Developing an Internet-based information resource for communication and education purposes - a case study

A thesis

by

Friedel van Zyl

submitted in partial fulfilment
of the requirements for the degree

Magister Artium
(Multimedia)

in the

Department of Information Science

University of Pretoria

Supervisor: Prof Dr Johannes Cronje

October 2001

Abstract

Candidate: Friedel van Zyl
Supervisor: Prof. Dr. J.C. Cronjé
Department: Information Science
Degree: MA (Information Science)
Title: Developing an Internet-based information resource for communication and education.purposes - a case study

This thesis reports on an investigation into the different elements/aspects concerning the design and development of a web site in order to facilitate effective learning and efficient communication between students and fellow students as well as lecturers and students. Contact learning and traditional communication are discussed in general versus distance learning and electronic communication. The pro's and con's of the above are set out as the research problems. The study comprises of four groups of respondents reacting on dimensions of education (content), communication, structure and design. The main contribution is to determine who the target population is and what the presentation of the content should be like to satisfy the need of this user.

It was found that a web site could promote learning and communication amongst all parties. The effectiveness of this project depends on how the design-related issues are applied and whether or not the content fulfils the needs of the target group.

Keywords: Interactive multimedia; effective learning; computer-mediated-communication; web design; enrolled students; potential students; self-regulated learners; Program in Interior Design.

Samevatting

Kandidaat: Friedel van Zyl
Promotor: Prof. Dr. J.C. Cronjé
Departement: Inligtingkunde
Graad: MA (Inligtingkunde)
Titel: Die ontwikkeling van 'n Internet gebasseerde inligtingsbron vir doeleindes van kommunikasie en opvoedkunde - 'n gevalle studie

In hierdie verhandeling word verslag gedoen oor 'n ondersoek na aspekte rakende die ontwerp en ontwikkeling van 'n webblad ter bevordering van effektiewe leer endoeltreffende kommunikasie tussen studente en mede studente sowel as studente en dosente. Kontakonderrig en tradisionele kommunikasie versus afstandsonderrig en elektroniese kommunikasie word in die algemeen bespreek Die voordele/nadele in albei gevalle word uiteengesit as die navorsingsprobleme. Die studie bestaan uit vier groepe respondente wat reageer op dimensies van onderrig (inhoud), kommunikasie, struktuur en ontwerp. Die hoofbydrae is om vas te stel wie die teikengroep is en op watter wyse die inhoud aan gebied moet word om te voldoen aan dié gebruiker se behoeftes.

Daar is bevind dat 'n webblad leer en kommunikasie by alle partye kan bevorder. Die effektiwiteit van hierdie projek is afhanklik van hoe die ontwerpbeginsels toegepas word en of die inhoud aan die behoeftes van die teikengroep voldoen al dan nie.

Sleutelwoorde: Interaktiewe multimedia; effektiewe leer; rekenaargesteunde kommunikasie; webontwerp; ingeskrewe studente; voornemende studente; selfgereguleerde leerders; Program in Interieur Ontwerp.

Acknowledgements

I wish to sincerely thank the following people:

- My supervisor, Prof. Johannes Cronjé, for forcing me to finish this thesis!
- My dearest family, for their patience and loving support.
- My sister Maryke, for her moral support and cooperation in completing this thesis during many late hours of the night.
- My mother Yvonne, for checking the grammar and interest in my studies.
- Helene Coetzee, for rendering her services in assisting me with authoring the web site and providing valuable tips in general.
- Friends, family and classmates who showed constant interest in my progress throughout the three years.
- Leon Rossouw, for his valuable technical advice and support.
- My Heavenly Farther for granting me the opportunity to complete this thesis with strength and knowledge.

Brief Table of Contents

Detailed Table of Contents

List of Tables

List of Figures

List of Appendices

Chapter 1

Introduction

Chapter 1

Introduction

1.1 Overview

This thesis reports on research conducted to determine the issues relevant when developing a web site in order to fulfil the need of communication and to promote learning in general. (Distance learning and class room activities)

The proposed web site is a product of a two-sided research with different perspectives:

1) Education and internal communication **(F. van Zyl)** and,
2) Marketing and global communication **(M. Meter)**

All the shared information throughout this study will be indicated by the following symbol: [⌖]

> The ease, with which Internet communication can take place over distance, makes it an effective medium for a constructivist teaching style, combined with cooperative learning, in a distance learning environment.
> (Cronje & Clarke, 1998)

Research by Gehlauf, Shatz & Frey (1991:20) generates a debate concerning the outcomes of the technology-advanced classroom. According to Russel (1999) no significant difference is visible in the results between the students in the traditional classroom and students in the electronic classroom. It is important however that the presentation of the content is adapted to the different settings in as far as design and technique are concerned. (Gehlauf, Shatz & Frey, 1991)

Cronje (1997) states that learner support is not related to distance. He further believes that learners form support groups irrespective of geographical boundaries. Factors such as professional and academic interests as well as shared tasks are more important

Clarke (1998) made the following assumption:

> "To ensure the essential learning factors of personalized feedback and interaction, a course that makes exclusive use of the Web for learning should be supplemented by computer-mediated communication (CMC) that provides this."

Research done at the **University of Pretoria** by Cronje & Clarke, (1998) indicated however that students benefited from a course where WWW and CMC (computer mediated communication) were applied. The approach and methodology provoked their interest. Expectations of expanding their knowledge and capabilities around on-line learning were fulfilled.

The use of web in learning is thus an option to promote aspects of learning and education. Limitations with regards to social contact and interaction with fellow students are however something to keep in mind.

Quoting Cronjé and Clarke, imply that the instructor has not got the visible evidence of the students on course, which results in numerous problems (Cronjé 1997). This will be discussed in the literature review (Chapter 2).

The majority of learning institutes e.g. technikons, and universities make use of the WWW for communication and information resource.

The **Program in Interior Design** at the **University of Pretoria** has been in need of a web site for different reasons. Until now they have made use of communication through personal e-mailing between students and lecturers and vice versa. A more structured and focussed network of information and communication channels are essential.

1.2 Motivation for the study

1.2.1 The research problem

The **Program in Interior Design** experienced difficulty in communicating information between students and fellow students as well as between lecturers and students. The normal e-mail facility became inadequate. Especially students not in close range of the university, battle to return

assignments and projects completed to the lecturer in time. The following problems arose from there:

- The **Program in Interior Design** was repositioned, now being part of the Department of Architecture, Landscape Architecture and Interior Design. With the content and composition of the **Program** drastically changed, a more focussed and job-orientated course is advertised with the focus on communication, design and management.

- Postgraduate students with full-time employment have the minimum time to attend classes and most of these students have access to a computer and Internet connection. (Refer to Figure 3.4)

- With the rapidly growing technology, especially in the education today, no one should be left behind as far as opportunities are concerned. With students scattered all over the country and some just out of reach of a learning center such as a university (U.P), it is essential to look at possible ways and means. to accommodate those students. This need provides the possibilities for distance education.
  (**Travelling, distance, transport**)

- The responsibility of financing studies, which has become a worry to a majority of students, results in taking up jobs before and during studies. This causes difficulty attending classes and a student with the necessary skills and talent does not have the opportunity to enroll for specific courses.
  (**Financial**)

- The time saving factor is also high on the priority list when dealing with education nowadays. Quality learning in a condensed time period needs good management. It will therefore be of great value to minimize unnecessary travelling etc. and rather spend that time dealing with educational matters.
  (Time saving)

- Education, like all other industries today, has to keep up with changing trends and developing technologies. This implicates contact with the most recent findings and methods/strategies.
  (Technological development)

All the above factors indicate that the development and use of a multimedia product is necessary for effective learning of students in the different circumstances which arise from today's living.

1.2.2 Purpose and objectives of the study

The purpose of this research is to establish the facility to convey information and to develop comfortable communication channels for students and lectures.

The objectives to meet this purpose are the following:

- Integrate study guides for all subjects.
- Develop a 'toolbox' for research methodology.
- Build up a database for relevant literature.
- Add links with the industry.
- Combine links with other research programs e.g. European Design Institute, Design Research Bulletin.
- Create occupation-orientated activities and development e.g. DSA and DEF development.
- Facilitate Internet communication between students and the department.

1.3 Research questions

The question to be answered was:

What are the issues to consider when building a web site in order to achieve effective learning and comfortable, efficient communication within an educational institute?

In order to be able to answer the main question, the following sub questions (issues) had to be dealt with:

1.3.1 Research sub-questions

1. How will effective learning be achieved?
   (Content)
2. How can comfortable and efficient communication channels be incorporated?
   (Communication)
3. How should a web site be structured?
   (Structure)

4. What will make a web site work (which design principles should be applied)? **(Design)**

1.4 Value of the research

The value of the web site as a product of the research is:

- Increasing the communication between the different levels within the Program by means of elimination of time consuming, factors, e.g. travelling and class attendance.
- Keeping up with recent technological development and achieving this through computer-mediated communication and a web-based instruction.
- The availability of general information concerning course requirements and relevant material to all persons interested.
- Recommendations for the extension of telematic studies.

