confirmed by a global trend, most visible in the USA, of implementing web-enabled *ERP* systems that integrate processes – including integration with course management solutions like *WebCT* and *Blackboard* as described in Section 3.2.

The spiral innovation process echoes the organisational knowledge creation spiral of Nonaka and Takeuchi (1995:73), depicted in Section 2.5.2. Another successful strategy was to choose pilot projects for the diffusion of *WebCT*.

Champions

As indicated by the critical success factors that emerged from the interviews, the role of the project leader is crucial to ensure successful innovation. This is also true for change management and project management.

The project champion plays a crucial role in terms of innovation – in this instance the characteristics of the academic project leader is probably more important than the project manager at Telematic Learning and Education Innovation. The reason is that the academic project leader is the change agent who must be credible enough to bring about radical change in the way lecturers teach. If the academic project leader is not enthusiastic and serious about driving the change and does not set an example for faculty, the project will in all likelihood fail. It is also necessary that they understand innovation and how to manage diffusion. In the case of the pilot projects, the particular project leader was Professor Antonie de Klerk - Head of Department of Technology and Engineering Management. Apart from choosing the MEM and MPM programmes based on the subject field and the profile of postgraduate students, these programmes were chosen because of Professor de Klerk's knowledge and understanding of technology innovation and personal characteristics of being a strong and visionary leader.

Important recommendations that emerged are that champion lecturers should also be used to train prospective *WebCT* lecturers. The reason is that lecturers share professional experience– attributes that contribute to credibility and respect. This strategy could help to adress the phase of *Persuasion* (Rogers, 1995). From a psychological perspective it would be easier to follow the example of someone in a similar profession where change is concerned, as opposed to being led by a person who does not practice web-supported teaching as a profession.

Diffusion

In terms of *WebCT* a significant finding is that the innovators, and especially the early adopters have to endure long enough until they reach a point of dependency of the new technology. It is at this point that diffusion has reached a level where users feel comfortable enough to become creative in using the new technology. A significant factor is that of creating an enabling context and culture in students. It is reminiscent of the recommendation by Wlodkowski (1999:11) that self-directed strategies in teaching should be negotiated with learners and not simply mandated (Section 2.3.6). A means of doing this is to provide clarity about the new educational model and what it entails in marketing material and to discuss the model with students at the first point of contact – preferably this should be face-to-face, but it could also be facilitated via a listserv or bulletin board.

A factor that emerged from the questionnaire for lecturers as well as the interviews is the user friendliness of the system. *WebCT* is not currently user friendly in the sense that its

interface is not as intuitive as for example *Microsoft Word for Windows (MS Word),* a dominant word processing package used by university staff. Yet enthusiastic lecturers make use of *WebCT* in spite of the lack of ease of use.

Finally, the support of Telematic Learning and Education Innovation confirms literature (Bates, 2000; Rogers, 1995; Pistorius, 2000) that successful diffusion is dependent on sufficient institutional support.

Opportunity

Opportunities for international collaboration in *WebCT*-supported programmes has yet to reach a level of significance. Benefits of international collaboration include cost saving, exposure to international experts and knowledge creation.

A significant request is to conduct more research on the needs of lecturers – an aspect that is included in Chapter Five with regards to recommended further research.

Section 4.15.9 reports on the findings of a questionnaire (Annexure I) that was administered to a sample of students who follow *WebCT*-supported programmes.

4.15.9 Questionnaire for *WebCT* students

The purpose of this section is to explore the learning environment of students following *WebCT*-supported programmes. A decision was made not to focus on *WebCT* only, as it would then disregard the flexible educational model and would not provide a holistic view.

As explained in Chapter One, a descriptive and interpretive case study entails that the researcher analyzes, interprets and theorises about the phenomenon against the backdrop of a theoretical framework. It is once again important to emphasise the systems perspective, in that both the researcher and respondents are subjective and create meaning in the expression of their world view by means of language. Also, language is used to construct the meaning co-constructed by the researcher and the respondents.

The research procedures followed in this section wil subsequently be described.

4.15.9.1 Validity and reliability

Reliability and validity are salient in qualitative research. As mentioned in Section 1.5.8, reliability relates to how items are developed for constructs and whether the items are dependable and consistent. Furthermore, reliability means that information provided by items does not vary as a result of the characteristics of the indicator itself (Neuman, 1994).

Another type of reliability is concerned with equivalence reliability, in which multiple indicators (several items in a questionnaire measure the same construct) are used. The reliability of the constructs was determined by the Cronbach alpha coefficient that is used when more than two different scores are possible for each item (Owen & Taljaard, 1996:66). The Cronbach alpha coefficient measures the internal consistency of the items. It is done by adding all the variances of respondents' scores for each item. High intercorrelations of items on a questionnaire indicate that similar attributes are measured, and therefore the coefficient will be high. In cases of error or items that measure different attributes, the reliability coefficient will be low. According to Owen & Taljaard (1996:70) a Cronbach Alpha of 0,6 and higher indicates a high level of accuracy with which the instrument measures specific constructs. The Cronbach alpha coefficient for the various constructs is as follows:

Theme or construct	Cronbach alpha
1 Deep information processing	0.8
2 Constructivist elements	0.7
3 Interaction	0.9
4 Intrinsic motivation	0.6
5 Effective feedback	0.8
6 Learner – centred assessment	0.5

Table 4.13 Result of Cronbach Alpha test

The results show that the item constructs are reliable – in that they measure the constructs in a reliable way, except for construct 6, which has a Cronbach Alpha coefficient of 0.5. This means that construct 6 has a lower, but adequate level of measuring learner-centred assessment in a reliable way.

4.15.9.2 Validity

According to Johns (1996) validity is an index of the exent to which a measure truly reflects what it is supposed to measure.

In this questionnaire, the items, or questions are developed based on the work of experts in the field of learning. Their work is discussed in Chapter Two. The researcher poses that the construct validity of the indicators is high because of the fact that the work of experts is used.

4.15.9.3 Description of statistical analysis

The SAS Software package, version 8 (SAS Institute Inc., 1999) was used for data processing. The MicroCAT ™ Testing System (1993) was used for an item analysis, including statistical properties such as the item mean, the item variance and the item-scale correlation. Other basic descriptive statistics were calculated, such as frequencies, averages and standard deviances by means of ITEMAN version 3.5 (Assessment Systems Corporation, 1993).

4.15.9.4 Population

The population consists of all programmes that have been supported by *WebCT* for one year and longer (64).

4.15.9.5 Sampling procedure

Purposeful sampling took place by selecting the two flag ship programmes that were the pilot projects for *WebCT*. These are the Masters in Engineering Management (MEM) and the Masters in Project Management (MPM) programmes. Both were redesigned from a distance model with paper-based support and two contact sessions to a model using *WebCT* in 1998. Both programmes enrol approximately 50 students who used to complete the degree over a three year period. Since 2001 students complete the degree over a two year period. Both first year and second year students for 2002 were included in the sample. The first year MBA students of 2002 were also selected, because the MBA shares certain courses with the abovementioned programmes. Furthermore, the MBA was developed in 2000, a year later than the previous programmes – providing a difference in maturity of the programme.

4.15.9.6 Differences between groups

To determine differences between independent groups, the analysis of variance (ANOVA) is used. The ANOVA test indicates that there is no significant difference (<0.05) between the results of the MEM, MPM and MBA groups. Neither is there a significant difference between the first and second years in these MEM and MPM groups.

4.15.9.7 Sample size

MEM first years	48
MEM second years	20
MPM first years	41
MPM second years	13
MBA first years (modular)	42
Total:	174

A total of 163 students responded, making the response rate 94%.

4.15.9.8 Instrument

A questionnaire was developed, consisting of 82 questions. The questionnaire was explained to each group of students before they completed it and the researcher was also available for questions whilst the respondents completed the questionnaire.

The theoretical basis for the selection of the questionnaire items was a thematic analysis. The questions are based on the extensive literature study conducted in Chapter Two and theoretical aspects in Chapter Three. Certain constructs emerged around which the researcher formulated the questions. The constructs are listed below.

a. Deep information processing.
b. Constructivist elements.
c. Interaction.
d. Intrinsic motivation.
e. Effective feedback.
f. Learner – centred assessment.
g. Role of the lecturer.

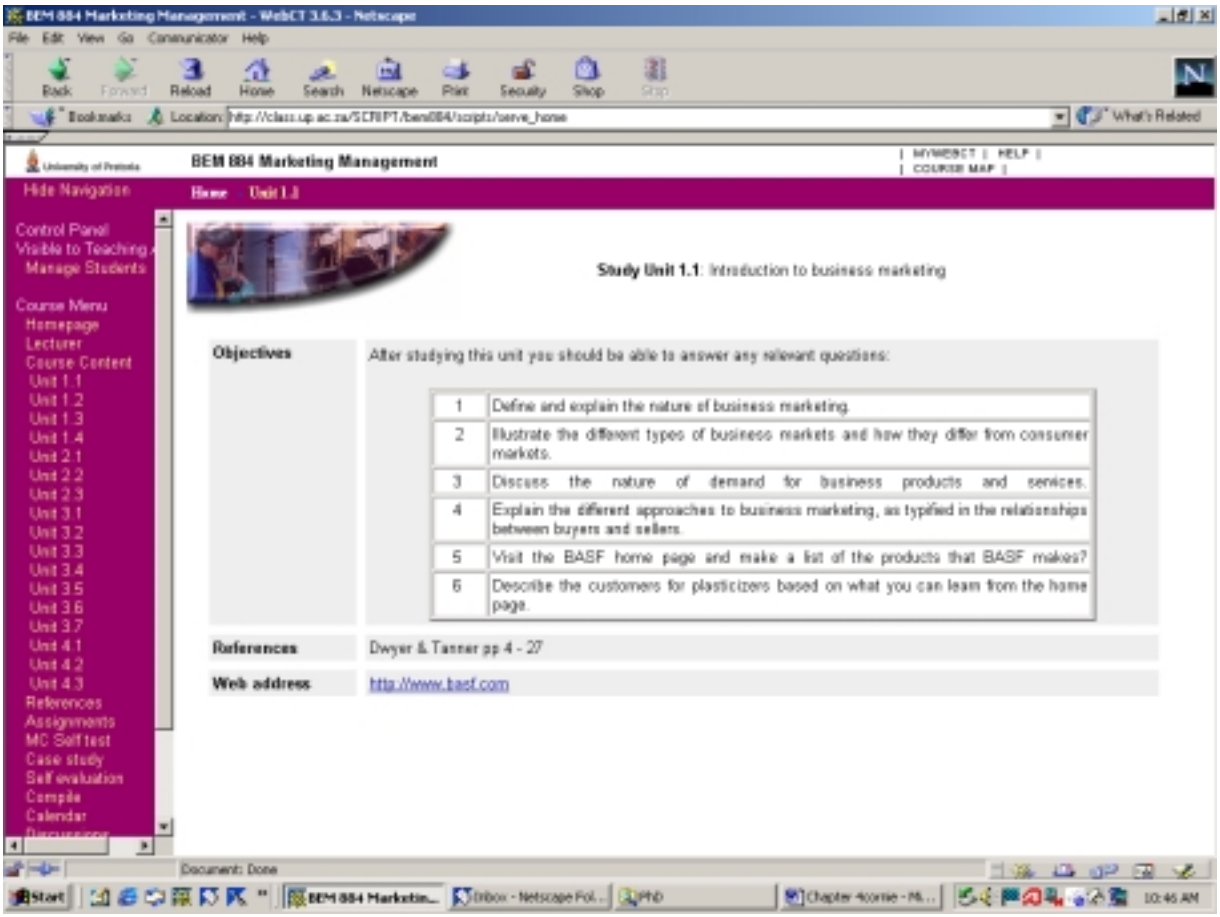
Each section indicates the theory that was used to construct the questions that constitute a specific theme. Examples of how these themes manifest in the sample courses are shown.

Section A: Deep processing of information

This construct is based primarily on the work of Henri (1992:73) which is discussed in Section 2.3.2 on *Cognitivism*.

The questions test whether students engage in the following cognitive strategies in their learning environment:

Linking facts, ideas and notions in order to interpret, infer, propose and judge.
Offering new elements of information.
Generating new data from information collected by the use of hypotheses and inferences.
Proposing one or more solutions with short- medium or long-term justification.
Setting out the advantages and disadvantages of a situation or solution.
Providing proof or supporting examples.
Making judgments supported by justification.
Perceiving a problem within a larger perspective.
Developing intervention strategies within a wider framework.



Screen capture 4.12 Outcomes in Marketing Management

These outcomes of Unit 1.1 are on a lower cognitive level of Bloom's taxonomy.

Questions 1 – 6 in the questionnaire (Annexure I) tests the construct of Deep processing of information). The table indicates the frequency (number of students) and percentage of students who rated the theme of Deep Information Processing on the Likert scale.

