Chapter 5 Conclusion

This thesis has investigated the creation and evolution of the virtual campus in terms of its components of *process, product* and *service* innovation.

Chapter Five closes the study by addressing the following aspects of the thesis:

- A reflection of what has been achieved.
- A review of the research questions of the thesis and their answers.
- An overview of the relevance of the study.
- A list of recommendations for future research.

Figure 5.1 illustrates how Chapter Five fits into the structure of this thesis.
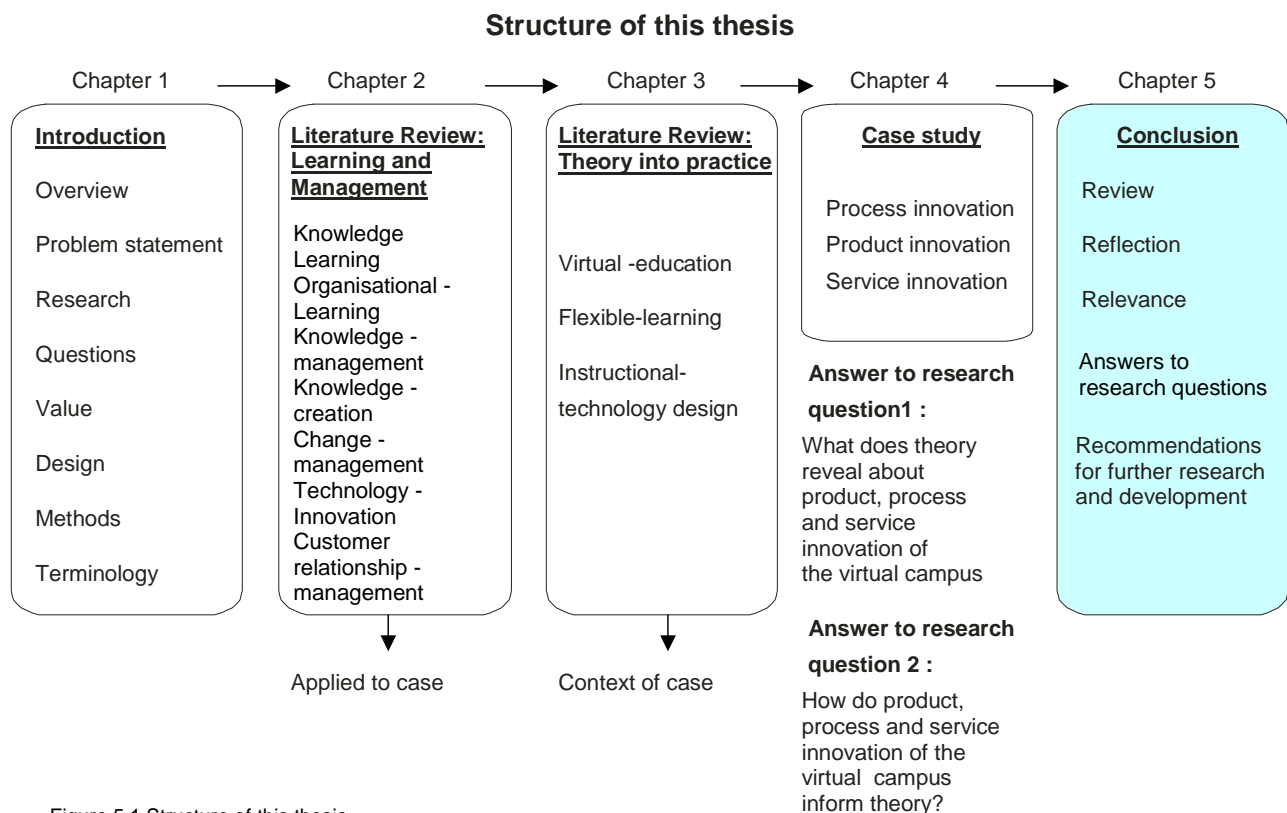
Structure of this thesis