The value of the research study and the relevance thereof for other similar institutions is the following:

- Identifying the target population for a specific program.
- A literature survey with relevant content with regard to an effective educational instruction and development of an efficient communication facility.
- A comparison between this study and completed studies of the same nature.
- Developing workable educational tools through the research of existing systems.

1.5 Research methodology

1.5.1 Research design

This study was conducted through an evaluation research. Trochim (1999) describes the type of study as "the systematic acquisition and assessment of information to provide useful feedback about some object" and that this "object" refers to a program or activity.

1.5.2 Population and sample

The target population for the study was primarily students presently participating in the Program in Interior Design as well as potential students interested in the Program.

Lecturers involved in this discipline and field of study were asked to participate in the evaluation of the product.

Samples were selected from:

- Current students
- Potential students
- Lecturers
- Experts in the field of web design.

1.5.3 Data collection technique

Data was collected by means of the literature review.

1.5.4 Data collection methods

- Literature Review on the relevant issues
- Interviews with the lecturers involved in the Program in Interior Design.
- Questionnaires for students and those interested in the Program.
- Focus group

The research questions and the data collection methods are summarized in Table 1.1

4. What will make a web site work (which design principles should be applied)? **(Design)**

1.4 Value of the research

The value of the web site as a product of the research is:

- Increasing the communication between the different levels within the Program by means of elimination of time consuming, factors, e.g. travelling and class attendance.
- Keeping up with recent technological development and achieving this through computer-mediated communication and a web-based instruction.
- The availability of general information concerning course requirements and relevant material to all persons interested.
- Recommendations for the extension of telematic studies.

The value of the research study and the relevance thereof for other similar institutions is the following:

- Identifying the target population for a specific program.
- A literature survey with relevant content with regard to an effective educational instruction and development of an efficient communication facility.
- A comparison between this study and completed studies of the same nature.
- Developing workable educational tools through the research of existing systems.

1.5 Research methodology

1.5.1 Research design

This study was conducted through an evaluation research. Trochim (1999) describes the type of study as "the systematic acquisition and assessment of information to provide useful feedback about some object" and that this "object" refers to a program or activity.

1.5.2 Population and sample

The target population for the study was primarily students presently participating in the Program in Interior Design as well as potential students interested in the Program.

Table 1.1 Research Questions and data collection methods.

Topic addressed and questions	Literature review	Questionnaire	Interview	Focus group
WWW and the Internet How can the Internet be used in Education?	√	√		
Education What does the target population need to know? How will effective learning take place on the web based program? In what way will distance learning be combined with real class contact?	√	√	√	√
Communication What methods of communication are necessary to ensure an effective web site? What does the learner need, to have access to these communication channels? Who will be communicating through these channels?	√	√	√	
Structural How should the web site be structured to ensure a logic and easy use for the target population?	√	√		
Design What will make the web site work? Which design principles should be applied to ensure an effective site?	√	√		√

1.6 Output

1.6.1 Description of the product

The product has to fulfil the need of the client to as large an extent as is possible. Therefore it is anticipated to include the following elements and provide the proposed functions and facilities:

- A multimedia program with a combination of text and other building blocks to obtain a medium to be delivered on the WWW and if necessary on CD-ROM.
- The program should ensure the learner of effective learning and communication through a variety of channels.
- Learners will be able to obtain information on the subject and will have control of the navigation.
- Lecturers will be able to assess projects delivered by the learners.

1.6.2 Description of the project team

The project team consisted of the researcher and a fellow researcher who shared tasks regarding the design, development and the production of the project. Because of the fact that the researchers, **(F. van Zyl and M. Meter)** designed and developed one web site, it implicated that they had to work close together. The same questionnaires were applied for evaluation purposes and as a result, shared information appears throughout this study. [✦]

The distribution of tasks is set out in Table 1.2

Table 1.2 Task distribution of the project team [↟]

Phases	F. van Zyl	M. Meter	Comments
Analysis			
- Goal	-Promote effective learning -Create a communication facility for students and lecturers	-Secure an optimal **market strategy** -Create internal and global **communication** channels	Two perspectives : • academic enhancement • marketing the institution
- Target	-Enrolled students in different year groups -Lecturers	-Potential students -Individuals in the Design Industry -Any interested party /web surfer	Different groups are applicable to accommodate the two perspectives.
- Content/ Information	-Content provided by client	-Relevant information provided by client	Content regarding academic issues. Information regarding design related fields for marketing purposes.
Design			
-Objectives	-Effective internal communication facilities -Tools to stimulate and enhance learning.	-Marketable product -Functional communication tool for the industry	Objectives from the two perspectives are integrated in the design phase.
-Specifications	-Education and internal communication according to the literature.	- Enhance marketing and communication globally according to the literature.	Refer to Literature Review (Chapter 2)
Development			
-Program editor -Delivery system	-*Dreamweaver* -WWW, Internet, CD	-*Dreamweaver* - WWW, Internet, CD	The decision of both researchers. Decision of client together with both researchers
-Prototype	-Create web site according to specifications	- Create web site according to specifications	The researchers worked as a team in the design, development and production of the prototype.
-Formative evaluation	-Discussions with the client, enrolled students and lecturers.	-Discussions with the client, independent marketing consultants, potential students, individuals in the Design Industry and interested parties.	Alpha testing by the different groups for the different issues. (e.g. education matters, communication matters, marketing)
-Summative evaluation	-Questionnaire-Evaluation of the prototype	-Questionnaire-Evaluation of the prototype	Both researchers used the same questionnaire. Specific questions in the single questionnaire addressed the different issues. (Refer to Table 5.1)

1.7 Overview of research report

Chapter 1: Introduction

This chapter provides the background to the development of the prototype web site. It gives an overview of the research problem and describes the motivation for the study. The distribution of tasks between the project team members is set out in this chapter and the value of the proposed prototype as well as the research study is described.

Chapter 2: Literature Review

This chapter provides relevant information on all aspects of building a multimedia product for the purpose of education and communication. The information gathered will support in answering to the research questions in 1.2.

Chapter 3: Design, Development and Production

The different stages of design and development are described in this chapter. All the changes that were made during the development are displayed and discussed in detail. The data collection methods used in this study are described as well as the samples used for the evaluation and testing of the site. All the data regarding the target population are displayed in this chapter and the needs, media, and content are analyzed.

The design principles applied to the program are tabulated in Table 3.10 and the derivation of these principles is also discussed in Tables 3.13 and 3.14. The researcher described the development phase step by step and screens of the different stages in the development are displayed throughout. The researcher gave a short discussion on the authoring tool used and general information on the proposed delivery system.

Chapter 4: Evaluation procedure

This chapter provides a definition of evaluation in general and describes the evaluation process according to the model of Trochim. Formative and summative evaluations are discussed and the different stages and activities involved in each evaluation are indicated. The researcher described the samples used for the evaluation and discussed the instruments in detail. The research questions, which had to be answered by the evaluation instruments in the summative evaluation, are mentioned in this chapter and the results on these answers are provided in Chapter 5.

Chapter 5: Findings

All the results of the data collected in the previous chapter are set out in Tables 5.2 to 5.5. The researcher discussed these results in terms of the research questions and the findings are set out in figures in order to display the differences and comparisons between aspects of the evaluated dimensions clearly. Comments and suggestions by the different respondents are included in this chapter to indicate the general impression of the evaluators.

Chapter 6: Conclusions and recommendations

The last chapter of this thesis discusses the findings with regard to the literature reviewed in Chapter 2. In this chapter the researcher indicates whether the main research question has been met by means of the sub questions. All the relevant evaluation instruments used to evaluate different aspects of the web site are discussed.

Limitations of the study and recommendations for further study or related research are also discussed in Chapter 6.

Chapter 2

Literature review

Chapter 2

Literature Review

2.1 Introduction

This chapter examines the second objective of the study: to address the research questions by means of a literature survey. Table 2.1 displays the issues relevant to the research questions.

Table 2.1 Issues addressed through the research

Topic of issues	Questions
WWW and the Internet	♦ What is the www/internet? ♦ How can the internet be used in education? ♦ What is search engines/portals?
Educational issues (Content issues)	♦ What does the target population need to know - general info and specific info? ♦ How will effective learning take place on the web-based program? ♦ What is the level of skills and ability of the learner within the program? ♦ In what way will distance learning be combined with real class contact?
Communication issues	♦ What methods of communication are necessary to ensure effective learning? ♦ What does the learner need to have access to these communication channels? ♦ What different groups will be communicating through this web site?
Structural issues	♦ How should the web site be structured to ensure logic and easy use for the target population?
Design issues	♦ What will make the web site work? ♦ Which design principles should be applied to ensure an effective site?