Likert	Frequency	Percent
1	1	0.6
1.6	5	3.0
1.8	2	1.2
2	5	3.0
2.2	4	2.4
2.4	7	4.2
2.6	42	25.7
2.8	18	11.0
3	21	12.8
3.2	22	13.5

3.4	9	5.5
3.6	18	11.0
3.8	4	2.4
4	5	3.0

Table 4.14 Frequency distribution of deep information processing

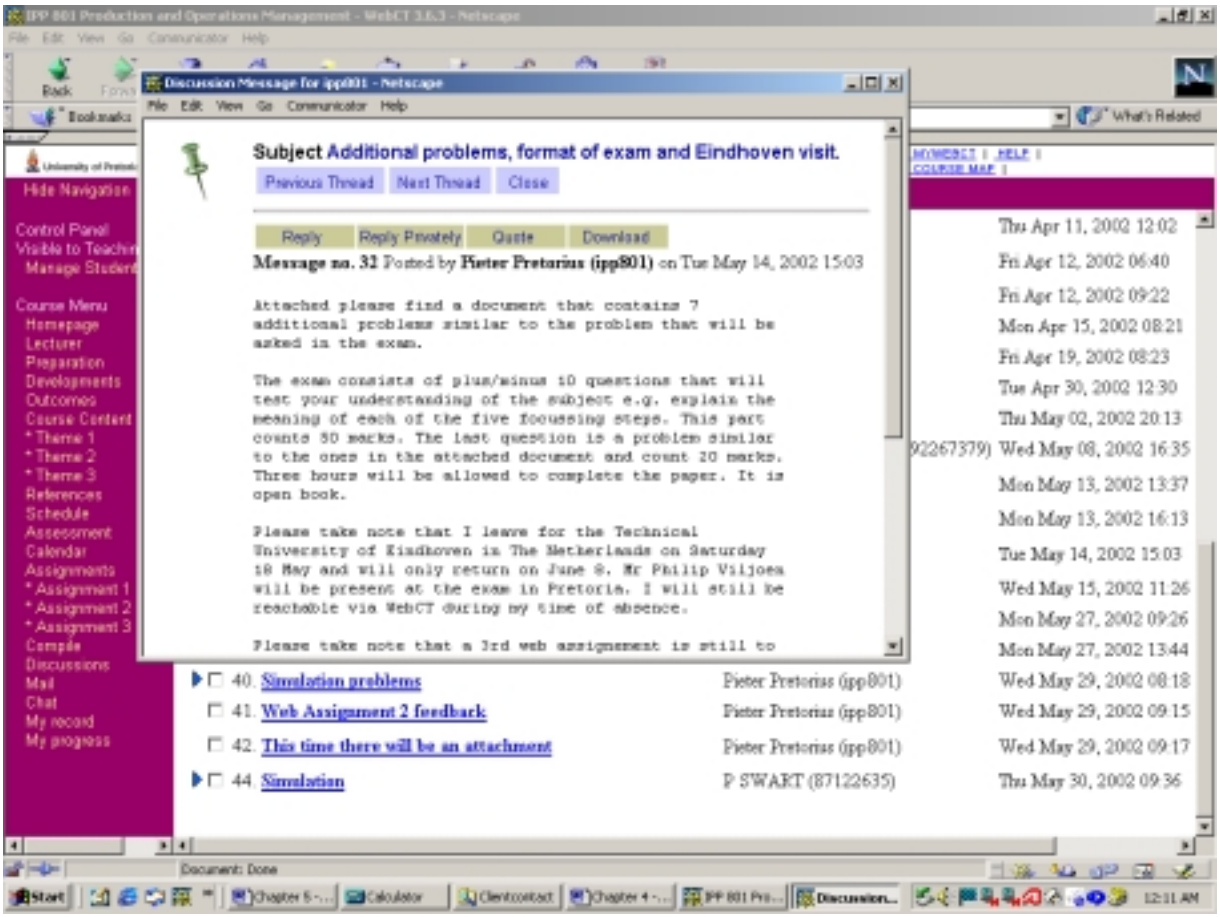
The frequency distribution indicates that deep processing of information takes place often in the learning experience for 45% of respondents (cumulative score of 3 – 3.8 on Likert). It takes place always for only 3% of respondents.

The total of 45% is low, considering that it is a postgraduate group.

Section B: Constructivist elements

This construct is based on Section 2.3.4, particularly the synthesis of constructivism by Bonk & Wisher (2000:6). Questions correspond to the following characteristics of constructivist learning:

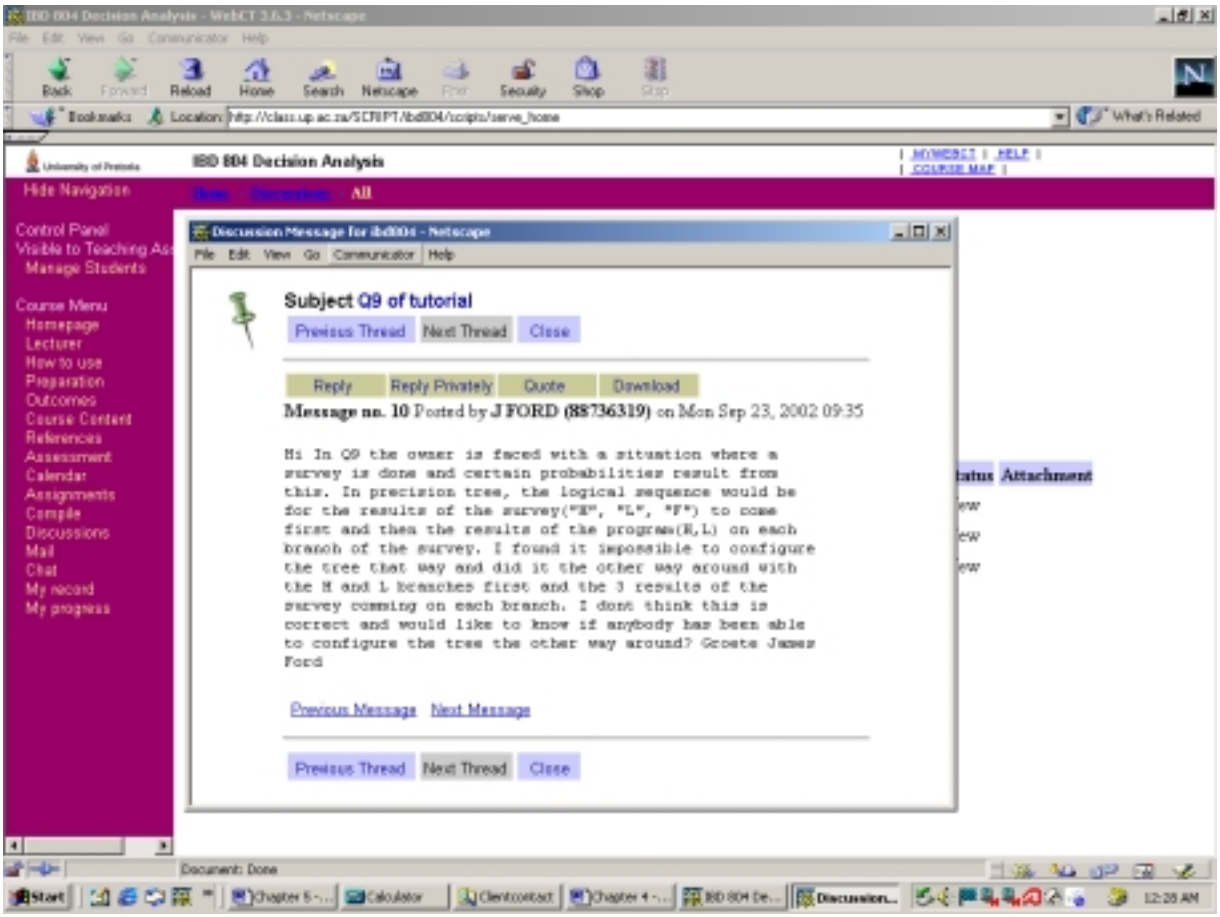
Construction of meaning and knowledge that builds on prior knowledge.
Personal interpretation.
Meta skills.
Active learning process.
Learning is collaborative – allowing for multiple perspectives.
Knowledge is situated in real life.
Assessment should be integrated with the task.
(High participation, transfer skills)



Screen capture 4.13 Arrangements for the exam and problem solving in Production and Operations Management

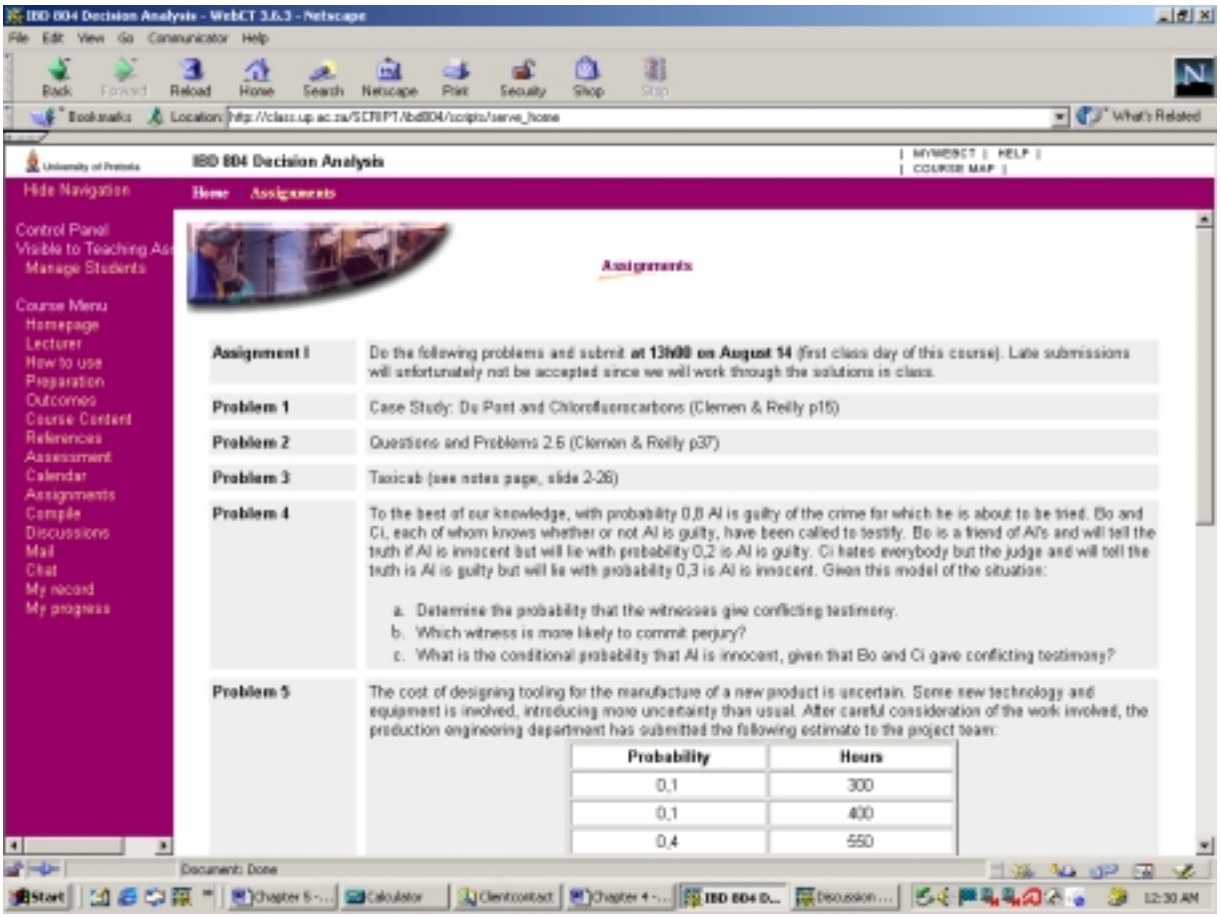
Screen capture 4.13 shows guidance regarding examination and also that the lecturer will be available via *WebCT* even though he will be overseas. The latter is a motivational strategy (Wlodkowski, 1999:294-297) and is an example of *concretely indicating cooperative intentions to help adults learn*.

It shows that *problem solving* forms a significant part of assessment in the course, which denotes cognitive and constructivist elements. An encouraging element is that the exam is open book – which means that it is not behavioural (rote learning) in spite of being an exam.