Chapter 1	Chapter 2	Chapter 3	Chapter 4	Chapter 5
Introduction	**Literature Review: Learning and Management**	**Literature Review: Theory into practice**	**Case study**	**Conclusion**
Overview	Knowledge Learning Organisational - Learning Knowledge - management Knowledge - creation Change - management Technology - Innovation Customer relationship - management	Virtual -education Flexible-learning Instructional- technology design	Process innovation Product innovation Service innovation	Review Reflection Relevance Answers to research questions Recommendations for further research and development
Problem statement				
Research				
Questions				
Value				
Design				
Methods				
Terminology				

Applied to case   Context of case

Answer to research question1 :
What does theory reveal about product, process and service innovation of the virtual campus

Answer to research question 2 :
How do product, process and service innovation of the virtual campus inform theory?

Figure 5.1 Structure of this thesis

5.1 Reflection

The virtual campus of the University of Pretoria is analyzed from multiple perspectives. *Knowledge*, *learning*, *organizational learning*, *knowledge creation*, *knowledge management*, *change management*, *technology innovation* and *customer relationship management* are drawn upon to better understand the innovation components of the virtual campus, namely, *process*, *product* and *service* innovation.

These theories were selected because they interface with one another and inform educational innovation. Technology innovation as a field of study is not adequate to investigate the various components of the virtual campus as an educational innovation.

Theory in Chapter Two is applied to the different components of *process*, *product* and *service* innovation in order to describe and interpret educational innovation. Interpretation is aided by examples from Theory in Practice, discussed in Chapter Three, and certain aspects discussed in Chapter Three are also applied in Chapter Four. Chapter Three illustrates how the different theories manifest in Practice, particularly in terms of the current higher education landscape and the impact of technology on higher education. It also provides the context for the case in Chapter Four.

Virtual education and flexible learning have become competitive strategies for universities. In turn, technology innovation requires universities to draw on knowledge about the use of technology in the learning process as well as institutional change management and organizational learning strategies. Knowledge creation strategies, project management and change management emerged as key to educational innovation management. Hence both learning and management theory augment technology innovation theory to facilitate educational innovation.

The complexity of the virtual campus is illuminated by the various theories. They all provide useful strategies that can be applied in educational innovation and inform on the different aspects that require attention in managing educational innovation.

An analysis of the diffusion of new products and services of the virtual campus of the University of Pretoria confirms the 'S' – curve maturation and signifies that especially

services need to be revisited in order to remain competitive, because they are reaching a plateau.

Processes that were used to create the new products and services are analyzed and processes that support and sustain the new products and services are described.

If one considers the initial objectives of the virtual campus project team, the online yearbook and degree audit, as well as online registration, are outstanding deliverables. In addition, complete online assessment and accreditation of courses have not manifested. Small components of courses utilize online assessment, but summative assessment continues to take place by means of examination. Continuous formal assessment such as assignments and collaborative research reports make use of *WebCT* as a tool to facilitate assessment. The researcher is of the opinion that this 'middle road' that has emerged signifies best practice within the context of the educational model that has been established at the University. Accreditation is an aspect that was not explored in this thesis, but courses that are web-supported follow the same accreditation processes as contact courses.

The scope of the thesis does not allow for in-depth analysis of the role that performance management and incentives play in the new learning environment. It does, however indicate that enthusiasm and passion for excellence are better predictors of success than monetary rewards.

The virtual campus has focused mainly on students and could be augmented to add more services for faculty. Another student service could include e-recruitment, which will facilitate career placement of students and possibly strengthen ties with Alumni, Business and Industry. The virtual campus could be expanded to incorporate other aspects of the university such as the personnel and purchasing systems. It should move in the direction of a virtual university in order to remain competitive.

One of the findings of this study is that the virtual campus should be marketed more effectively. Observations about the research questions are made in Section 5.2. Although answers are given these should not be construed as absolute findings.

5.2 Research questions and answers

The research in this thesis makes two main contributions as it answers the research questions of Chapter One.