To introduce multimedia as the final product of this research, the following description by Phillips is appropriate:

> "Interactive multimedia deeply affects the way humans learn, work, communicate and relax into the new century."
> **(Phillips 1997:7)**

According to Phillips, **Interactive Multimedia** (IMM) is the provision of computer software with information. **"Multimedia"** describes the presence of text, pictures, sound, animation and video. **"Interactive"** means power of the user to control the environment by a computer. IMM is the technology implemented in a software package and not the delivery mechanism nor the hardware platform.

Because of the popularity of IMM, the quality of software packages are often not on standard and to prove that, a quote from the Wall Street Journal shows that many products do not sell:

> "According to PC Data Inc., the number of CD ROM titles burgeoned to 2,057 by the end of 1994 up from 197 two years earlier. But much of the multimedia hype has been nothing but hot air, with 20% of titles selling fewer than 11 copies last December. Ninety titles sold only 1 copy that month."
> **(Wall Street Journal 1 March 1995, A1)**

Thus the reason for Phillips (1997:8) to insist that software content must be appropriate, the user interface must be effective and the graphic design must be well planned. The performance should also be responsive and without errors.

2.2 WWW and the Internet

The Internet as an international network of computers linked up to exchange information. The word **Internet** is a contraction of international and network. To get on to the Internet you simply connect your computer to any of these networked computers via a service (or Access) Provider. (Kennedy, 1997:6; Sachs & Stair, 1997:4)

Sachs & Stair (1997: 2) further divides the Web into four components:

- The global Internet is the carrier of the information.
- The Web servers hold the information.
- The Web Browser software shows the information.
- A universal addressing scheme finds the information.

The Internet is not about computers, but about people, communication, sharing knowledge. "It's about overcoming physical boundaries to allow like minds to meet. And that's why you want it." (Kennedy, 1997:411)

2.2.1 Education through the Internet

Clarke (1998:2) believes that the existing global connectivity of computer systems has provided the development of the World Wide Web (WWW). As the WWW is a large-scale system of computerized, interconnected hypermedia resources accessible from computers connected to it, it can thus create a facility to deliver information, including educational resources to the desktop of your computer.

Greaves, cited by Clarke (1998:2), sees the situation in S.A universities at this stage as "a challenge of a transformation model that involves increased access, massification and a changing student population with diverse educational backgrounds and levels of preparedness." Greaves explains that this challenge can only be met when the institutions become information-based where the processes of teaching, learning and research are re-engineered with the aid of information-technology itself.

Through the Internet, learning resources can now be distributed across international boundaries and through this method, information can be gathered beyond the traditional resources of library and textbooks. (Harasim, 1996)

Bacon (1997) states that the learner can now access material, which has been otherwise inaccessible and the educational needs can be fulfilled by the provision of relevant resources.

2.2.2 Portals vs. Search engines

Webster defines a portal in Crawford (2000) as: "A door, gate, or entrance, especially one of imposing appearance, as to a palace." In a more specific manner a portal can be described as: "A web site that provides a particular entrance to the rather staggering wealth of information, products, and services that exist in cyberspace. A portal is any site that attempts to organize and streamline the on-line universe for anyone who chooses to (virtually) enter through that particular door." (Crawford, 2000).

Elliott Masie, President of the Masie Center, a leading consulting group for learning and technology based in Saratoga Springs, New York, defines a learning portal as " a single point of access for learning from multiple sources." (Crawford, 2000)

Learning portals specifically bring together existing best practices in training and education. Two learning portals are mentioned:

- Generic portals can be helpful to about any population of learners.
- Prescriptive portals can be personalized to the individual student's needs.

The advantages of a prescriptive portal are:

- Individual needs assessment.
- Assess the individual's learning style preference.
- Prescribes a learning path based upon the learning style.
- Check progress and report results.

Technology has provided an overwhelming world of information, which is available anytime.

Portals have arrived to help us focus through an entry to a subset of specific information, organized in a logical way. The learning portals take us to a collection of training-related information and individual learning goals. (Crawford, 2000)

A learning portal is a web site that provides its users with the same easy access and focus to specific information in the training- and educational space.

According to Franklin (2001), search engines are special sites to help people find information on different sites. There are differences in the ways search engines work. All search engines however perform three basic tasks which includes:

- They search the Internet by specific important words.
- They keep an index of the words they find and where they find them.
- They allow users to look for combinations of words found in that index.

An Internet directory, on the other hand has become a very popular search tool. The advantage of being listed on a directory versus a search engine is the fact that a directory is created by human editors from manual submissions. This eliminates automatic software submissions but most valuable is the fact that a directory powers many other indices and portals. The traffic on such a directory or portal is also of major importance opposed to that of an ordinary search engine. (Bruemmer, 2000)

2.3 Educational issues (Content)

Issues concerning the use of the WWW as an advantage for learning and education in general will be discussed under the following headings:

2.3.1 Applications of Interactive Multimedia (IMM)

Phillips (1997:9) refers to the designers of games and stresses that the engaging interaction between the user and system as well as the seductive interfaces and presentation are often lost in IMM education.

He also states that IMM can improve the quality of education although there is an ethical responsibility to the design of educational programs in order to make a distinction between facts and fiction.

Phillips believes that the advantages of IMM are mainly in the mixed media such as animation, text, graphics etc. Only now can the user decide which path he prefers to follow through the learning material and especially which medium is best for a required message. Is it text for thought or animation for dynamic information?

Because of this user control, each learner builds up his own knowledge and this results in a student-centered learning approach. A situation of life-long learning develops. Tutors need to upgrade their skills continuously. Because of the rapid movement of technology, changes become essential. (Phillips, 1997:11)
According to Phillips (1997) IMM can accommodate different learning styles. That refers to the "individual's characteristic ways of processing information, feeling and behaving in learning situations". (Smith, 1983) It is thus important to extend learning strategies to help students to be more flexible in their mental processing and not to limit them to a style.

Making use of technology related to the computer-environment could accommodate these different styles and limitations. Clarke (1998:8) sees the benefit of the computer linked to the web as a potential supporting tool for learning in your own space, time and pace.

IMM is not the sole answer to a given educational problem, but it is definitely a great extension to a situation by means of instructional aids, interactive tutorials and reference work. (Phillips, 1997:13)

Linda Slack-Smith of the School of Biomedical Sciences states that course material must be reviewed in advance and different teaching approaches should be used. (Phillips, 1997:14) The combination of self-study and computerized assessment for example, has resulted in flexible time management and learner responsibility. It also promoted active learning.

When applying IMM, Phillips (1997) stresses that it is important to remember that the program should be:

- Small and focussed.

Add detail later because we never know how quick a learner deals with the given information but keep it tight and focussed initially.

- Appealing.

Present the information in an attractive manner so that it pique the users' curiosity and draw their attention to the content. Information can be rejuvenated when using the right graphics and enough interactions.

- Flexible and portable.

It is useful to consider a wider audience while developing the product.

- Modular.

Finishing one part of a module means that you don't have to go back to it again and while using a multimedia resource such as sound it can be stored centrally. When updating is required, it is only necessary to change the central resource.

In this regard, Laurillard (1994:204), and Phillips (1997:204), emphasize that the learner should concentrate on the content of the program and not how the program is operated. Refrain from using long pieces of music when returning to the main menu. The educational nature of the program should always be of utmost importance because that will determine whether learning from IMM is more effective than from traditional methods.

2.3.2 Effective Learning

Laurillard (1993:13) quotes Ramsden by stating that: "The aim of teaching is simple: it is to make student learning possible." There have been changes in approach in teaching but most important is the change in practice. The teacher at university level should know something about student learning and not only imparting knowledge. That is also the reason for looking into the nature of academic learning at university level and thus finding out what make student learning possible.

Learning has been described as a high-level thinking by some academics and they see learning not only as a product, but also as a series of activities. (Laurillard, 1993:14) More than accuracy is needed and the integrating of background reading receives credit. It is clear that high level knowledge is one part, but handling that knowledge is the actual concern.

Laurillard further implies that if formal education were embedded in more natural activities, students would be able to make their own sense. Nevertheless, situated cognition is not enough. It is still necessary to abstract knowledge and represent the knowledge in a formal way, so that it can be generalized. (Laurillard, 1993:20)

Laurillard believes that an interaction between student and teacher develops, rather than an action on the student. This would provide a structure capable of its own improvement and should result in an improved quality of learning. (Laurillard 1993:95)

Vockell (1989:5) distinguishes between two thinking skills:

- Metacognitive skill implies that a learner is aware of thinking while performing a task and it improves the performance of that task. The absence of this skill leads to a failure of learning.
- Critical and creative thinking imply that the learner differentiates between **evaluative** and **generative**.