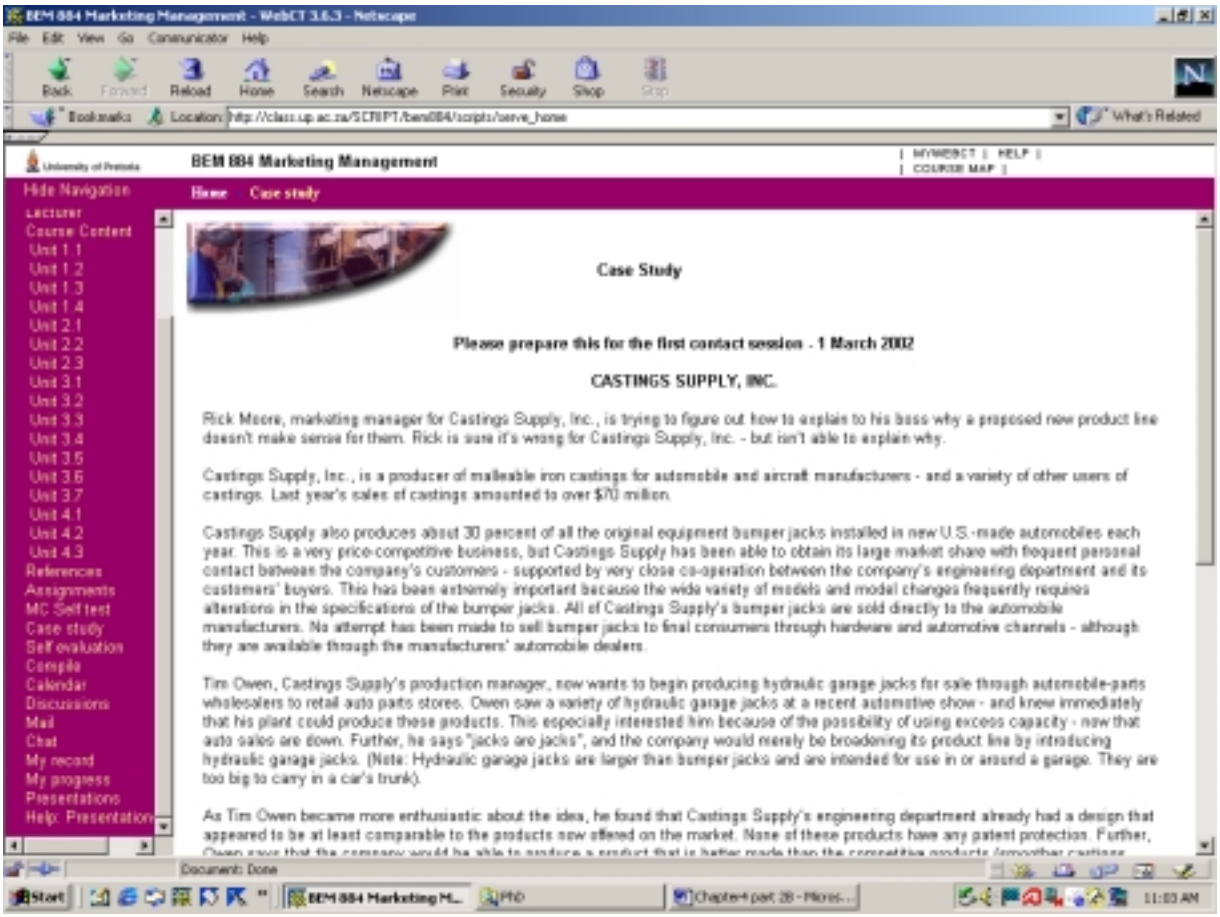
Screen capture 4.14 Group interaction in Decision Analysis

This message signifies a high level of group interaction and discussion. The particular learner states a problem he encountered in trying to answer a question. He explains how he tried to solve the problem, before asking assistance and clarification from his peers. Returning to the quality of online discussions, this message reveals a question related to a case study and how the learner tries to solve the problem by negotiating meaning and testing whether his assumption is correct. It is a good example of spontaneous cooperative learning and learning on a high level.



Screen capture 4.15 Assignment in Decision Analysis

What is significant about this screen capture is that it illustrates the educational model described in Figure 4.15. Students are provided with problems in *WebCT* that they have to complete before they come to the second contact session. They are instructed that late submissions will not be accepted because the contact session will deal with the solutions to the problems. A case study is also given, which reflects constructivism.



Screen capture 4.16 Case study in Marketing Management

The prevalence of case studies in these courses is positive because it provides real life situations that learners must solve. Wlodkowski (1999: 294-297) states that the use of case studies enhance meaning and aids motivation.

Questions 10 – 18, 49 – 52, 58, 59, 67, 70 in the questionnaire address this construct.

The table indicates the frequency (number of students) and percentage of students who rated the theme of Constructivist elements on the Likert scale.

Likert	Frequency	Percentage
1.6	1	0.6
2	1	0.6
2.2	22	13.5
2.4	18	11.0
2.6	20	12.2
2.8	43	26.3
3	29	17.7

3.2	11	6.7
3.4	10	6.0
3.6	4	2.5
3.8	4	2.5

Table 4.15 Frequency distribution of constructivist elements

The frequency distribution indicates that constructivist elements are present often (cumulative 3 – 3.8 on Likert scale) in the learning experience of 36% of respondents.

The percentage of 36% is low, but indicates that constructivist elements are present in their learning environment.

Section C: Interaction

This construct is based on Section 2.3.10 and uses specifically the work of Curtis & Lawson (1999) and Oliver & Macloughlin (1996) in the questions:

Interaction consists of the following:

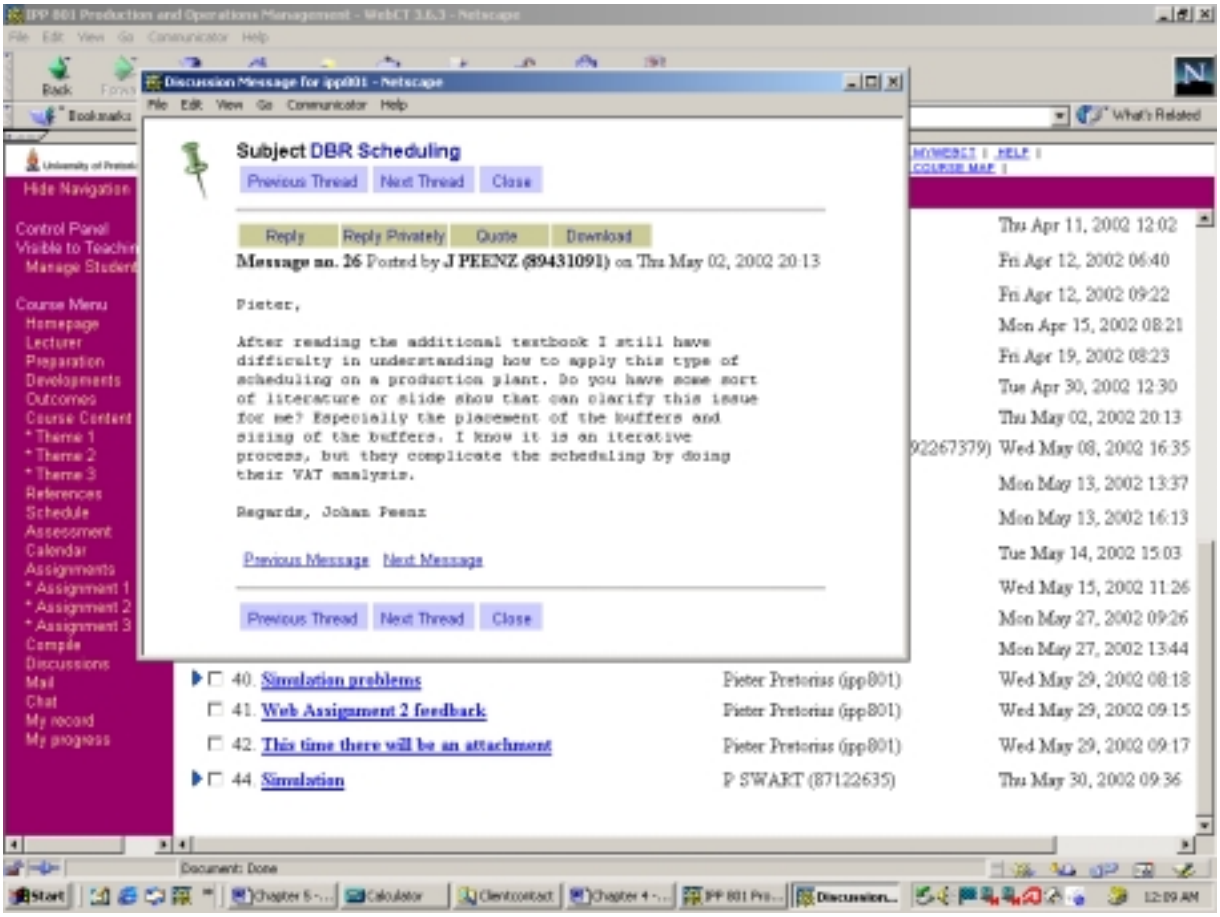
Receiving help.
Exchanging information.
Explaining and elaborating on information.
Sharing knowledge with others.
Challenging others' contributions.
Advocating increased effort and perseverance among peers.
Engaging in group skills.
Monitoring the efforts of others.

Oliver & Macloughlin (1996)

Kinds of interactions:

Social interaction.
Procedural interaction – dialogue between learner and lecturer.
Expository interaction – answering questions.
Explanatory interaction – using the learners reactions to explain new information.

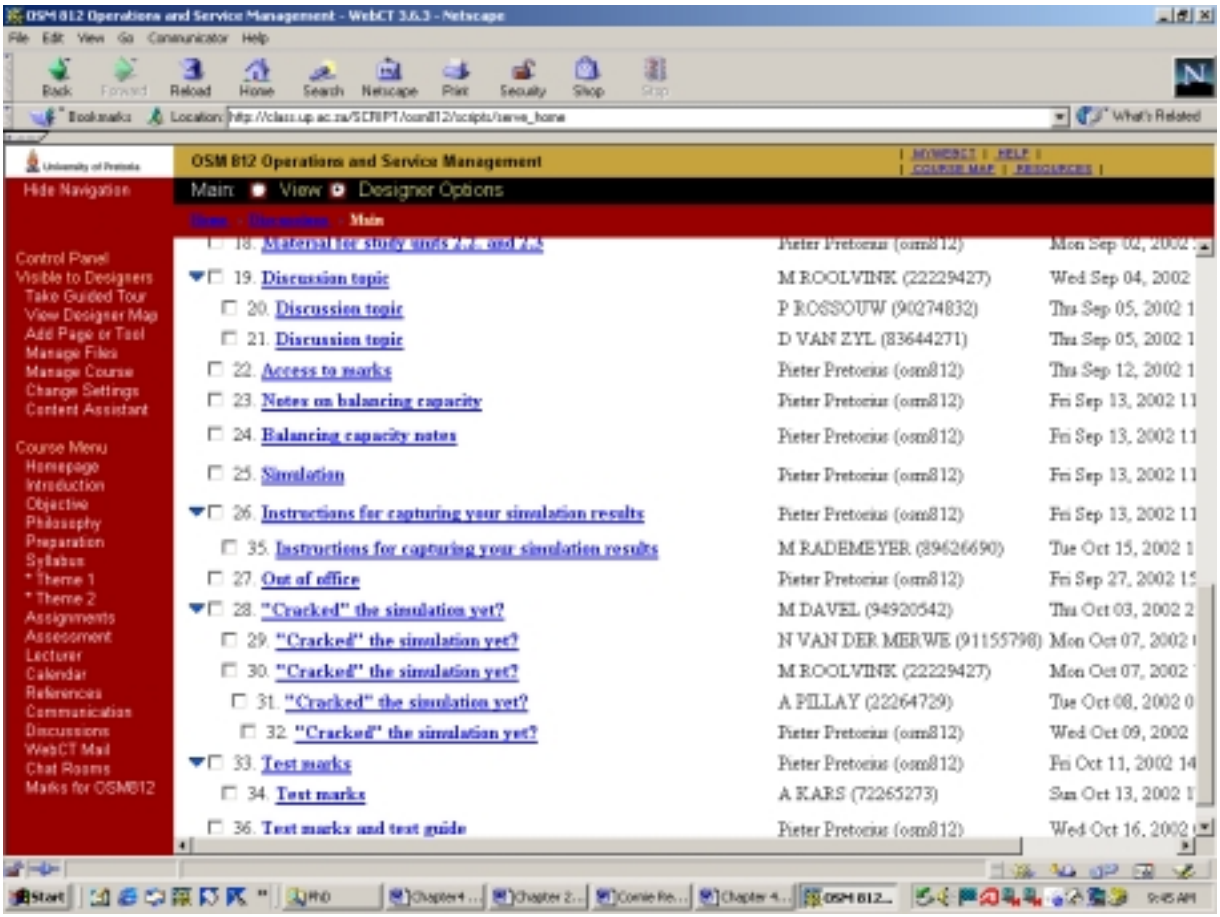
Cognitive interaction – giving a constructive answer to learners so that they reconsider their own ideas.



Screen capture 4.17 High level interaction in Production and Operations Management

This screen capture shows dialogue between the lecturer and student regarding a problem posed in an assignment.

From a learning theory perspective this type of interaction is conducive to effective learning in adults and reminiscent of the argument by Pea and Gomez (1992:5) that a learning conversation takes place when “both parties [lecturer and learner] clarify messages, test for understanding, compare and contrast with previous understandings” as discussed in Section 2.3.6. Discussions that are facilitated by technology should take place on this level in order to facilitate learning. As discussed in Section 2.3.10 some studies indicate that online discussions remain on the level of information sharing and comparing, as opposed to knowledge negotation, construction, testing and application (Kanuka & Anderson, 1998; Bonk & Wisher, 2000). The fact that this course is singled out possibly signifies that this is one of the few courses where this level of communication takes place via *WebCT*.



Screen capture 4.18 Discussion in Operations and Service Management

This screen capture shows the frequency of discussions in Operations and Service Management. Note the combination of both administrative and subject-related topics. The allusion to “cracking a case” reflects a positive attitude of learners towards solving the simulation and also shows that they, or at least the particular individual, view it as a challenge.