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.	
Goal	*Data collection methods*
Action *(Using theory and practice to investigate the manifestation of its elements in the case study)*	*Qualitative methods:* • Application of theory, interpretation of interviews, questionnaires, document analysis of non-technical literature and overview of courses.
	Quantitative methods: Collection of quantitative survey data and descriptive statistical analysis. • Adoption rate of services. • Adoption rate of products. • Aspects of web-supported courses.
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 theories discussed in Chapter Two.	

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.

5.2.1 Response to research question one

Chapter Four describes and interprets *process*, *product* and *service* innovation of the virtual campus through the application of various theories discussed in Chapter Two. Both qualitative and quantitative research methods are used to investigate the virtual campus innovations.

Research question 1 (Chapter Four)
What does theory reveal about *process*, *product* and *service* innovation of the virtual campus?

1.3.1.1 Having selected theoretical and practical elements to comprise the literature survey in Chapter Two and Chapter Three, in what ways, and to what extent, are they found to be implemented and manifested in the creation and evolution of the virtual

campus in terms of *process, product*, and *service* innovation and the management thereof.

5.2.1.1 Research questions and answers regarding product innovation

- What is the prevalent educational model that is followed in web-supported courses?

Educational model

The prevalent educational model is typified by flexible learning. Contact sessions with students are reduced and augmented by the use of *WebCT* and in some cases other technologies such as e-mail and CDROM. Contact sessions are used predominantly for lectures and assessment purposes.

Encouraging lecturers to build in self-preparation before the first contact session by means of a quiz, group presentation, report or case study can strengthen the emerging prevalent educational model using *WebCT*. The fact that this seems to be a model that is manifesting is encouraging, provided that contact sessions are not used for lectures. Unfortunately the lecture prevails as the preferred activity during contact sessions for the majority of lecturers. This means that a completely learner-centred model has not been adopted and could indicate superficial adjustments that appear to be learner-centred, but are in fact not. It is recommended that contact sessions be used for collaborative assignments and discussions.

- Does behaviourist or constructivist instructional design principles manifest in the web-supported courses?

Elements of behaviourist, cognitivist and constructivist principles are present in these learning environments (MEM, MPM and MBA).

- Is the diffusion of *WebCT* as the solution to support web-supported courses successful?

Slower rate of product innovation diffusion and higher rate of service innovation diffusion

Descriptive statistics indicate that both product and service innovations have followed the 'S'-curve adoption pattern.

Although the diffusion of *WebCT* is following the 'S'-curve, it is uncertain whether the chasm between the innovators and early adopters will be overcome, or for that matter the chasm between the early adopters and the early majority. The support of Telematic Learning and Education Innovation will assist diffusion. Probably the most critical success factor will be a strategy to ensure that communication takes place via *WebCT* and that discussions take place on a high level of learning. The strategy will have to ensure that lecturers take ownership of the new learning environment. A possible explanation for the wider diffusion of service innovation is that product innovation in a higher education institution is more complex because of the nature of learning. Product innovation requires radical innovation and considerable change in the way learners and lecturers engage in the learning environment.

The fact that *WebCT* has become the market leader in South Africa shows that its diffusion has been successful – not only a the University of Pretoria, but throughout the country.

Instructional design and development

There is a danger in relying on instructional designers instead of being actively involved in the new learning paradigm. Reluctance of lecturers to become involved will eventually result in *WebCT* becoming an information site for learners. A possible solution could be to allocate more support to faculty members in the form of tutors, such as graduate assistants. Tasks could range from facilitating discussions, i.e. scaffolding online discussions, to assistance with administrative and technical work.

- Does effective learning take place in web-supported courses?

The lack of effective feedback in the sample of *WebCT*-supported programmes needs to be addressed. The perceptions of the sample of 174 students indicate that other aspects of effective learning, i.e. deep information processing, constructivist elements, interaction, intrinsic motivation and learner-centred assessment are present, but not significantly so.

- How does the use of the web in teaching and learning impact the role of the lecturer?

The use of the web requires a stronger focus on preparation and on making tacit knowledge explicit knowledge. Feedback and responsiveness become more important than in a contact situation. Apart from acquiring technical skills, skillful planning and management are required to facilitate web-supported courses because it could be more time consuming otherwise. This study indicates that knowledge creation regarding the new learning environment among lecturers is not optimal.