A comparison between the two thinking methods is set out in Table 2.2.

Table 2.2 A comparison between Evaluative and Generative thinking skills

Evaluative	Generative
"Reasonable, reflective thinking that is focussed on what to believe or do"	Development and application and ideas in solving problems.
"A concept of critical thinking"	People who understand facts and concepts and who can apply them in a new situation.

(Harvard Educational Review 32; 1962)

According to Vockell & Van Deusen (1989:16-18), video technology is actively involved in teaching higher order thinking skills.
More recently, the computer provides an excellent tool for teaching higher-order thinking skills (HOTS). That leads to interactive capabilities and the ability to present and stimulate problems. The computer can teach initial skills and promote generalisation. The computer can also be a more efficient tool to time-honoured techniques such as writing, collecting, analysing and categorising information.

- Students can do real thinking in the revision process much more effectively e.g. 50 minutes on thinking and 10 minutes on copying the manuscript. This means that more time is spent on higher-order tasks than trivial activities.

- The computer is not directly teaching HOTS but indirectly enhances the thinking skills by using their time more effectively.

- The computer offers advantages of individualization and immediate feedback.

- Each student can tailor the skills to his own need, he can proceed at his own pace, repeat the process as often as necessary and this is suited for co-operative learning.

- The computer can not replace the tutor; therefore it is best to combine the computer and the teacher in a well-planned program or lesson.

- With direct instruction, the learning is academically focussed. Teacher-directed classrooms with logically sequenced instructional materials or teacher guidance has the following advantages:

    - The goals are clear to students.
    - A time is allocated to the class.
    - The performance of the student is monitored.

Vockell & Van Deusen (1989:18) believe that for basic skills such as reading and mathematics, direct teaching (instruction) is proved to be more effective.

The disadvantages of students alone at the computer are social isolation, which ends up in mood states. Difficulty arises in summarising and explaining their learning tasks and there is no social comparison.

Research by Cohen, Kulik and Kulik, Rosenshine, cited by Vockell & Van Deusen (1989:28) show that small groups working together on HOTS computer programs are almost always preferable to students working alone.

De Jong and Simons, as compiled in Pieters, Simons & De Leeuw (1990:81) formed a theory of **self-regulation** in learning. Three levels regarding **self-regulation** of tasks were compiled:

- Knowledge and Conceptions (Metacognitive).

- Executive control/regulation.
- Transformation/ executive skills.

Self-regulated learners can

- prepare their own learning;
- take necessary steps to learn;
- regulate learning;
- provide own feedback, and
- concentrate and motivate.

Therefore such a student is an **"active"** learner, but there are impediments to active learning such as student factors and interactive factors.

Metacognitive knowledge, which entails thinking, problem solving, learning, remembering or third person's cognition, can be interpreted as to how somebody think or learn. The steering of this cognition is the executive control process.

Simon as compiled in Pieters, Simons & De Leeuw (1990:42), states that executive control process is the control structure governing the behaviour of thinking man is a strategy or program that marshals the cognitive resources for performance of a task.

The self–regulated learner can form the ability to be his own teacher. Sub skills of this learner is:

- The preparation of learning.
- Orientation of learning goals.
- Planning of learning activities and choice of learning goals.
- Self-motivation.
- Finding prior knowledge and skills for new learning.

This learner is able to shift between different learning activities. He can execute learning activities, which leads to knowledge, comprehension and integration and problemsolving. (Pieters, Simons & De Leeuw, 1990)

According to Van Brakel (1996), more attention should be given to adding issues of learning management in the self-directed model of learning. A web-based study, computer mediated communication and learning management guides can support the clarification of these issues.

Learning activities should be tuned to learning goals. To understand a part of a domain of knowledge, the learner should engage in other learning activities than when he wants to be able to apply that part of that domain.

Learning for recall is different to learning for understanding or integration. Thus, all learning shouldn't be active, not referring to the amount of effort but to the quality of the learning activity used.

Learning according to Shuell, (Pieters, Simons & De Leeuw 1990) is divided into different categories. These categories are displayed in Table 2.3 and discussed by the researcher.

Table 2.3 Different learning categories

Category	**Discussion**
Active learning	The student must do certain things while processing incoming information in order to learn the material in a meaningful manner.
Constructive learning	New information must be elaborated and related to other information in order for the student to retain simple information and to understand complex material.
Cumulative learning	All new learning which builds upon and utilises the learner's prior knowledge in ways that determine what and how much is learned.
Goal-directed learning	The success of the learning is dependent on the fact that the learner is aware of the goal in general and works towards an expectation appropriate for that specific outcome.

Salomon as cited by Pieters & Simons (1990) believes in **mindfulness**, which implies that a student should strive for activity in learning and problemsolving as a value in itself. De Jong and Simons as compiled in Pieters, Simons & De Leeuw (1990), differ slightly from the above by stating that the essential thing to do is to be **constructive** and **mindful** at the right moment.

2.3.2.1 Learner Activities

Shuell as cited by Pieters, Simons & De Leeuw (1990) differentiates between areas of learning. These areas are dependent on certain learner activities. Table 2.4 summarises the effect of the areas as well as the activities on active learning.

Table 2.4 Different learning areas and learner activities as IN Pieters, Simons & De Leeuw (1990:81)

Areas of Learning	Learner Activities	Effect of active learning
Quality and quantity	♦ Quality of learning is affected because some learners can only apply certain learning activities and although they learn extensively it is not efficient.	♦ Active learning can reach specific learning goals ♦ Active learning as a part of self-regulated learning might be an important goal of education. ♦ Studies suggest that active learning causes better learning performance.
Student character	Students see the fundamentals of learning differently: ♦ copying information and ideas ♦ construction of knowledge individually	♦ Construction of knowledge can lead to active learning
Learning goals	♦ Some students take learning for granted and do not set explicit goals Experiment has shown that a lot of students fail to vary learning approach according to task demands and imposed learning goals	♦ Students loose the opportunity of active learning because they misinterpret the formulation of goals.
Motivational and affective factors	♦ Students can be afraid of changing their learning approach. ♦ Active during learning in an unproductive way makes them feel secure.	♦ Students over learn e.g. underline every word to memorize instead of thinking about the study material. ♦ They do not believe in active learning. ♦ Shuell describes students who can not learn 'actively' as to mind orientated. That refers to a fixation on certain parts of the regulation process.
Skill of active learning	♦ A student must make use of certain activities to obtain the necessary skills for learning e.g. analysis and elaboration. ♦ Research on learning styles shows that students use surface processing strategies and other students have difficulty in active learning	♦ Metacognitive knowledge lacks, so students do not know the different learning activities and when to use a specific one.
Regulation skills	♦ Students do not plan properly and only when a problem arise they think. ♦ Very few students monitor, check and test their learning activities that it is tuned to their goals.	♦ Research showed that the amount of regulatory activity and the nature of testing the learning goals predict the performance of the student. ♦ Active learning seems to depend on regulation styles.

Computer assisted instruction requires a certain ability of abstract reasoning to transfer the information into adequate regulation activities. Computer questions can not be as tailor-made as a human tutor can.

Venezky and Osin (1991:2) state that a classroom without a teacher is not the answer. Text is an evolution not a revolution. Computer assisted instruction can be a meaningful aid in "teacher directed" settings and home learning.

The support role will not be "directly instructional but will be spent in management, testing, grading, scheduling and communicating."(Venezky & Osin, 1991:2)

According to Laurillard cited by Phillips (1997:64), there are two models of education that affect the design of an educational program. They are **'didactic'** and **'communication'** models, which can be used to analyze the pedagogical principles within educational media. She differentiates between two types of knowledge:

- Perceptual knowledge is known as the definite knowledge in a subject. It is also known as 'instructive' or 'didactic'.
- Conceptual knowledge obtained through social interaction and experience. (Laurillard, 1987)

Knowledge is not something that you get from one person, but rather a development of one's own perspective. By following this model the learner takes more responsibility for what they learn and how they learn it.

Even on traditional campus, distance learning are widely used and subsequently face-to-face communication becomes less. This gives the student the opportunity for interaction with the teacher who plays an absent and indirect role.

2.3.3 The target population

Defining the target population for your web site is an important factor early in the planning of the project. Issues concerning the audience are discussed.

2.3.3.1. Identifying the audience

The more specifically you can catalogue the needs of the people reading your web pages, the better you'll be able to meet the needs. The background information, which will be revealed in

the content, is predicted by the prior knowledge of the target population. That will also affect the detail of the terminology explanation.

Sachs and Stair (1997:63) believe that the usefulness is often easier to provide to a narrow target set than to the whole web audience. To select a specific topic and direct the focus is much more useful to those who need that specific information.