Questions 19 – 48, 76 – 81 in the questionnaire address this construct.

The table indicates the frequency (number of students) and percentage of students who rated the theme of Interaction on the Likert scale.

Likert	Frequency	Percent
1.4	2	1.2
1.6	2	1.2
1.8	8	4.9
2	14	8.6

2.2	11	6.7
2.4	17	10.4
2.6	22	13.5
2.8	22	13.5
3	28	17.1
3.2	18	11.0
3.4	10	6.1
3.6	9	5.5

Table 4.16 Frequency distribution of interactions

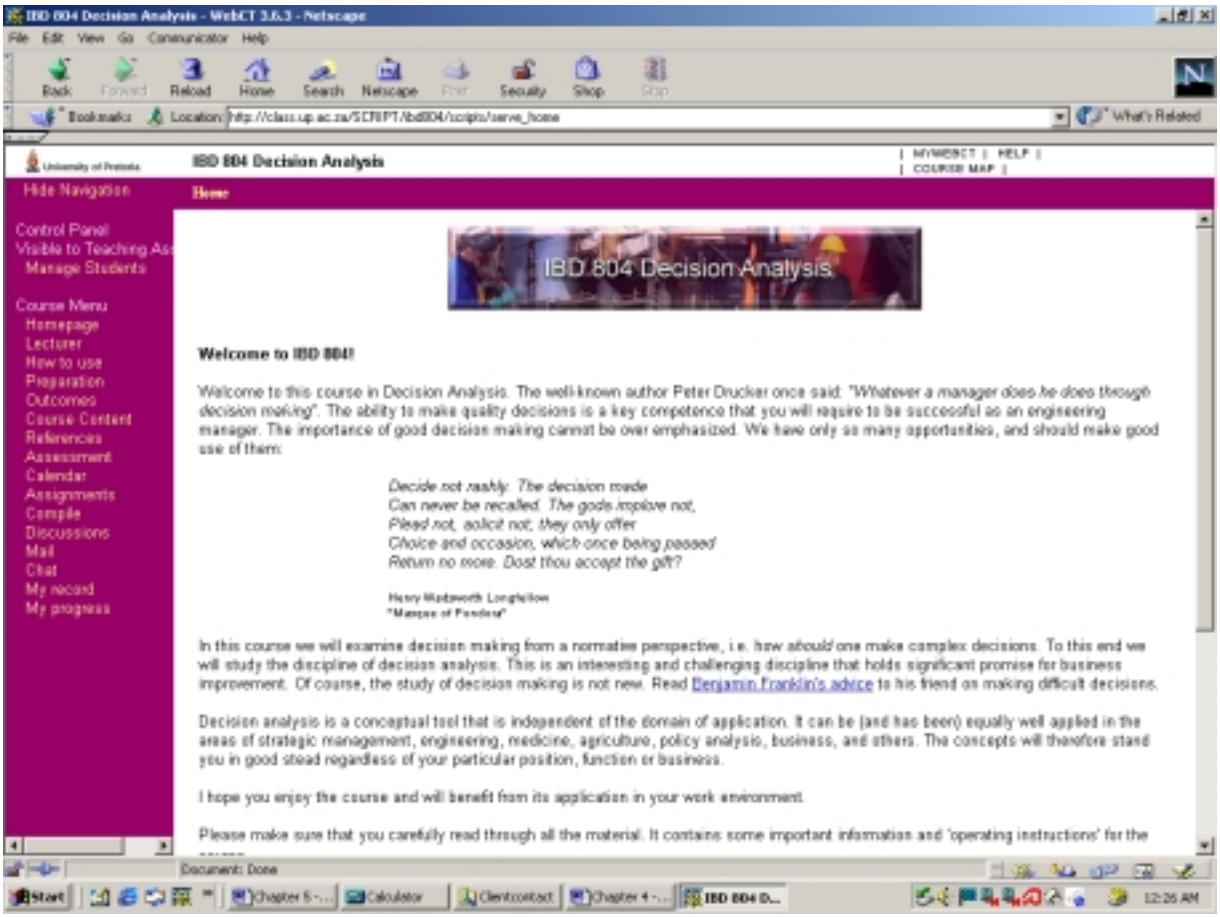
The frequency distribution indicates that interactions take place often (cumulative Likert 3 – 3.6) for 40% of respondents.

The fact that only 40% of respondents experience interaction often in their learning environment is a concern. Especially in light of the importance of interaction between the lecturer and students in a web-supported environment this result could be considered too low.

Section D: Intrinsic motivation

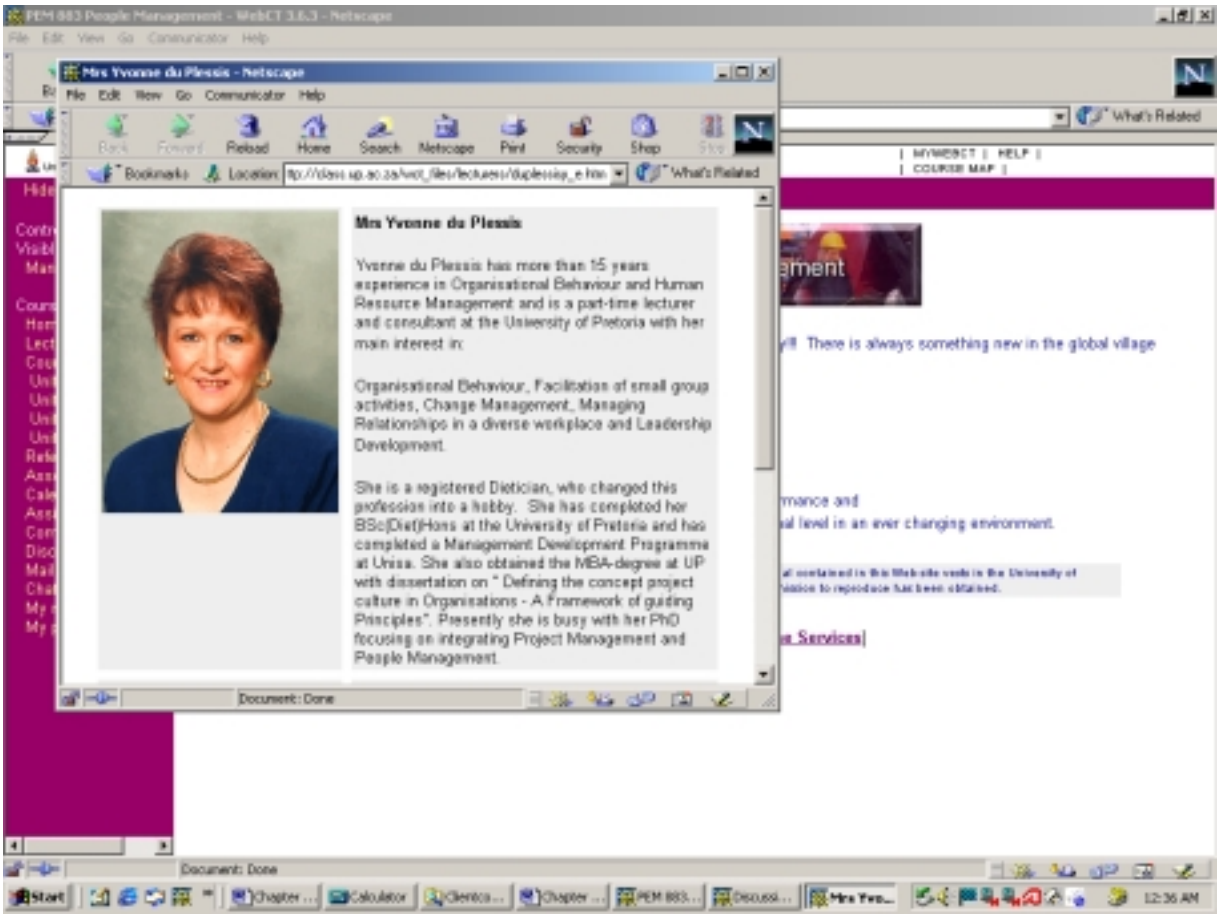
This construct is based on the work by Fleming & Levie (1993:6) and Wlodkowski (1992:12), discussed in Section 2.3.5. Intrinsic motivation is enhanced by:

Variation.
Curiosity.
Relevance.
Challenge.
Control.
Success.
Choice.
Value.
Enjoyment.



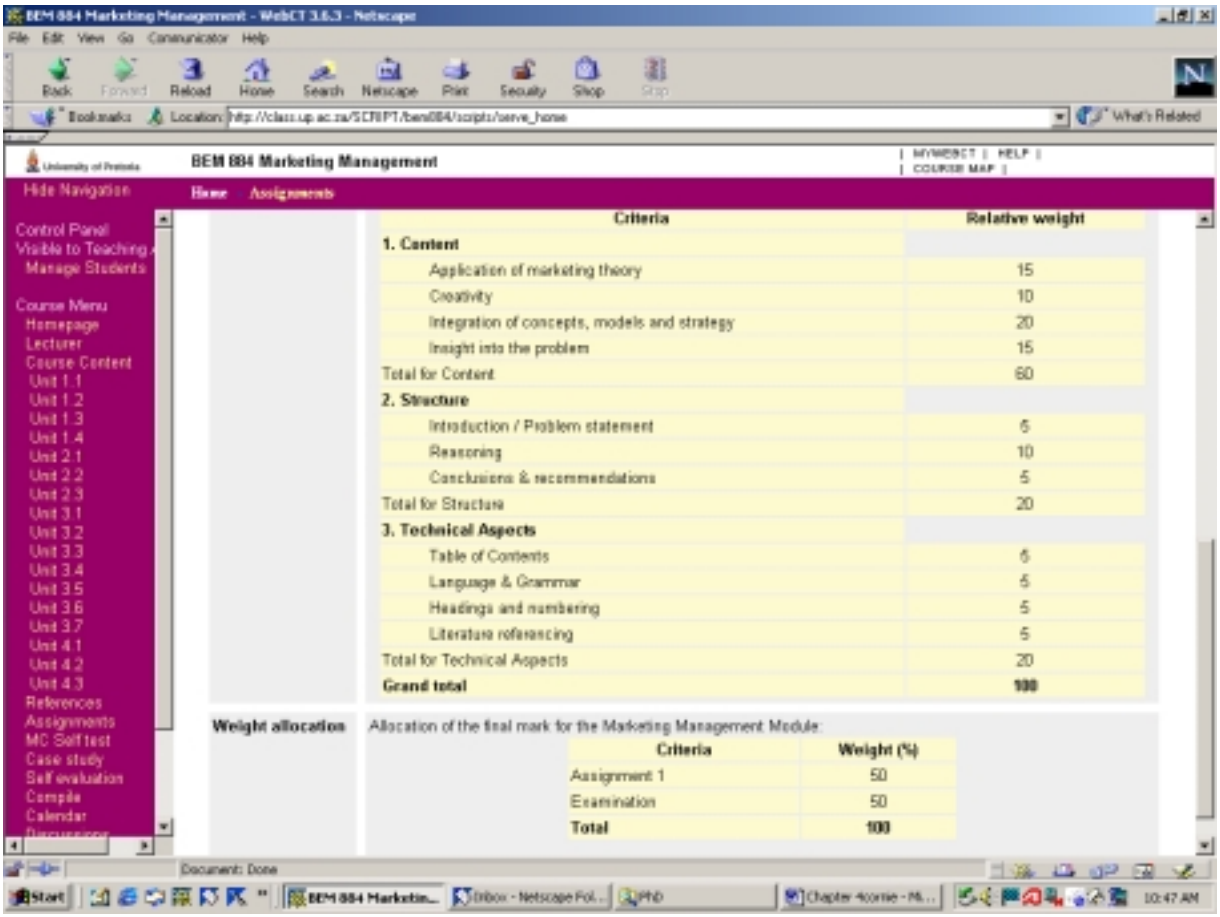
Screen capture 4.19 Welcome note in Decision Analysis

The Welcome note in Decision Analysis is a good example of how students can be introduced to a *WebCT* course. It pulls the learner into the subject field by citing a global expert on leadership – Peter Drucker, and procedes to give an appropriate quote that reflects on the importance of decision making. The tone is enthusiastic and a sense of camaraderie is created by referring to 'we'. It is further personalised and expresses the wish that the learner will benefit from the application of the knowledge in their work environments. It epitomizes two of the motivational strategies provided by Wlodkowski (1999: 294-297), i.e. "Allow for introductions" and "Emphasise the human purpose of what is being learned and its relationship to the learners' personal lives and contemporary situations".