5.2.1.2 Research questions and answers regarding process innovation

- Which processes were used to create new products and services and in what way do the theories of knowledge creation, knowledge management, organizational learning, change management, technology innovation and customer relationship management manifest in these processes?

Knowledge creation as an innovation management strategy

The importance of knowledge creation in educational innovation emerged as an important finding. Organizational innovation requires sufficient understanding of how to make tacit knowledge explicit and how to globalize new knowledge to sustain change. Knowledge enabling steps and conditions that are conducive to knowledge creation should be incorporated in change management plans. Knowledge creation accelerates as time passes. New mental models were created in the course of innovation.

Choosing an innovation strategy that fits the culture of the institution

Equally important is a focus on the culture of the institution and to choose an appropriate innovation strategy accordingly. A radical strategy was chosen, as the virtual campus impacted significantly on the product and service offering of the university and, as a result on institutional processes, structures and infrastructure. It also impacted on consumer behaviour – i.e. the way in which students access information, do transactions and engage with their learning environment. It was combined with a mostly bottom-up strategy and visible top down support. Elements of a middle-up-down strategy were present. An incremental process was followed regarding the implementation of *WebCT* and the subsequent development of the virtual campus technology architecture. The virtual campus is in line with the principles of customer relationship management and could be considered as the first attempt to move in the direction of a consumer-oriented model at the University of Pretoria.

- How do the processes look that sustain the new products and services?

The processes are illustrated in Chapter Four.

5.2.1.3 Research questions and answers regarding service innovation

- Is the diffusion of web-based services successful?

Services of the virtual campus have been diffused on a wide scale. As a result of a captured market, saturation or complete diffusion is imminent; hence additional functionalities are required to remain competitive. Service innovation does not require major changes in terms of the actions of users. Additionally, the ease of use of Student Online Services probably also contributes to its wide diffusion. Yet additional functionality should be developed because the virtual campus is dated and needs to incorporate a wider range of self-services via the web for students to remain interested. From an institutional perspective the web-enablement of more services will lead to a bigger cost saving in the long term.

5.2.1.4 General research question regarding the virtual campus

- Do the new products and services of the virtual campus make the University of Pretoria more competitive?

The virtual campus makes the University of Pretoria more competitive because it has improved the accessibility, flexibility and quality of products and services. Self-service has led to cost savings for the institution and has released time that personnel can use for more complex tasks. The virtual campus assists with knowledge management in terms of making information available when it is required and in terms of courses in *WebCT* that contain intellectual property that is explicit. It has improved the corporate image of the University by placing it at the forefront of virtual education in South Africa, and initially as a global leader in concept and function. It proves that the University of Pretoria is sufficiently mobile to respond to external forces and is able to make tacit knowledge explicit in order to create new products and services. Both are competitive advantages.

5.2.2 Response to research question two

Research question two was answered by exploring how theoretical elements in Chapter Two function in various aspects of innovation.

Research question 2 (Chapter Four)
How do process, product, and service innovation of the virtual campus inform theory?

1.3.2.1 How do the findings about *process, product and service innovation* of the virtual campus inform knowledge about the theories discussed in Chapter Two?

5.2.2.1 Research questions and answers regarding product innovation

- How does the prevalent educational model used for web-supported courses inform about behaviourist and constructivist instructional design approaches?

The fact that both approaches manifest in the sample of web-supported courses could indicate that a combination of behaviourist and constructivist approaches is appropriate, rather than using one or the other. Both are on a spectrum and could be relevant, depending on the outcomes of a specific course.

- How do the perceptions of learners and lecturers inform the role of the lecturer in a web-supported environment?

Role of the web lecturer

An interesting finding is that students regard the characteristic of *Expertise* as the most important characteristic of a web lecturer, 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 possibly indicates 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. This 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 findings indicate 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 and not web expertise.

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. On the other hand, lecturers marked those of *Facilitator*, *Mentor*, *Provocateur*, *Observer* and *Participant* most often.