2.3.3.2 Accommodating your audience

Wilson (1996) advises to keep in mind the problems that your target population will be trying to solve, while reading the pages. It is also important to keep in mind that other than the specific audience might also peep at the site and therefore you should do a similar categorization.

2.3.3.3. The choice of a Browser

According to Sachs and Stair (1997: 8), the earliest Web browsers showed only text. Mosaic was developed and caused a tremendous change. From there Netscape Navigator took over and presently it is possible to show text, graphics, sounds, movies and other small software applications written in Java and JavaScript. The success of a browser is that no typing is necessary. A mouse click takes you to the information indicated by a hyperlink, which hides the address of other resources.

Sachs and Stair (1997:101) inform that there are numerous people still using text browsers and some people choose to turn off the graphics to speed up the response of their modem lines. It is important to accommodate these visitors.

Wilson (1996) emphasizes that the choice of browser has an effect on the audience who will be visiting the site. It is wrong to assume how someone will be viewing your site. Rather try to accommodate people with a wide variety of capabilities. On the other hand, it is also true that the content of the web site might need the features of a specific browser to be presented effectively.

It is always important to maximize the value and usable content, minimize the size of the document and the load time, keeping in mind that everybody might not use the same browser. Some users will have a slower link by which they retrieve the information on your web page.

2.3.3.4 The bandwidth of the Internet connection

The most important differences between designing for the web and other traditional media designs resolve around perceived performance. And the ways in which the Internet connection will affect the audiences' perception of the product quality.

The way in which you use graphics, size of images and the layout of the page as such, will be perceived differently depending on the speed of, and quality of the user's Internet connection.

On the other hand Veen (1998) believes that web pages should look good viewed in any browser on any computer. He further states that the World Wide Web can serve the information needs of any user with any device at any speed, but only when the site is build and designed by a smart author. He adds that the biggest web myth is that you can not design well without high bandwidth. As a matter of fact, Veen found that design solutions have emerged from the problem with bandwidth limitations. For example, cascading style sheets offer the designer the possibility to do much more with much less.

2.3.3.5 Who and where is the target population?

According to Phillips (1997:50), a feasibility study for any software production is to know your target audience. He suggests that the following questions should be asked in order to identify the target group successfully:

- How many users will be interested in this site?
- Where are they located and do they work from different places?
- Will all the people interested using the program the same way and if not, how will it differ?
- Is there a specific teaching problem in the current environment with specific students and can the development of the web site accommodate it?
- What is the computer literacy of the general target population?
- What hardware is available to the user?

It is on the other hand worthwhile to design for a larger audience in the long term. There should be either an opportunity to gain the appropriate skills or the interaction must be simplified to meet the competency of the audience.

2.4 Communication issues

Important matters concerning communication as an issue to design and develop this web site successfully, are discussed under the following headings:

2.4.1 Effective communication

For the communication facility to be effective, certain components should be kept in mind such as

- learning;
- general information transmission, and
- social communication.

2.4.1.1 Essential learning communication

Broholm & Aust (1994) believe that the essential learning process of interaction and feedback can only occur through supplementing a form of computer-mediated-communication (CMC). The presentation of an electronic mail (e-mail) communication or a dedicated e-mail mailing list can accommodate the essential feedback and interaction.

Computer-mediated-communication (CMC) offers the opportunity of **student to student** and **student to lecturer** contact. It also opens up the path to learning material by experts. This global interconnectivity results in an increased collaboration that extends the institutional and national boundaries. (Harasim, 1996)
Active learning is promoted by CMC because the learner can use his own time to give thought to a matter and return to the topic in a tutorial presented by a- synchronous text-based medium. (Laurillard, 1996)

Dede (1989) detected that the introvert as a less assertive learner, gains far more by the CMC method than the traditional face-to-face class communication. For the simple reason not to compete with the confident learner.

2.4.1.2 General information communication

According to Clarke (1998:14), sufficient provision should be made for course and learning issues. These include the relevant resources, technology, terminology and how to interpret it. It should

also identify the help sources and explain the means of assessment of work and projects completed.

Research has shown that the predominant communication is of a more social and other wise course management orientated nature, than it is focussed on content matters. CMC accommodates all learners at once and provides all the information concerning administration and other course requirements, while a face-to-face situation can waste a considerable amount of time. (Draper, 1997)

Wilson (1996) is of opinion that the "most basic level of interactivity is by means of hypertext links, blue underlined clickable words which take you to the underlying information."
He also advises a search tool for an information-rich web site in order to cut the time in search of what the reader is looking for. This search tool is indeed interactive. The reader types in a word and a selection of matching document titles are made.

2.4.1.3 Social communication

To create a social atmosphere and cohesion in a study environment, the necessary communication channels are essential. This requires a specific method. A class-mailing list for asynchronous social communication and synchronous electronic "chat" channels are the possibilities for this need. (Clarke, 1998:14)

Of all the possible CMC methods, e-mail has been the most popular amongst students. (Holden and Wedman, 1993) Wilson (1996) believes that the need for social communication (interaction) is very high on the list when planning a web site. He states: "Customers want to be treated as individuals, and all but nerds enjoy conversation. This means our web sites must glow with humanity and flexibility: our e-mail is answered promptly, our writing style is personal and chatty."

According to Wilson (1996), the most popular feature of a server is the real-time **chat** groups and then again it is the preference of the customer and not the designer or developer of the site.

An inexpensive tool makes "**chat**" between groups possible on the web without any special plug-ins. What you want to avoid on your Web site is an empty chat room that people only enter to ask, "Is anybody here?" The Internet is the ultimate global forum for interacting with customers and potential customers. Wilson advises that it is therefor wise to take advantage of everything available for information retrieval and social interaction.

2.4.2 Limitations of computer communication

Computer-mediated-communication has several limitations. It is said that CMC is only suitable for instrumental relationships rather than social supportive ones. The lack of visual and social presence is another limitation. CMC is a suitable method of conveying information, opinion and suggestions, but it would not accommodate agreement or disagreement. When dealing with social-emotional tasks, CMC is also not the answer. (Hiltz and Wellman, 1997)
In cases where the students are too busy to log on regularly, they tend to fall behind and result in missing deadlines for assessment etc. If the communication tools do not provide adequate management of the information, it can result in information overload.

2.4.3 Traditional vs. Electronic communication

Greller and Barnes (1993) believe that communication by means of computer facilitates interaction similar to that of contact communication in a classroom, but with the difference of a combination of the printed word with verbal patterns of speech.

An advantage of the electronic communication is the storage and recording of messages for later use.

2.4.3.1 Bulletin boards

In real world, a bulletin board is a device to which you can staple announcements, appointments, etc. Alessi & Trollip (2001) describe a web-based bulletin board as a web site to which Web users can post items such as text, pictures or complete multimedia programs.

A bulletin board must be visited periodically to browse its contents unlike e-mail, which is delivered to your computer.

Bulletin boards provide asynchronous communication because each user accesses the bulletin board at his own convenience.

A freeware/shareware bulletin board program can be used to support a learner. Any question or comment from a learner causes an automatic copy to be sent to the bulletin board owner. The e-mail response can then be posted directly to the board. The bulletin board owner can also re-arrange the questions and answers into the meaningful categories and sequences.
(Wilson, 1996)

2.4.3.2 E-mail

Wilson (1996) discusses hyperlinked e-mail addresses ("mail-to" links) as a facility to provide a quick way for users to contact each other. Provide a simple form with information like name, e-mail address, topic, and phone number and by doing that the reaction is quick and precise. Interaction is all about answering e-mail promptly and in a helpful manner. A successful web site should provide an essential communication channel, such as the e-mail facility.

2.5 Structural issues

Aspects, which affect the structural design and development of the planned web site, are discussed under the following headings:

2.5.1 Navigation

The most important thing about navigation is that it must be very clear. (Sachs and Stair, 1997) They see image maps as a wonderful and colorful navigation tool, but advise to have a default URL specified. The images should also have defined borders and not a fuzzy look around them.

Sachs and Stair (1997:175) suggest that an image or icon link should be near to a text hyperlink, for the simple reason that many people will admire them, but will eventually go to the familiar text hyperlinks. They stress the fact that the same words or phrases must be used for icon, image and text hyperlinks.

2.5.1.1 Linear, Hierarchical and Mixed- hierarchical

All the above schemes follow naturally from an objectivist approach to educational design and according to Laurillard (1994) there is a serious shortcoming in these book-like structures, analyzed in terms of the ideal teaching/learning process. There is very little user control, other than going to different topics at will. The viewer still has to use the material as the designer dictates and the usual menu encourages the user to start at the beginning and keep going.