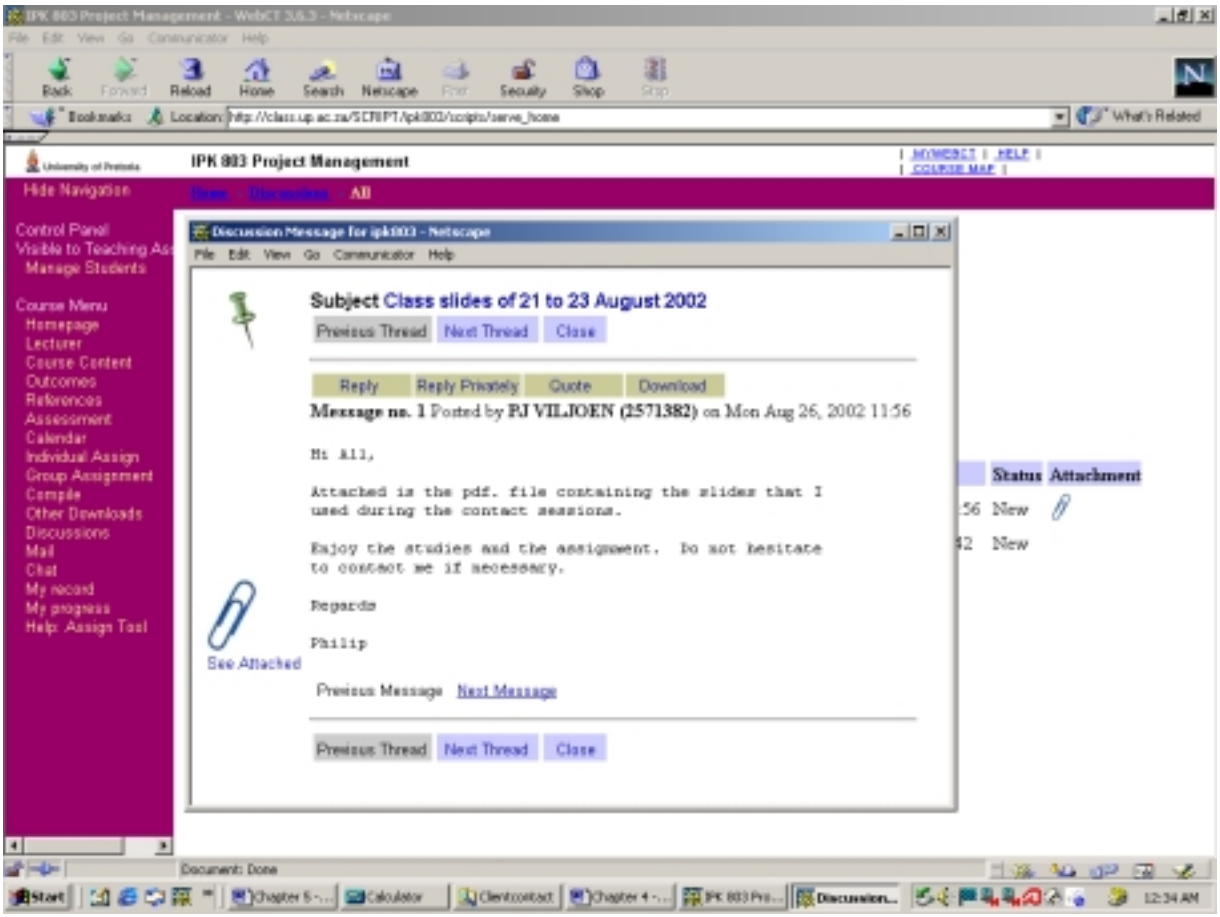
Screen capture 4.20 The lecturer of People Management

This is an example of information about the lecturer that is provided on *WebCT*. Lecturers are encouraged to provide their photographs, because it assists in personalising a course. An abbreviated resume aids confidence in the competence of the lecturer.



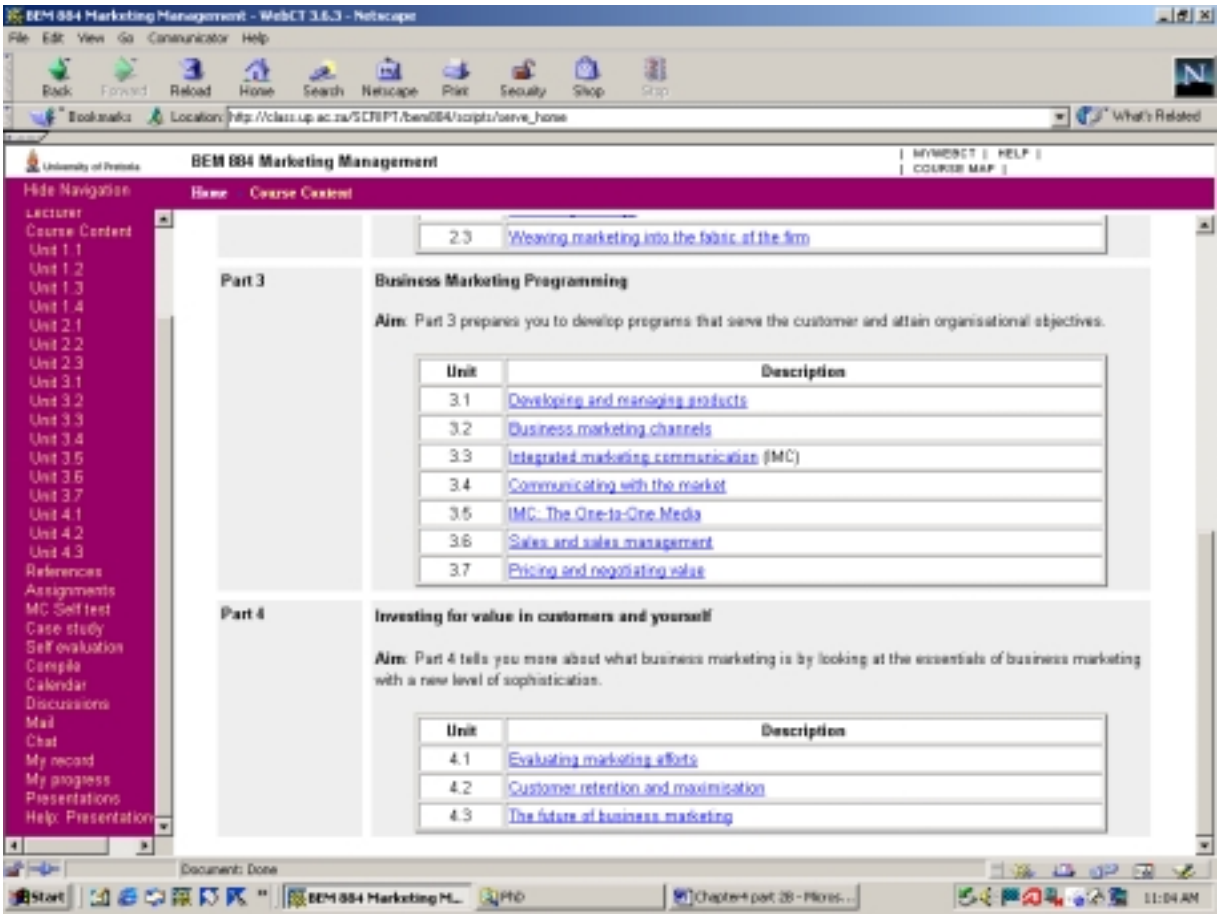
Screen capture 4.21 Assessment criteria for an assignment in Marketing Management

The assessment criteria are clear, which is conducive to learner control and motivation.



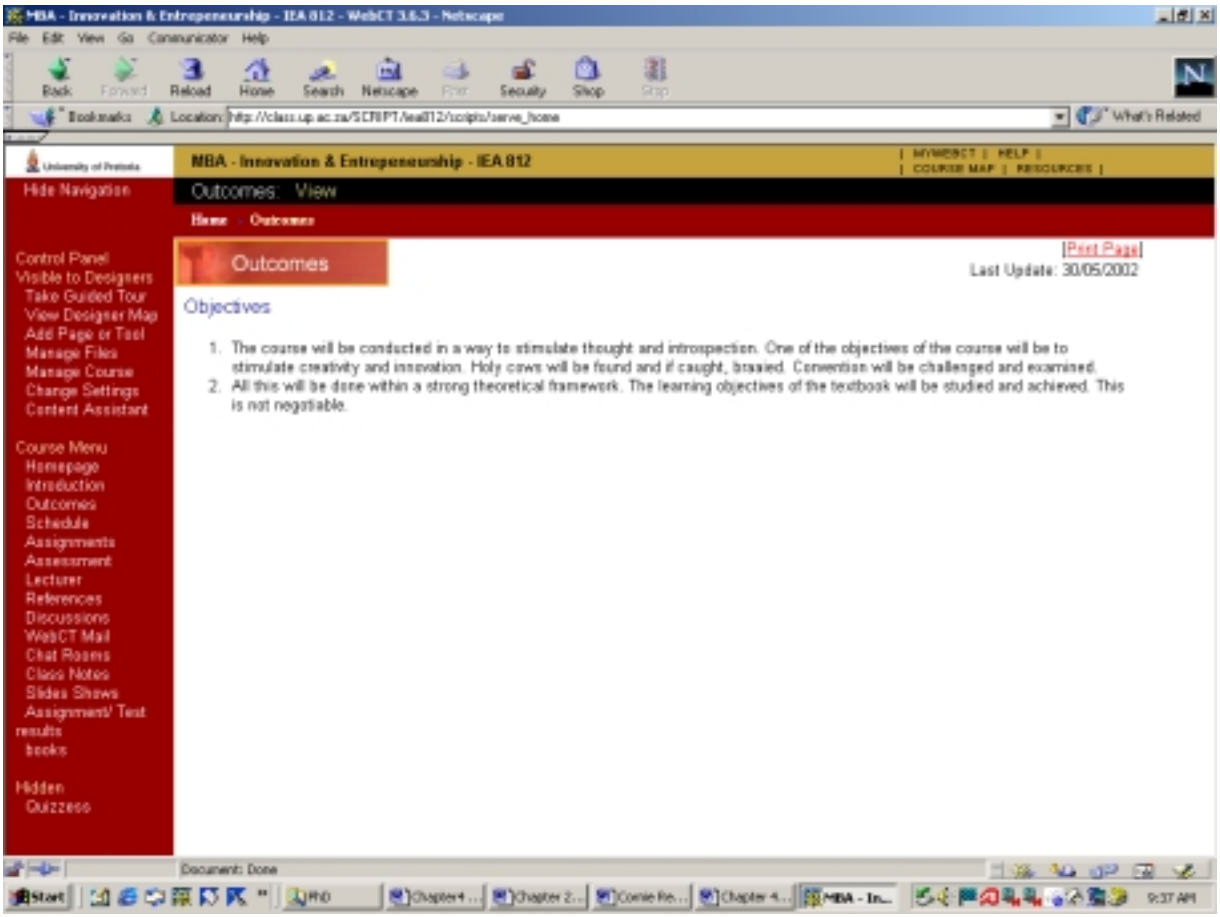
Screen capture 4.22 Power Point Slides in Project Management

What is interesting about this screen capture is that the lecturer provides the students with slides that were presented during a contact session. A different model would have entailed providing the slides beforehand in *WebCT*, and discussing questions about them during the contact session. As this is one of the courses that was singled out by first year MEM students it is noticeable that the lecturer is enthusiastic, encouraging and supportive. The motivational strategy of “Encourage the learner” (Wlodkowski,1999: 294-297) is apparent.



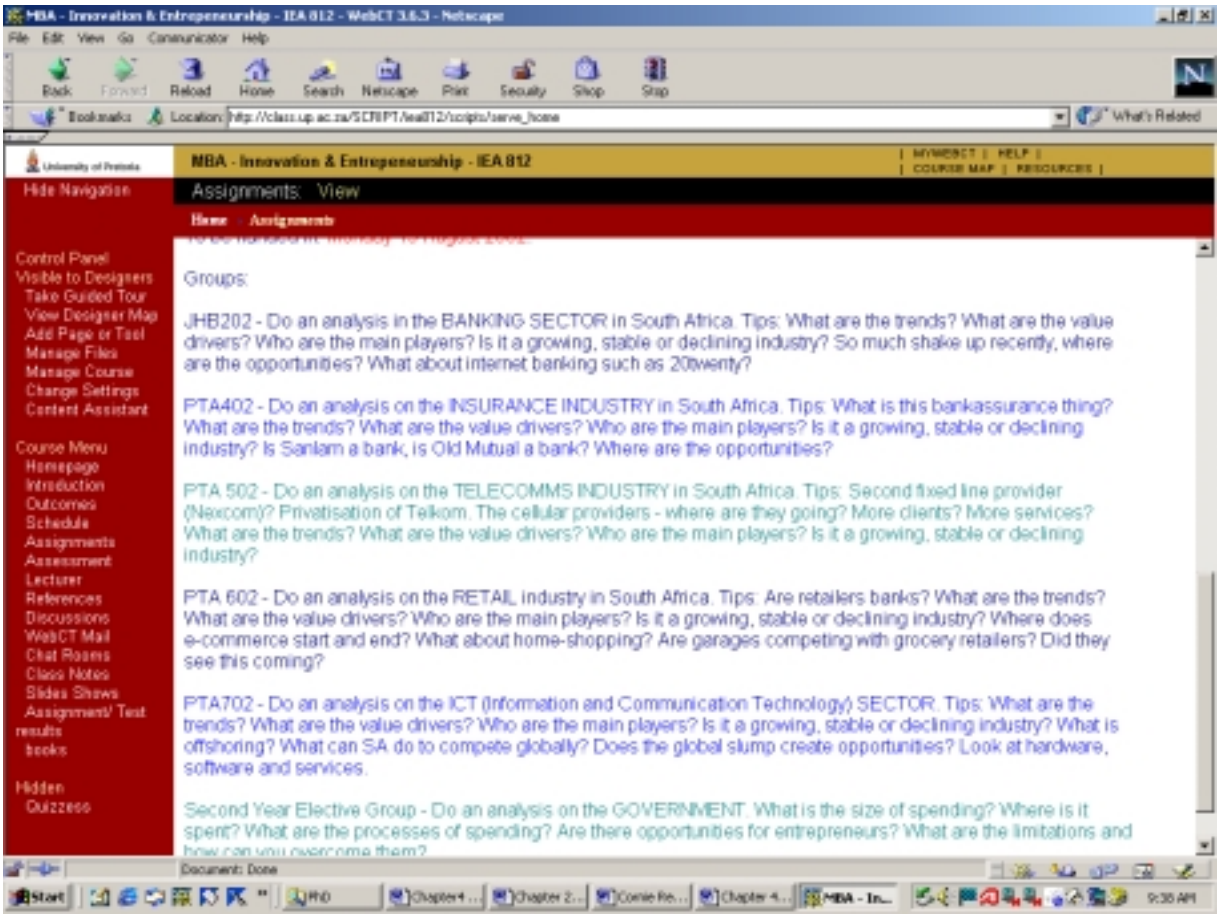
Screen capture 4.23 Course outline in Marketing Management

The fact that the course outline is available before the course starts provides learners with a mental model of the course. It facilitates effective learning by enabling individuals to work through the material at their own pace, in conjunction with structured time lines in a course. It could be considered a linear design model.