The ones that correlate in terms of both students and lecturers are the roles of *Facilitator, Mentor* and *Provocateur.* Hence the roles required of a web lecturer that are deemed important enlist facilitation skills, mentoring skills and encouraging critical thinking skills in students.

- How does the diffusion of the new web-supported courses inform technology innovation theory?

Both product and service innovation mirror and therefore confirm the 'S'-curve.

5.2.2.2 Research questions and answers regarding process innovation

- How do the processes that were used to create new products and services inform the theories of *knowledge creation*, *change management* and *technology innovation*?

Innovation and knowledge creation

- Innovation on an organizational level requires an understanding of knowledge creation strategies.
- Knowledge creation leads to new processes that are embedded in the institution.
- Knowledge creation in team-based innovation accelerates as time passes.

Innovation and project management

- Project management is necessary to implement product and service innovation.

Innovation and change management

- Innovation on an organizational level has to account for change management strategies that suit the context and culture of the institution.

Radical innovation in a large organization

- Radical innovation is possible in a large organization, provided that appropriate strategies are chosen. Knowledge champions are key to cross-cutting, institution wide innovation projects.

No need for additional time

- Additional resources and time are often not available and not necessary. There is enough 'white space' that people create for themselves.

Unrealistic time scales are effective to overcome inertia

- Momentum is maintained through almost unrealistic time scales.

Incremental strategy for IT architecture

- Incremental technology architecture development lowers risk and allows for greater mobility if technology changes.

Enthusiasm overrides other barriers to innovation adoption

- Enthusiasm can override barriers to innovation adoption (such as a lack of ease of use and a lack of *perceived usefulness*).

Account for other technologies that could threaten the innovation

- An innovation strategy should account for other technologies that could threaten the adoption of the innovation. In the case of the use of *WebCT* at the University of Pretoria it is *e-mail* and *CDROM*.

- How do the processes that have been embedded to support and sustain new products and processes inform virtual education?

Design web materials in *PDF*

- It is best to design web materials in *PDF* format because most learners continue to print their online materials.

Web technology allows for rapid development

- Web technology enables cost effective customer process reengineering by integrating processes on the front end so that customers (students) have seamless access to relevant information, courses and transactions.

Provide electronic information sources

- The integration of electronic information sources in web-supported courses significantly improves quality and access.

Project management

Project management is key to quality instructional design and development and is conducive to a professional corporate image.

5.2.2.3 Research questions and answers regarding service innovation

- How does the diffusion of the new web-based services inform technology innovation theory?

The diffusion of the web-based services of the virtual campus confirms the 'S'-curve growth pattern. An incremental technology development strategy combined with a radical institutional strategy can be successful on an institutional scale, as is shown in the case of the virtual campus.

5.2.2.4 General research question regarding the virtual campus

- Which critical success factors are important to consider in educational innovation?

The answer to this question came in the form of revealing how the different theories manifested in the innovation components of the virtual campus. Hence the fields of *knowledge, learning, organizational learning, knowledge creation, knowledge management, change management, technology innovation and customer relationship management* can all be used in educational innovation. An understanding of the way in which *process*, *product* and *service* innovation interact is key to successful educational innovation. The different steps that are important in *process* innovation are to scan the environment and formulate an appropriate strategy, accompanied by a plan in which risks are identified. A vision needs to be created and a team consisting of knowledge champions and other key players. An incremental process of *learning by doing*, i.e. adapting products and services based on monitoring execution and feedback, assists in retaining a market focus. Knowledge enabling steps and conditions for knowledge creation contribute to market adoption.

5.2.3 Strengths and weaknesses of the thesis

- The researcher's proximity to the case aids interpretation. Tacit knowledge illuminates findings gained by means of qualitative and quantitative methods. At the same time it poses a threat to the reliability of the research. The researcher attempted to increase reliability by means of the following strategies:
- Member checks - taking data and tentative interpretations back to colleagues from whom they were derived, and asking them if they are plausible.

- Long-term observation – close involvement as project leader of the virtual campus since March 1998 to date.
- Clarifying the researcher's biases, assumptions, worldview and theoretical orientation at the outset of the study.