2.5.1.2 Concentric

Phillips (1997:66) describes a concentric structure as a knowledge base with a number of reference topics where the information is divided into different categories. A wheel represents each topic. The user moves between topics along the axis to investigate the different categories of information at the rim of the wheels. This is quite a quick method of finding information for especially knowledge bases and the user has control over what information to look at.

Kennedy and Taylor (1994) think that this model can create a constructivist environment because it avoids the directionality of the linear and hierarchical structures. The user can start anywhere.

2.5.1.3 Hypermedia

Because the computer is not restricted to two-dimensionality, which is the case with traditional media, any links can be made between pieces of content. These links on the information network are known as 'hyperlinks' and the general structure is known as 'hypermedia'

The hypermedia structure can be based on hierarchical structures with links moving side-ways between the arms of the hierarchy. Hypermedia structure offers an advantage to educational programs because it facilitates a constructivist approach. This structure enables the student to build knowledge according to personal preference.

Phillips (1997:70), on the other hand, mentions that in some programs difficulties arise because of unstructured access to all information. The user can thus be sidetracked to follow interesting information to its end and in the absence of adequate navigational tools, the user might get lost in "hyperspace". This is a real concern in the design of IMM.

A further problem is the inadequacy of research skills to be able to construct from the knowledge network. It is thus necessary to provide a guideline for the students in discovering the knowledge, other wise they won't make any sense of the hyperlinks.

The dilemma regarding hypermedia is that the student must have the necessary research skills and computer-based cognitive tools to make sense of the environment. The World Wide Web is a good example of the hypermedia structure. In the current form however, it has not been applied to the advantage of education. It is not enough to have information resources to guarantee learning. The student needs guidance to build pieces of the information into a mental structure.

Phillips (1997:72) is of opinion that the successes in CBT projects often have a mixture of hierarchical and hypermedia structures.

2.5.1.4 Explicit structures

A traditional way of implementing navigation schemes is by menus made up of buttons. This metaphor means an explicit structure on the content, because in the Western world we are used to start in the top left corner and continue until we are finished. With the menu a 'start here' linearity is implied. Menus lead to a typical linear sequence of screens which is commonly accessed by navigational buttons e.g. **back, next, previous, continue.** Icons may also be added to the navigation. For moving up the hierarchy, buttons such as main menu, topic, contents, previous menu etc. are often used to guide the user. Graphics are also sometimes used. (Phillips, 1997)

2.5.1.5 Implicit structure

Table 2.5 Description of the Implicit structure

Use content to navigate	→	1.Parts of subject material 2.Click on 'hotwords'
Start from the end	⇒	Use result of the structured argument

Start with the result of the structured argument represented in a visual form. The student can then investigate any aspect of content to a depth of his desire, restricting the scope to only one key concept. Investigating leads to other information.

It is not yet known whether this approach is widely applicable and it might be limited to concepts with simple visualizations. (Phillips, 1997)

2.5.1.5 Navigation headings

Important facts concerning the success of the navigation of a web site is the following:

- It is advised to add headings to chapters in order to link back to the beginning of that document.
- For pages in a chapter, add a sub-heading in order to go back to the beginning of the chapter.

- Pages longer than one- and-a-half screens need duplication of the navigational links to save readers from scrolling up and down the pages.

- Avoid "**back**" and "**return** to" buttons and links. Rather use a more descriptive link such as "**ahead to Chapter 5: Evaluation**"

- A navigational scheme for a number of topics is even better.

- Avoid a palette of graphic navigational buttons. Try not to confuse the user and rather make it easy to decode your navigational symbols.

- If graphic navigation buttons must be used, add text labels to them.

- It is a good idea to add a short list of content to a long page. Two reasons for doing this are for first time readers to see what to expect from that section and returning readers to find the information they are looking for even quicker.

- A title header on each page would be of great navigational value-small but recognizable as a title.

- Choose a title that accurately summarizes the content of the page. Meaningful titles save the reader time and avoid frustration.

- Provide a search service and clearly state the scope of the collection being searched. (Levine, 1999)

According to Merle (1999), navigation bars must be a simple set of buttons or text and should be repeated on each page. It shows best at the top, left, or bottom. Consistency is of utmost importance.

She also advises that if a scroll bar is used for more than 1½, add simple text navigation at the very bottom to avoid scrolling back in order to make another selection.

Merle (1999) adds that it is a good idea to let the user know where he /she is at a given moment. For this reason you can alter that page button slightly e.g. dim, highlight or another colour. The navigation bars should include a home page button and contact information. If the site is large, it is necessary to add an index page or site map. The site map must show a complete outline of the site.

Merle (1999) suggests that, search capabilities are also a good idea in order to allow the user to conduct a one or two word search to receive a possible list of relevant pages.

Merle (1999) emphasises that consistency is very important and that one must keep in mind that the web site as a whole is well organised. She recommends no fancy backgrounds etc. but rather concentrate on the organisation of content in a simple and easy-to-follow format.

Most interactions with web pages include navigating hypertext links between documents. The most frequent problem is the feeling of being lost on a site. Clear and consistent icons, graphic identity schemes, and graphic or text overview can give the user confidence to find what they are looking for. To be able to return to the home page is very important as well as to other major navigation points in the local site. It is a set of basic buttons, often graphics that appear on every page of the site to navigate and create the graphic identity that reminds the visitor that he is still on the site.

There should be no dead-end pages, meaning that there is no link to any other local page, including the home page. If a user that go directly to a subsection of the site, it is fatal if there is no link back to the home page or to a local menu page. Those readers will have no further access to the site. (Merle 1999)

2.5.2 Storyboard

Initially a site will consist of screens with certain topics but with no content. The storyboard defines all the resources required for each screen.

Vaughan (1998:468) describes a storyboard as an essential part of the planning phase. This is where each screen is sequentially organized and the necessary design notes as well as sketches accompany the planned project.

During the development phase the storyboard is reviewed many times and production work starts as soon as the content has been finalized.

Schwier & Misanchuk (1993:294) have found that storyboards are useful for an overall idea on the multimedia product. This method gives you a clear communication of the specific compositions within the multimedia production.

2.5.3 Hardware

According to Phillips (1997:50) it is an important consideration when building a software program, to decide which type of platform or hardware to use. The use of relevant and suitable software is also of primary importance. For instance, a colour program for end users with black and white model is of little value.

On the other hand, the development of the computer industry is so fast moving that the upgrading of the user's computer is often quicker than the completion of the final product.

2.5.4 Software

Phillips (1997:52) stresses that it is as important as the choice of hardware. The choice of the software package can determine the use of hardware. For example, if a cross-platform program is developed with *Apple Media Tool,* you will need a Macintosh while the *Asymetrix Toolbook* works with IBM. Packages like *Authorware* forces students to follow certain paths through the material. In an educational program specifically, it restricts the student to go to any part of a module or unit at any time.

The second software issue is that of responsiveness. In general most IMM packages are slow because of the amount of mixed media used. The issue however is, to determine the speed of the program on the delivery platform.

Phillips (1997:52) gathered information about programs used on specific delivery platforms, which are displayed in Table 2.4.

Table 2.6 Comparison between combinations of different software and hardware

Delivery platform	Program/software
Macintosh	Use *Authorware* for delivery under windows
IBM	Exposed problems with *Authorware.* Resolutions were lost on transfer and transitions took longer than 20 seconds.
Spinnaker Plus	Faster than *Authorware* but to slow for effective student use.
Asymetrix Toolbox	Windows machines had to be used for development.

2.5.5 Delivery Platform

Different aspects can influence the choice of a proper platform. Personal preference, budget restrictions and the delivery requirements of the project are examples of such aspects. From the start the **Macintosh** has been defined as the "multimedia computer" for the simple reason that it has good built-in audio. (Vaughan, 1998:57) He believes however that the "newest, fastest, and most flexible computer" is still the best production station.

The **multimedia PC** is described as a standard and not a computer. It includes the minimum specifications to turn it into a multimedia computer.

Because of the fact that 80% of a developer's target market may be Windows platforms (multimedia PC's), it is of utmost importance that the designer/ developer makes use of tools, which make transfer, across platforms easier. (Vaughan, 1998)

For delivering a program on the web, it is without a doubt a requirement to have reasonable knowledge of the language (format) used to present structured text mixed with inline images. This format is known as HyperText Markup Language (HTML). (Vaughan, 1998:421)

Virtual Reality Modeling Language (VRML), a specifically designed environment which accommodates high-performance 3-D worlds, will be discussed as a possible web feature which can enhance the design industry as far as the collaboration on product designs, photorealistic 3-D graphics etc.

2.5.5.1 Virtual Reality Modeling Language and Hyper Text Markup Language

Virtual Reality Modeling Language (VRML) is a 3-D navigation specification. It enables the creation of 3-D sites e.g. chat rooms.