Screen capture 4.24 Outcomes of Innovation and Entrepreneurship

The outcomes in Innovation and Entrepreneurship presented with humour – an important motivational strategy (Wlodkowski,1999: 294-297).



Screen capture 4.25 Group assignment in Innovation and Entrepreneurship

The assignments shown in Innovation and Entrepreneurship are meaningful because they relate learners to adult interests and use critical questions to stimulate learner engagement and challenge (Wlodkowski, 1999: 294-297).

Questions 53 – 57, 68, 69, 73 (barriers – external factors), 74 address this construct.

The table indicates the frequency (number of students) and percentage of students who rated the theme of Intrinsic motivation on the Likert scale.

Likert	Frequency	Percentage
1.8	1	0.6
2	2	1.2
2.2	10	6.1
2.4	9	5.7
2.6	31	19.1
2.8	42	25.9
3	25	15.4

3.2	26	16.1
3.4	7	4.3
3.6	9	5.6

Table 4.17 Frequency distribution of intrinsic motivation

The frequency distribution indicates that 39% of respondents (Likert 3 – 3.6) are often intrinsically motivated. This result is low, because it indicates that more than half of respondents are not often intrinsically motivated.

Question 73 was an open ended question that requested students to list the barriers that they experienced. The two main themes are that lecturers do not use *WebCT* and that they do not give prompt feedback.

Section E: Effective feedback

This construct is based on the work of Wlodkowski (1999:244-249) who states the following about effective feedback, as discussed in Section 2.3.10.

Effective feedback is informational rather than controlling.
Provides evidence of the learner's effect relative to the learner's intent.
Is specific and constructive.
Can be quantitative.
Is prompt.
Is frequent.
Is positive.
Is related to impact criteria.
Is usually personal and differential.

Questions 60-66, 82 address this construct.

The table indicates the frequency (number of students) and percentage of students who rated the theme of Effective feedback on the Likert scale.

Likert	Frequency	Percentage
1	3	1.8
1.2	7	4.3
1.4	2	1.2

1.6	14	8.6
1.8	18	11.1
2	15	9.2
2.2	28	17.2
2.4	11	6.7
2.6	31	19.1
2.8	18	11.1
3	4	2.4
3.2	6	3.7
3.4	1	0.6
3.6	3	1.8
3.8	1	0.6

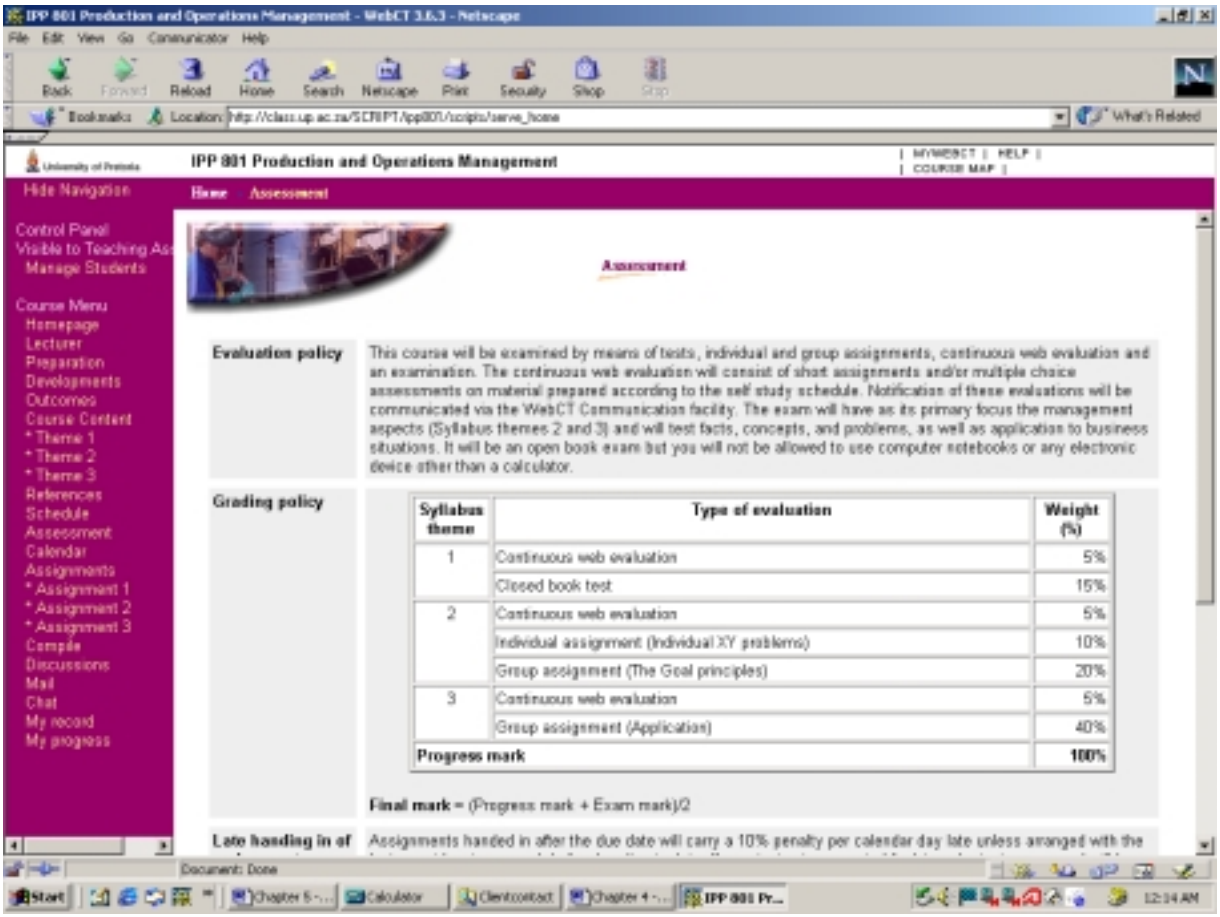
Tabe 4.18 Frequency distribution of effective feedback

The frequency distribution indicates that only 9% of respondents experienced that they receive effective feedback often (cumulative of Likert 3 – 3.8). Compared to the other constructs, this result is extremely low. It means that 91% of students in these postgraduate programmes do not experience effective feedback often.

Section F: Learner – centred assessment

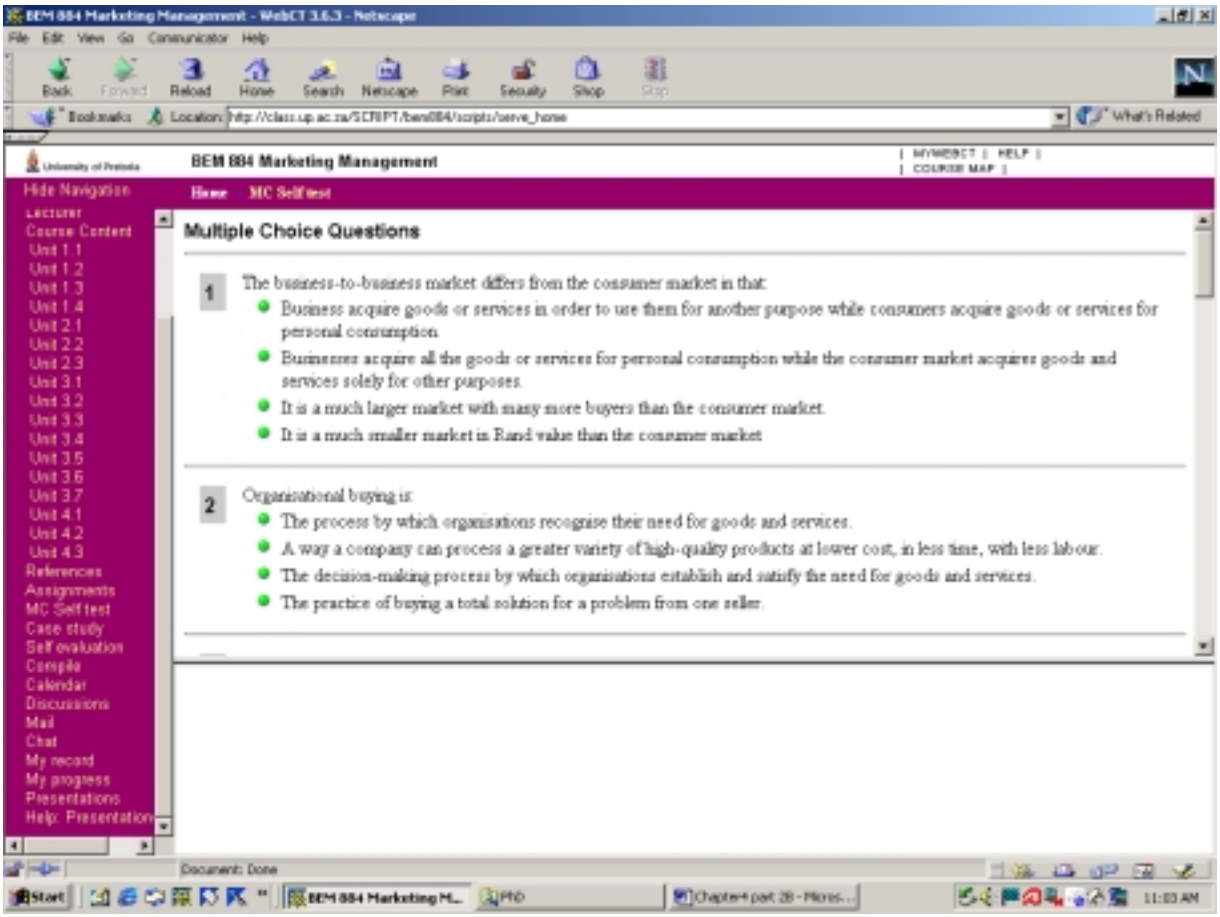
This construct is based on the work of Brown & Duguid (1996:10) who define learner-centred assessment as follows in Section2.3.7:

Continuous learner and course assessment is used to analyse teaching.
Learner performance is observed by others versus only private assessment by the instructor.
Learners help define the questions rather than instructors simply handing out facts.