The study is encompassing and aims to provide a holistic view of the virtual campus. It investigates one educational innovation model that has proven to be successful. The Literature reviews in Chapter Two and Chapter Three consist of theories that were generated in other countries. The fact that these theories are applied to a South African context could be considered a weakness of this study. Limited theories have been generated in a South African context. The researcher is of the opinion that the theories that are discussed and applied can be generalized to a South African context.

This study is not an attempt to answer one specific aspect of educational innovation in detail. Rather, it is broad in focus, and strives to contribute to knowledge about various aspects of educational innovation. Therefore the case of the virtual campus informs about both learning and management aspects of educational innovation. The scope of the study does not allow the researcher to investigate both learning and management aspects in - depth. The findings should be considered as research findings on a macro, and more strategic level. A possible limitation is the fact that samples of 40 lecturers and 174 students respectively (who participate in web-supported courses) are used. However this study focused on learning, management and technology aspects of the virtual campus and therefore these samples are regarded as adequate.

A possible weakness is that the perceptions of students are recorded in the questionnaire. Their perceptions are not necessarily a representation of reality, but a qualitative research approach does not attempt to prove an absolute reality. Another limitation is that the questionnaire for students is very long. In spite of its length, it required a half an hour of students' time. The researcher guided them through the questions. The strength of this thesis lies in its comprehensive view of various aspects of a virtual campus. It provides numerous strategies that can be utilized in educational innovation and adds to the international knowledge base on virtual education. It is also informative in describing strategies to remain competitive. The advantage of a case study is that it is not a theoretical study, but a study that is informed by experience.

5.3 Relevance of this study

Higher Education institutions globally have to remain competitive in the face of rapid changes in technology, the knowledge era, changing demographics of learners and market demands. This research informs higher education leaders, administrators and lecturers on useful fields that can be drawn upon to succeed in innovation. Technology plays a central role in the types of innovation described but although emphasis is given to the relevance of technology innovation theory; this study reveals the importance of incorporating a broader range of strategies in educational innovation.

Higher education institutions that have initiated steps to utilize technology as a competitive advantage could benefit from this study. It is particularly relevant to South African higher education institutions that cannot afford the resources and infrastructure available in the U.S.A. and Northern Europe.

Institutions that have started out on the road of virtual education could find the procedures, processes, structures and infrastructure that have been created in the virtual campus useful. Not as examples to replicate but as ideas to adapt to their institutional culture and resources.

5.4 Recommendations for future research

The virtual campus and its components of *process*, *product* and *service* innovation were selected as the case because of the researcher's close personal involvement, which is a recommendation for qualitative, interpretive analysis.

Directions for further research can be to investigate whether different strategies are used at other higher education institutions in terms of innovation and perhaps to find a correlation between the strategies used and the culture of particular universities.

An area that requires considerable research is the needs of South African learners and lecturers in the flexible learning environment – specifically web-supported learning.

Another research field pertains to the question whether a web-supported learning environment fosters students who are academically more mature.

5.5 Conclusion

Competitiveness is topical and relevant in the higher education sector. This study puts forward a wide range of strategies that can be used in educational innovation. It describes and interprets educational innovation at a South African university – investigating *process*, *product* and *service* innovation. The research can make a contribution to improve current practice at the University of Pretoria, but also to provide ideas to institutions that are now embarking on this route. It contributes to a better understanding of *process*, *product* and *service* innovation components of virtual education and indicates ways of both creating and sustaining these components. Critical success factors are drawn from a wide range of theoretical fields due to the complexity of educational innovation.

The virtual campus is a competitive advantage for the University of Pretoria. Its new products and services are customer focused and provide improved accessibility and flexibility to students. Product innovation has led to a product offering that is in line with a quality flexible educational model, although learning facilitation aspects require attention. Service innovation is reaching a level of complete diffusion and additional services should be web-enabled to remain competitive.

Apart from new products and services, the creation and evolution of the virtual campus has led to new institutional knowledge and it shows that the University of Pretoria can adapt timeously to external factors.