HyperText Markup Language (HTML) is the specification for page oriented Web navigation. Vacca states that the construction industry has already made use of VRML to explore exact representations of architectural drawings and models before even start building. (Vacca, 1996:1)

Laurillard (1993:122) describes hypertext as a controllable element by the user and as a medium with great strength. Iconic forms and options support the indexing, referencing, searching and editing tasks very well. A mouse click and pull down menus 'makes accessing and displaying an item of information very convenient' and the flexibility makes it customizable for the user. Another advantage of hypertext is the accessibility of the structure's topic. If the structure doesn't suit the user's way of thinking, it can easily be changed to suit their purposes better. Laurillard (1993:130) concludes that no form of hypermedia succeeds in supporting all the activities to complete the learning process.

Vacca (1996:7-11) indicates that the use of Virtual Reality modeling Language (VRML) balances the principle of simplicity and flexibility. Certain software products which can 'speak' VRML allow users to browse in 3-D before they start building.

According to Vacca (1996:15), VRML creates a much richer interaction than HTML. In 2-D home pages it is possible to jump from page to page and view images from a fixed, pre-determined perspective. The world of VRML however has no limitations and it is inexpensive to build. It can become bigger than the earth and the objects can defy the laws of gravity. VRML can change a 2-D home page into a 3-D home world.

2.5.5.2 Band width for VRML

Vacca (1996:17) reveals that images are loaded in chunks for greater accessibility. This has made a graphic-intensive web site more accessible for the average modem user. The user can now start reading text before the images have been off loaded completely.

VRML files are usually very compact and good VRML tools can access and save 3-D spaces in chunks. Even large files can be broken into many small files and loaded incrementally. It is actually more effective than 2-D.

2.5.5.3 Application of VRML

Vacca (1996:21) recommends VRML for any web site especially to engage visitors and keep them returning. Vacca stresses however that one must consider the user group carefully and should still keep the bandwidth in mind to avoid producing an attractive VRML site that is painfully slow to navigate. The lack of a language barrier makes the site even more attractive for a broader general audience. Vacca (1996) states that the intention of VRML is to become the standard language for interactive simulation within the web.

2.6 Design issues

Cottrell and Eisenberg (1997) state that "web page creation is becoming commonplace".

They added that writing HTML becomes easier but creating valuable web pages is not that easy. As desktop publishing software led to different combinations of styles which did not work, the ease of web page creation has resulted in some web pages of dubious design and questionable value. Cottrell therefore states that people are paying more attention to development of well-designed pages.

Aspects like minimising download time, avoiding flashing text, insufficient colour contrast and short page lengths with the important content near the top, have become the primary factors. A well- designed page must focus on the need of the target audience.

Cottrell also implies that the general audience approaches a web page in an information- seeking or problem-solving mode. Therefore they developed a model for information problem-solving and techniques for applying the model to web page design.

> "The heart of design is communication: defining a problem and creating a solution that balances pure information with an aesthetic that gives the message voice. The tension between form and function is the starting point for our exploration of Web design."
> **(Veen, 1998)**

Veen (1998) formulates a design philosophy as web sites lined up on a continuum between a library and a gallery. He explains this as the intent of a library to take inquisitive people to the information they are looking for. On the other hand, the gallery provides similar information but through a more experimental path.

Veen (1998) concludes this design approach by stating that form must follow function for a web design to be considered successful.

2.6.1 Importance of the design process

Phillips (1997:59) states that an important factor as part of the incremental prototyping model, is the design process, apart from the production process. It is best to complete the whole user interface before starting production. All aspects of the content should also be finalized.

First phase of the design is the requirements specification. The structure is not clear until the design process is almost complete. The success of the specific design strategy is uncertain until an advanced stage of the development. The purpose of the requirement specification is to define the functionality and scope of the project. This is inter-linked with the feasibility study.

Evaluation of the prototype exposes problems in the design, which leads to changes in the requirements specification. The final requirements specification as the first stage of the project is a difficult task but it is essential to create the process because it documents the design.

This phase provides a clear understanding of the project and an overview of the content. To ensure a well-structured content, teamwork is essential from the start, as all members of the team should be familiar with the content.

According to Phillips (1997:61) it is important to understand the scope of the content (brainstorming). All ideas are discussed and then only can a consensus be reached about the basic structure of the project. The design should be signed off after a consensus about the basic structure has been reached. No further changes should be made to the general design.

2.6.2 General design principles

In any multimedia program it is of importance to gain and hold attention. According to Schwier & Misanchuk (1993:213) it occurs quite often that the developer creates a distraction rather than attracts the user's attention. Too many colours, graphics and styles affect the quality of communication. The use of basic principles is after all, the most powerful concept in screen design.

2.6.2.1 Simplicity

According to Schwier & Misanchuk (1993:213) a minimalist approach is always effective. It should be a challenge to use as little text and graphics as possible in order to keep the program "lean", but effective and appropriate. Schwier and Misanchuk assure that formative evaluation

will reveal a program, which tends to be too simple. On the other hand, a too extravagant program will never show through evaluation but will waste time and disc space.

According to Schwier & Misanchuk (1993) the bottom line is to keep away from the "siren song of multimedia" and keep it simple and straightforward.

Veen (1998) stresses that simplicity is the essence of good web design. He stresses the importance on taking control of the content and keeping it down to the very essence. The main purpose of the web is to communicate a message.

According to Veen (1998), the user needs simplicity in every aspect. Elements should be familiar to the user e.g. underlined words, which refers to hyperlinks, a colour strip on the left hand side of the pages which indicates the navigation vocabulary.

2.6.2.2 Consistency

Unexpected elements must be limited to the minimum. Schwier & Misanchuk (1993) indicate that it upsets the user. When the unexpected is used to generate excitement or a special reaction, it is accepted, but always in an expected context. Consistency implies:

- style of presentation from one section to another;
- placements of various items e.g. navigation devices, student input, feedback;
- use of colour;
- access structure e.g. use of headings;
- use of cues e.g. font, italics, bolding, colour;
- screen density and white space;
- terminology (directions, menus and help screens);
- names of commands and manner of evoking them; and
- interactive behaviour in similar situations (e.g. click of the button in all multiple-choice questions).

2.6.2.3 Clarity

Schwier & Misanchuk (1993:214) refer to clarity as the process of stipulating what to teach or communicate. That refers to the different analyses, e.g. task analysis, content analysis etc.

To ensure that the clarity of the multimedia product is good, Schwier & Misanchuk (1993) divide content into three categories:

- Things the learner must know.
- Things which is nice to know.
- Things the learner doesn't need to know.

Schwier & Misanchuk (1993) state that the language level must suit the target population. They provide the following guidelines to ensure the clarity regarding language:

- compatible language;
- short sentences;
- avoid jargon;
- keep your prose lean;
- use bulleted lists;
- use active voice;
- keep away from negative statements;
- informal language is more accepted than journal style;
- use personal pronouns;
- use lots of familiar examples; and
- use inclusive language, meaning non-racial and non-sexist.

Veen (1998) advises that clarity should be a primary concern in building a web site. Thus, avoid confusion and make use of a rough 10-15 seconds to impress your reader, spark his interest and navigate him clearly into your site.

Veen (1998) mentions an effective strategy of matching words and pictures together, creating an eyeful of information that will easily guide your user.

2.6.2.4 Aesthetic Considerations

Schwier & Misanchuk (1993:215) reject the approach of aesthetics that over rule instructional considerations. Only if the instructional considerations have been applied satisfactory, can aesthetic considerations be added without affecting the other. These are the important considerations to bear in mind:

- Balance in screen design creates a feeling of stability.
- Harmony is using similar text fonts and colour within a screen display.

- Unity refers to the wholeness of a display and is the result of a well-balanced and harmonious screen.

2.6.2.5 White Space

White space has the function of bringing ideas together or separating them. It creates a lighter screen and can illustrate relationships. Therefore Schwier & Misanchuk (1993) state that the content must be chunked together to make sense instructionally.

Schwier & Misanchuk (1993:223) refer to Frase and Schwartz, who applied "segmentation" as a technique to divide text into meaningful segments. This resulted in an increased response time of 14-18%.

2.6.2.6 Interface layout and design

User interfaces have changed many people's lives. Schneiderman (1998:5) states that it is clearly visible in the effectiveness of learning. It is however important to remember that a certain amount of frustration, fear and failure occurs when the terminology, layout or level of complexity is not met by the user.

In designing a hypertext learning site, there is no control over the way in which the learner arrives at the site, the order in which the learner navigates the site, how much time spent at the site and where he exits the site. The learner gets involved in a jungle of information, which is spread across a number of sites. This situation differs significantly from the traditional topic of information presented in a single written article or book. It is therefore very important to guide the learner with regards to the navigation and the overall design and layout of the web site. (Clarke, 1998:23)
The user interface created the possibility for people to control their computers directly. They expect a level of design sophistication from all graphic interfaces, including web pages. The actual goal is to prevent putting any obstacles in the user's path.