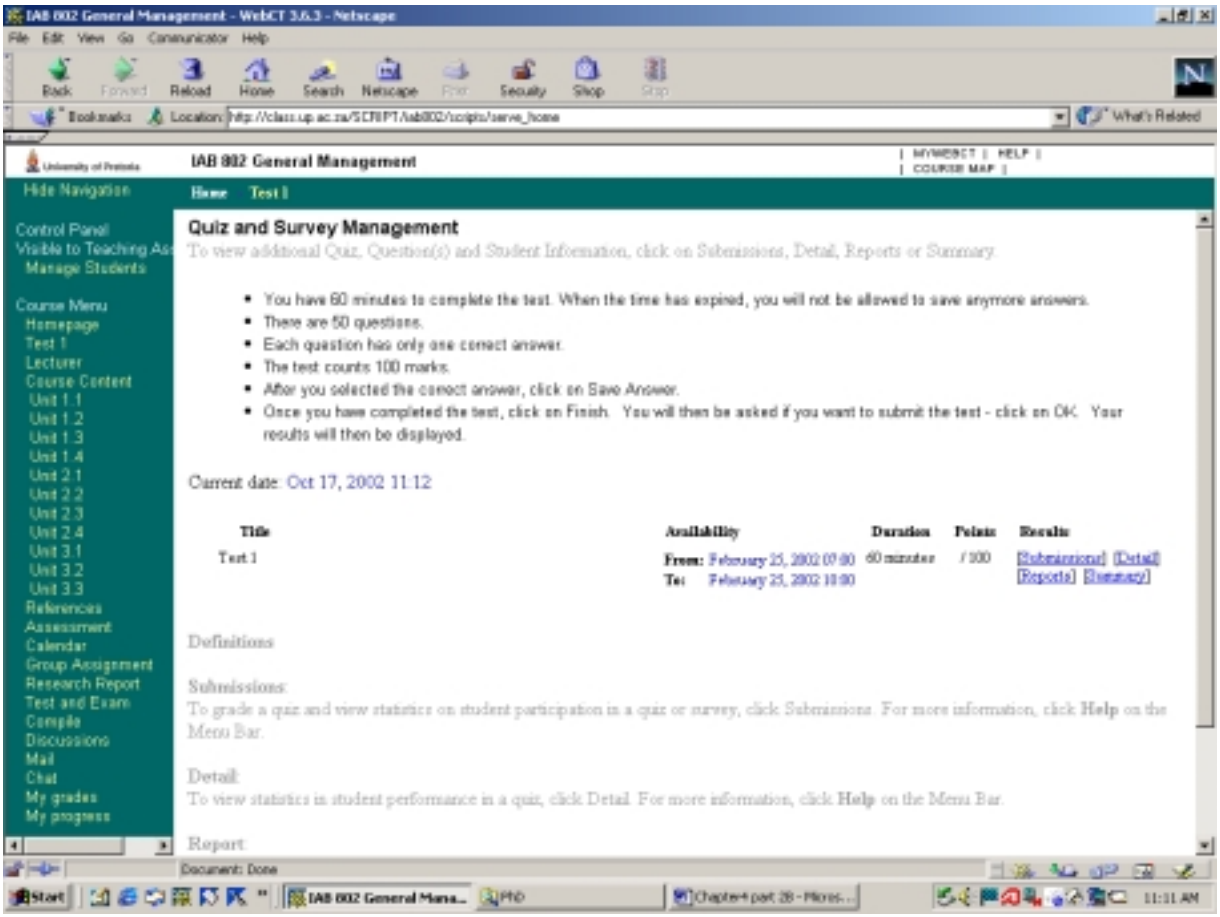
Screen capture 4.26 Evaluation outline in Production and Operations Management

This screen capture illustrates the evaluation in the course. It is significant that a wide variety of assessment methods are used, which includes continuous assessment and individual and group assessment. Both signify a learner centred approach, as described in Section 2.3.9. It is a motivational strategy to clearly identify learning outcomes and to make assessment, tasks and criteria known to learners (Wlodkowski, 1999: 294-297).



Screen capture 4.27 Quiz in Marketing Management

The *WebCT* quiz tool is useful for continuous self-assessment. It is reminiscent of a motivational strategy provided by Wlodkowski (1999: 294-297) “Use self-assessment methods to improve learning and to provide learners with the opportunity to construct relevant insights and connections.



Screen capture 4.28 Quiz in General Management

Questions 7, 8, 9, 71, 72, 75

Likert	Frequency	Percentage
1.4	1	0.6
1.6	4	2.4
1.8	3	1.8
2	11	6.7
2.2	12	7.3
2.4	16	9.8
2.6	46	28.2
2.8	14	8.5
3	23	14.1
3.2	13	7.9
3.4	14	8.5
3.6	4	2.4
3.8	1	0.6
4	1	0.6

Table 4.19 Frequency distribution of learner-centred assessment

As reported in Section 4.15.9.1 on *validity* and *reliability* the Cronbach Alpha test indicates a lower level of accuracy in terms of reliability for this construct. The frequency distribution indicates that 34% of respondents experience learner-centred assessment often (Likert 3 – 3.8). One could interpret this result that the perception of the majority of students is that assessment is not learner centred.

Figure 4.19 provides an overview of the percentage per theme.

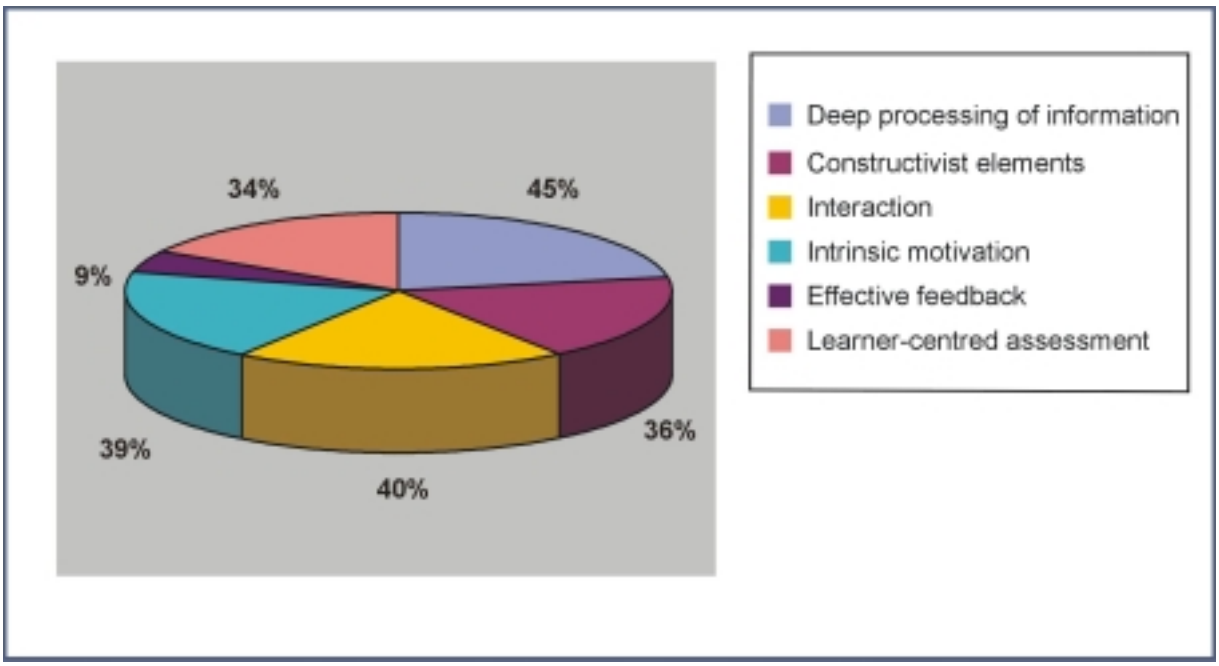


Figure 4.19 Percentage (*often* on Likert scale) per theme

What can be deduced from the findings is that cognitive and constructivist elements are present in the programmes, and manifest lower than 50%. Of significance is that Effective Feedback is so low. It is reason for concern because interaction is not very high either, which means that learners do no have adequate interaction with lecturers apart from the two two- week long contact sessions per year. This conclusion is based on the fact that the questionnaire dealt with the learning environment in totality and not only on the use of *WebCT*.

The mean score for the six constructs are as follows:

Variable	N	Mean	Std Dev
Deep information processing	163	2.9	0.5
Constructivist	163	2.8	0.4

elements			
Interaction	163	2.7	0.5
Intrinsic motivation	162	2.9	0.4
Effective feedback	162	2.3	0.6
Learner – centred assessment	163	2.7	0.5

Table 4.20 Mean score per theme

The *means test* indicates that all six constructs fall on average on 'sometimes' on the Likert scale, or between 'sometimes' and 'often'; which is not very conclusive. *Effective feedback* scores the lowest and differs consideraly from the results of the other constructs.

An analysis of selected individual items is subsequently made. Only the largest percentage in terms of frequency is indicated.

Deep information processing

Item	Question	Frequency distribution
V1	I link facts, ideas and notions in order to interpret, infer, propose and judge	Often 47%
V2	I contribute new elements of information	Often 44%
V3	I create new knowledge	Sometimes 45%
V4	I propose solutions supported by justification	Often 48%
V5	I make judgments supported by justification	Often 57%
V6	I propose advantages and disadvantages of a situation or solution	Often 56%

Table 4.21 Individual items of Deep Information Processing

It is noticeable that V3 on the creation of new knowledge had the highest frequency on the Likert scale of *sometimes,* indicating that respondents are possibly less sure of their creating knowledge than other questions related to deep information processing. The fact that 57% often *make judgments supported by justification* indicates a satisfying level of *evaluation* in the learning environment. Problem solving, on the other hand, as indicated by V4, is lower at 48%.

Constructivist elements

Item	Question	Frequency distribution
V10	I take an active role in learning.	Always 42%
V11	I take a pro-active role in learning.	Often 38%
V12	I cannot complete a cooperative/group assignment without the contribution of others in the group.	Sometimes 35%
V13	I remain accountable for a group assignment.	Always 50%
V14	Everyone shares leadership in a group assignment.	Often 45%
V15	Everyone shares responsibility in a group assignment.	Always 42%
V16	The group is involved in processing its effectiveness.	Often 35%
V17	The lecturer observes during group assignments.	Sometimes 35%
V18	The lecturer intervenes during group assignments.	Not at all 55%
V49	The learning outcomes in my courses build on my prior knowledge	Often 42%
V50	I can apply what I learn to my work environment.	Often 49%
V51	The assessment criteria allows for multiple perspectives.	Often 46%
V52	The role of the lecturer is to help students learn about the real world.	Often 43%
V58	Learning takes place with other people.	Often 53%
V59	I prefer learning alone.	Often 55%
V67	What I apply has visible consequences.	Sometimes 44%
V70	The assignments are situated in real-life situations, like case studies.	Often 43%

Table 4.22 Individual items of Constructivist elements

Some of the item results require closer scrutiny due to their sigificance. Only 42% of respondents take an active role in learning (V10). The fact that 50% of respondents feel that they always remain accountable for a group assignment is positive. More than half of respondents (55%) indicated that they *prefer learning alone* often(V59) and almost half (53%) indicated that *learning takes place with other people* (V58). The relevance of their studies to their work environment (V67 *What I apply has visible consequences*, and V70 *The assignments are situated in real-life situations, like case studies* is quite low at 44% (*sometimes)* and 43% (*often)*. It is reason for concern that only 42% of respondents feel that their learning outcomes build on their prior knowledge (V49). It could be ascribed to the interdisciplinary natures of particularly the MPM and the MBA, yet no sigificant difference was found amongst these groups and the MEM, which is focused on engineers.

Co-operative learning

In an attempt to establish whether true co-operative learning occurs, the items constituting the construct of **Constructivist elements** were screened for those items that reflect the true characteristics of co-operative learning (Section 2.3.10).

Important items are V12, V13, V14, V15, V16, V17 and V18

Item	Question	Frequency distribution
V12	I cannot complete a cooperative/group assignment without the contribution of others in the group.	Sometimes 35%
V13	I remain accountable for a group assignment.	Always 50%
V14	Everyone shares leadership in a group assignment.	Often 45%
V15	Everyone shares responsibility in a group assignment.	Always 42%
V16	The group is involved in processing its effectiveness.	Often 35%
V17	The lecturer observes during group assignments.	Sometimes 35%
V18	The lecturer intervenes during group assignments.	Not at all 55%

Table 4.23 Individual items measuring extent of true co-operative learning

From this analysis it can be said that less than half of respondents experience a significant amount of true co-operative learning. What is interesting is that such a large percentage indicate that lecturers do no intervene during group assignments.

Interaction

Item	Question	Frequency distribution
V19	Social interaction takes place with other learners.	Often 44%
V20	Dialogue with the lecturer takes place often via e-mail.	Sometimes 61%
V21	Dialogue with the lecturer takes place often via WebCT discussion tools.	Not at all 42%
V22	Dialogue with the lecturer takes place often during block sessions (face-to-face).	Always 56%
V23	The lecturer answers our questions.	Always 52%
V24	We answer the lecturers' questions.	Often 48%
V25	My reaction/answer to a question is used by the lecturer to explain new information.	Sometimes 41%
V26	The lecturers' answers to my questions encourage me	Often 47%

	to reconsider my ideas.	
V27	The interactions between block sessions lead to increased learning	Always 40%
V28	The interactions between block sessions lead to increased participation.	Always 32%
V29	The interactions between block sessions develop communication with the lecturer.	Not at all 29%
V30	The interactions between block sessions develop communication with fellow learners.	Always 34%
V31	The interactions between block sessions enhance elaboration	Often 40%
V32	The interactions between block sessions enhance retention.	Often 33%
V33	The interactions between block sessions support self-regulation	Often 39%
V34	The interactions between block sessions support self-directed learning.	Often 38%
V35	The interactions between block sessions increase my motivation.	Always 36%
V36	The interactions between block sessions facilitate negotiation of understanding.	Often 34%
V37	The interactions between block sessions facilitate team building.	Always 32%
V38	The interactions between block sessions facilitate discovery.	Often 36%
V39	The interactions between block sessions facilitate exploration.	Often 37%
V40	The interactions between block sessions facilitate clarification of understanding.	Often 35%
V41	The interactions between block sessions take place on a level of information sharing.	Often 45%
V42	The interactions between block sessions take place on a level of information comparing.	Often 44%

V43	The interactions between block sessions take place on a level of knowledge negotiation.	Often 35%
V44	The interactions between block sessions take place on a level of knowledge construction.	Sometimes 35%
V45	The interactions between block sessions take place on a level of knowledge testing.	Sometimes 32%
V46	The interactions between block sessions take place on a level of knowledge application.	Sometimes 35%
V47	The interactions between block sessions aid clarification of my ideas.	Often 40%
V48	The interactions between block sessions aid clarification of my ideas and the ideas of others.	Often 38%
V76	I exchange resources with fellow learners.	Often 47%
V77	I exchange information with fellow learners.	Often 52%
V78	I challenge others contributions.	Often 48%
V79	I share knowledge with others.	Sometimes 59%
V80	I monitor the efforts of others.	Sometimes 53%
V81	I engage in group skills.	Often 52%

Table 4.24 Individual items of Interaction

Returning to Section 2.3.10, Oliver & Macloughlin talk about *procedural interaction* which in this instance is experienced always by 56% of students as V22 indicates.

Expository interaction is indicated by V23 and V24, namely *always* 52% and *often* 48%.

Explanatory interaction is indicated by V25 as *sometimes* 41%.

Cognitive interaction is indicated by V26 as *often* 47%.

Hence *procedural interaction* (dialogue between learner and lecturer) is experienced more than other types of interactions.

V44 – V46 are significant in that all relate to knowledge (construction, testing, application) and respondents indicated that they experience it sometimes (34% average), which could be considered low for a postgraduate programme.

Intrinsic motivation

Item	Question	Frequency distribution
V53	The assignments are too easy to solve.	Not at all 57%
V54	The assignments are too difficult to solve.	Often 58%
V55	What I study makes me more competent.	Often 48%
V56	My studies help me to be successful.	Often 46%
V57	I am responsible for learning to take place.	Always 67%
V68	The assignments in my courses foster curiosity.	Often 50%
V69	The lecturer fosters curiosity in the subject matter.	Sometimes 45%
V74	I feel I have control over the learning experience in terms of when, how and where I learn.	Often 38%

Table 4.25 Individual items of Intrinsic motivation

Items in Table 4.25 indicate that learners take responsibility for their learning (V57) and that on average less than half of the respondents are intrinsically motivated. It is disconcerting to look at the result of V74 in which only 38% indicated that they *often* feel in control of the learning environment.

Effective feedback

Item	Question	Frequency distribution
V60	Feedback in my courses is prompt.	Sometimes 51%
V61	Feedback in my courses is frequent.	Sometimes 44%
V62	Feedback in my courses is positive.	Often 46%
V63	Feedback in my courses is personalised.	Sometimes 44%
V64	Feedback in my courses relates to assessment criteria.	Sometimes 42%
V65	Feedback in my courses is specific.	Often 30%
V66	Feedback in my courses is constructive.	Often 44%
V82	I receive help and feedback timeously.	Sometimes 50%

Table 4.26 Individual items of Effective feedback

These items indicate that less than half of respondents experience effective feedback sometimes or often. 51% of respondents experience effective feedback *sometimes*. As indicated earlier in this section, only 9% of respondents experience effective feedback *often*.

Learner – centred assessment

Item	Question	Frequency distribution
V7	Continuous assessment takes place in my courses.	Often 37%
V8	My performance is observed by others versus only private assessment by the lecturer.	Sometimes 35%
V9	I help define the questions in the assignments.	Not at all 60%
V71	Assessment is varied (multiple choice, group assignments, individual assignments, exams).	Always 37%
V72	Assessment is appropriate for the specific courses I take.	Often 52%
V75	The assessment criteria are clear.	Often 42%

Table 4.27 Individual items of Learner centred assessment

A significant result in Table 4.27 is that the majority of respondents (60%) do not help define questions in assignments. This correlates with V11 in which only 38% of respondents indicated that they often take a pro-active role in learning. Yet this construct proved not to have a high level of reliablity and the researcher would consequently be hesitant to interpret these results.

The fact that multiple methods of assessment are used in the courses offered in MEM, MPM and MBA is a positive finding. It appears that few courses demonstrate high level learning discussions. A recommendation would be to provide lecturers with strategies to plan, order and execute interactions and discussions so that it is structured as opposed to haphazard. In addition to encouraging learners to engage in discussions, lecturers should use specific strategies to elicit discussion.

The following section reports on the perceived important characteristics of a web lecturer.

Important characteristics of a *WebCT* lecturer from a student perspective

Characteristic	**Mean**	**Std Dev**	**Rating** (1 as most important and 12 as least important)
Expertise	3.2	3.0	1
Clarity	3.8	2.7	2
Responsive	4.6	2.8	3
Enthusiasm	4.9	3.0	4

Positive	5.1	2.3	5
Flexible	6.9	2.5	6
Friendly	7.2	2.6	7
Patience	7.5	2.6	8
Web-smart	7.6	3.6	9
Empathy	8.2	2.9	10
Caring	8.2	2.8	10
Cultural responsiveness	9.7	2.8	11

Table 4.28 Rating of important characteristics of a Web lecturer from a student perspective

The results in Table 4.28 indicate that students rated the characteristic of *Expertise* as the highest, followed by *Clarity* and *Responsiveness*. It is significant that both *Expertise* and *Responsiveness* correlate with the top three characteristics identified by lecturers. The fact that students rate *Expertise* as the most important characteristic could indicate that they still regard competency in the subject field as the most important charactersitic, regardless of mode of instruction. The implication of choosing *Clarity* as the second most important characteristic could imply a need for more structure due to the mode of instruction. This also pertains to choosing *Responsiveness* – implying a need for responsiveness, possibly because of the mode of instruction. It is interesting that the characteristics of *Caring* and *Enthusiasm* rate so low, compared to lecturers who rate *Enthusiasm* as the most important characteristic. His could indicate that this particular grouping of respondents with a profile of engineers and managers are task oriented and more concerned about effectiveness and efficiency than affective and motivational aspects of their studies.

The results of the question on the role of the lecturer indicate that roles of *Facilitator*, *Mentor*, *Mediator*, *Co-learner, Provocateur* and *Assistant* were considered to be the most appropriate roles for students.

These roles share a strong common theme of supporter – indicating that respondents have a need for a lecturer in a supporting role. The ones that correlate with the most appropriate roles as perceived by lecturers are those of *Facilitator, Mentor* and *Provocateur.*

4.15.10 Examples of specific courses

Students could indicate below each question which course/s the answer applies to. Project Management, Decision Analysis, General Management and People Management had the highest frequency among first year MEM students. In the second year MEM students, 14 students mentioned that Production and Operations Management (IPP 803) is a course in which the lecturer observes during group assignments and in which dialogue with the lecturer takes place via the *WebCT* discussion tools. The courses with the highest frequency in terms of being examples of their statements were Decision Analysis, Marketing Management, Production, Operations Management and Project Management. Four respondents in the first year MPM group listed Technology Management, Project Management, Marketing Management, Production and Operations Management, Quality Management, Human Resource Management and Organisational Behaviour as courses to which their statements apply. A total of 19 respondents indicated that their statements pertain to all the courses. In the second year MPM group 7 respondents indicated that their statements pertain to all courses. Systems Engineering, General Management and Project Management Practises were singled out by four respondents. In the first year MBA group, 11 students listed Entrepreneurship and Innovation, Operations and Service Management, Human Resources Management, Decision and Risk Management and Marketing Management. A total of 15 respondents indicated that their responses include all courses.

In Section 4.16 the virtual campus is compared to the benchmarking document provided in Chapter Three.

4.16 Benchmarking

Symbols used:

✓	The benchmark is in place.
✗	The benchmark is not in place.
☒	The benchmark is in process.
!	The benchmark is a concern.

Benchmarks
Institutional support
1. A documented technology plan that includes electronic security measures (i.e., password protection, encryption, back-up systems) is in place and operational to ensure both quality

Benchmarks

standards and the integrity and validity of information. 🖂

2. The reliability of the technology delivery system is as failsafe as possible. 🖂

3. A centralized system provides support for building and maintaining the electronic education infrastructure. ✓

Course Development

4. Guidelines regarding minimum standards are used for course development; design and delivery, while learning outcomes – not the availability of existing technology – determine the technology being used to deliver course content. ✓

5. Instructional materials are reviewed periodically to ensure they meet program standards. ✓

6. Courses are designed to require students to engage themselves in analysis, synthesis and evaluation as part of their course and program requirements. ✓

Teaching/Learning

7. Student interaction with faculty and other students is an essential characteristic and is facilitated through a variety of ways, including voice-mail and/or e-mail. ✓

8. Feedback to student assignments and questions is constructive and provided in a timely manner. !

9. Students are instructed in the proper methods of effective research, including assessment of the validity of resources. ✓

Course structure

10. Before starting an online program, students are advised about the program to determine:

    - If they possess the self-motivation and commitment to learn via electronic education and!
    - If they have access to the minimal technology required by the course design. ✓

11. Students are provided with supplemental course information that outlines course objectives, concepts and ideas and learning outcomes for each course are summarized in a clearly written, straightforward statement. ✓

12. Students have access to sufficient library resources that may include a “virtual library” accessible through the World Wide Web. ✓

13. Faculty and students agree upon expectations regarding times for student assignment completion and faculty response. !

Student Support

14. Students receive information about programs, including admission requirements, tuition and fees, books and supplies, technical and proctoring requirements, and student support services. ✓

15. Students are provided with hands-on training and information to aid them in securing material through electronic databases, interlibrary loans, government archives, news services and other sources. ✓

16. Throughout the duration of the course/program, students have access to technical assistance, including detailed instructions regarding the electronic media used, practice sessions prior to the beginning of the course and convenient access to technical support staff. ✓

Benchmarks

17. Questions directed to student service personnel are answered accurately and quickly, with a structured system in place to address student complaints. ☒

Faculty Support

18. Technical assistance in course development is available to faculty who are encouraged to use it. ✓

19. Faculty members are assisted in the transition from classroom teaching to online instruction and are assessed during the process. ✓

20. Instructor training and assistance, including peer mentoring, continues through the progression of the online course. !

21. Faculty members are provided with written resources to deal with issues arising from student use of electronically accessed data. ✓

Evaluation and Assessment

22. The program's educational effectiveness and teaching/learning process is assessed through an evaluation process that uses several methods and applies specific standards. ×

23. Data on enrolment, costs, and successful/innovative uses of technology are used to evaluate program effectiveness. ×

24. Intended learning outcomes are reviewed regularly to ensure clarity, utility and appropriateness. ☒

Table 5.27 Benchmark application to virtual campus

In light of lessons learnt and feedback from clients (students, faculty and support departments) the virtual campus will be upgraded in 2003. In terms of the characteristics of a customer driven organisation (Section 2.8), particularly pertaining to the virtual campus products and services, the researcher would rate the university as follows:

We spend time meeting customers and listening to their problems.
We benchmark competitor's products and seek 'best of class' solutions.
We continuously improve and refine service offerings according to market feedback if resources allow.
We meet customer requirements for customisation where it can be done profitably.
We study customer needs and wants.
We measure company image and customer satisfaction continuously.
We influence all employees in the organisation to be customer-centred.

Section 4.17 provides an overview of the migration and upgrading of the virtual campus.

4.17 Migration of the virtual campus

A project to migrate and upgrade the virtual campus has commenced with the following specifications that were drafted by the new virtual campus project team:

Functionality	Description	Comment
Logging in	Allows a user to log in to the virtual campus	This must be replaced by the sign mechanism in the UPPortal.
Online application	Allows a student to apply online.	A number of changes to the current functionality are necessary. These concern streamlining the process and ensuring that the web based and paper based application processes are as similar as possible
Online payment	Allow students to make payments online.	It is anticipated that the volume of online payments will continue to increase. This needs to be better integrated with back office allocation of money received.
Contact information	Allows students and lecturers to update contact details.	This is not currently passed to the mainframe, but kept in a separate database. In future, this information must be updated on the mainframe.
Messaging and discussions	Allows lecturers and students to send messages to each other. Also allows for open discussions.	A generic way of handling these needs to be developed. Business decisions will have to be made with respect to where this is implemented, who will be allowed to post messages etc.
Registered courses	Allow students to see a summary of the active *WebCT* and other modules that they are registered for.	
Results	Allows students to view their exam results	Needs to be extended to include test results as well.
Calendar	Displays diary information	Need to look at how this relates to event publishing. Lecturers need to be able to input course specific dates.
Opinion polls	Allow students to give their opinions on various topics	Need to decide whether this should still be included or not.
Help	Provides help on a number of virtual campus issues.	A greater variety of help is needed for lecturers
Academic record	Shows student their full academic record.	
Downloads and uploads	Allow students to download various programs and information.	Need to look at how information from the mainframe can be uploaded e.g. student marks.
Class lists	Allows lecturer to see class lists.	Needs to be integrated with the functionality available in the web based student administration system.
WebCT	Links to *WebCT*	
Search	Allow lecturers to search for information pertaining to a specific student.	This needs to be extended to include all the information currently available via the web based student information system. Lecturers however should not be allowed access to account related information.

Table 4.29 Migration and upgrading of the virtual campus

The new virtual campus architecture will form part of an organisation wide deployment of a Java-based portal for the university.

Diagram 4.5 shows how the virtual campus will fit into the new technology architecture.

Diagram 4.5 Proposed new architecture of the virtual campus (illustrated as part of portal project) (IT Department, University of Pretoria)