Experienced as well as inexperienced users should be accommodated. Feedback from the users should be an objective indication of the success of the design ideas.

"An effective web site, is yet another powertool to help achieve the goals of the enterprise. The enterprise can be a business, a school, a government agency, or an individual."

(Sachs and Stair, 1997: 14)

They stress the fact that the objective of your enterprise should be the first and foremost issue. To follow on that is the objective of the web site. The web site should thus coordinate with the activities and goals of the enterprise.

2.7 Building blocks

2.7.1 Text

"More than any other element, body text can whisper or shout, look old or new, relax the reader, startle the reader, or send the reader away after two paragraphs, never to return..."
(Misanchuk, 1992:137)

"Typeface may be the single most important decision of your entire publication... and it can make or break your design."
(Lichty 1989:25)

According to Vaughan (1998:181) text is still one of the most powerful components of communication. Advertising companies and media wizards can change the meaning of a sentence into a single powerful logo or tagline. Multimedia authors blend a variety of components and add text to create integrated tools and interfaces for displaying messages on computers.

To create the correct atmosphere and feel to a specific text or screen, it is of utmost importance to use the appropriate word. According to this principle, the design of labels for title screens menus and buttons need using words with power to express.

Vaughan (1998:184) advises to rather use text for titles, headlines, menus, navigation and content than sound or other building blocks. It is tiring to listen to a sound or spoken voice to get where you want to be.

A balance of the amount of text on a page is equally important. Too little text on a page results in much more page turning and can annoy the learner. On the other hand, too much text on a page is restless, overcrowded and unpleasant. (Vaughan, 1998:186)

2.7.2 Text attributes

- Fonts and Faces

According to Vaughan (1998:182) and Schwier & Misanchuk (1993:239) a group of graphic characters is known as a typeface and the moment they appear in the same size and style, it is known as a font. Font styles include boldface and italic. Underlining and outlining can be added by the software of your computer.

- Print size

When using a substantial amount of text on screen, a small size of font makes sense as long as it is legible. Vaughan stresses that some fonts may actually look to busy in small size (9-point size) and it tires the readers eyes. Opposed to small body text, a larger font for titles and headlines can look elegant and catches the eye to get the specific message across more efficiently.

Schwier & Misanchuk (1993) state that the font size is partly affected by the screen definition and with a higher definition, a small font can be read much easier. They emphasise however, that a smaller font than 12 points should only be used in highly necessary situations.

Misanchuk (1992:128) agrees that a 9-12 point font is suitable for the body text, while anything bigger than that is appropriate for display, which includes headings, titles etc.

Eventually the print size, which looks well on your screen, is of importance. That may well not be the same as for material printed out on paper. Schwier & Misanchuk (1993:240) add that the main issue is that reading must be comfortable and a 14-point text seems to suit most people's preference.

- Type styles

Schwier & Misanchuk (1993:241) found that the use of unusual type styles should be strictly limited and only used when it can serve a specific purpose e.g. technical terminology, titles of books, periodicals and films.

The use of *Italics* merely for emphasis or for foreign words is not accepted. This originates from the fact that research has shown that it appears harder to read on paper and Schwier & Misanchuk (1993:242) adopted this finding to the use on CRT text as well.

Misanchuk (1992:128) adds that a decorative typeface can be used for an eye-catching effect, as long as it is used in very limited amounts, if at all in instructional materials.

Bold type is a good way of emphasising, providing it is used in moderation so that it can still be unusual and effective. (Misanchuk, 1992:242)

- Cases

According to Vaughan (1998:184) a mixture of upper- and lowercase words and sentences are easier to read than all in uppercase. If the lower-case letters have true descenders, the reading is definitely more comfortable. (Isaacs, 1987; Misanchuk 1993)

- Serif and Sans Serif

These terms refer to the type's mechanical and historical properties. It is the easiest way to categorise a typeface. It either has a little flag at the end of a letter stroke (serif) or it does not (sans serif).

According to Vaughan, the use of sans serif is far more attractive and legible on screen than serif font. The opposite is true for the print world. The reason for this assumption is purely because of the difference between the world of standard in computers and of printers. The research has also shown that user preference may include other things than just legibility, but there is enough discrepancy between the findings of print-based and CTR-based text to accept the generalizability of print-based research to CRT-based text. (Schwier & Misanchuck, 1993:241; Garner 1991;Vaughan, 1998:185)

Other authors have found that there is no final finding about the use of either serif or sans serif for better legibility. (Misanchuk, 1992:141; Lang, 1987:167; Tinker, 1963; White, 1983:58)

Serif font is widely recommended by some authors for the body text and sans serif for headings and other special uses. (Misanchuk, 1992:130)

Smaller size sans serif is however more legible than serifs. Thus the reason to believe that sans serif is a better choice for short bodies of text e.g. reference works etc. (Misanchuk, 1992; Collier & Cotton, 1989)

The important aspect in the end is still that typography gives a page a certain personality and an overall feeling.

Text, which is **"pleasant to look at"**, may have positive transfer to learning even if it is minimal in measuring. As long as **"the pleasant to look at"** does not hamper the learning, it would be a good idea to consider the learner's preference. (Misanschuk, 1992:14)

According to Schwier & Misanchuck (1993) there should be no more than two font types used on a single screen display. Style variation may however be applied through using **bold,** *Italics* etc. to create the necessary differentiation.

Suggestions and reasons for a suitable font according to Vaughan (1998) are set out in Table 2.5.

Table 2.7 Suggestions for a suitable font

Suggestion	Reason for suggestion
Small font	Most legible available
Different faces	As few as possible Vary weight and size e.g. italics/bold
Text blocks	Adjust leading for best line spacing
Vary the size of a font	Emphasise the importance of a message
Large size headlines	Adjust the spacing between letters
To make the type stand out	♦ Use different colours ♦ Various backgrounds ♦ Use reverse type
Anti-aliased text	To blend titles and headlines with background
Centered type in a text block	Keep to minimum lines
Drop shadows	Much more legible and greater impact
Headlines	Surround with lots of white space
Pick the right font	♦ The font that works for you ♦ The one which gets your message across

2.7.3 Screen grids

A concept transferred from designing on paper to the design on screen. Although invisible, Schwier & Misanchuck (1993:232) believe that it organises each display and establish certain areas of the screen for certain kinds of information. That is why the orientation, the navigation information, the instructions, the learner responses, the feedback and the error messages, and all other options should always appear in a consistent manner. The main function of the screen grid is to keep the user clearly navigated and without confusion.

2.7.4 Line length

Conflicting advice for print materials as to what the ideal line length should be varies between 35-75 characters. Research however, has shown that readers tend to dislike long as well as to short line lengths.

In computer-based instruction, authorities such as Bork (1984) and Heines (1984) recommend short lines. They also note that a CRT's width doesn't necessarily mean that the line length correspond to the full width.
In general longer lines are preferred to very short lines with 26 characters (Grabinger, 1985). Garner (1991:234) advises lines of 40-60 characters or double columns of 30-35 characters.

Not enough research has been done about this issue and Hannafin and Hooper (1989) state that text is read more efficiently when presented in a dense manner.

2.7.5 Colour combinations

Schwier & Misanchuk (1993:244) found that it is not safe to assume that colours are seen the same by all users of a CBI program, while users are exposed to a wide variety of colour representations on different colour monitors. It is thus better to go without colour unless there is a good reason to use colour.

Research up to 1991 concluded that all colours are superior to monochrome materials for emphasis and cueing. (Schwier & Misanchuk, 1993; Berry, 1991)

Colour should not become over-used and confuse learners instead of cueing them. (Glynn, Britton & Tillman, 1985; Schwier & Misanchuk, 1993)

To conclude, Schwier & Misanchuk (1993:244) state that the attractive colour display is due to the reduction of saturation (intensity) and the restriction of the number of colours (hues) used. Thus the use of pastels can be friendlier to the eye than the default colours provided. Using the same basic colour in different shades can also result in attractive colour displays.

Shneiderman (1998:398) adds that colour has powerful attractions and it is wise to keep to a set of guide lines to create a effective interface:

- Use colour conservatively.
- Limit the number of colour.
- Recognise the power of colour as coding technique.

- See that colour coding needs minimal user effort.

With a background texture and/or colour, Wilson (1996) assures that an attention-grabbing effect will be enhanced. Plain gray is the entry-level colour scheme and all browsers can display it but advisable. With the right code the background can easily be changed to any colour and the text can then be the contrasting colour.
Textured and coloured backgrounds are a common use on the web nowadays. It can however make the site pretty and something special when applied correctly. As soon as it affects the readability of the text, it should be excluded and plain white can be a better option.
(Wilson, 1996).

2.7.6 Images, graphics and animation

Research by Schwier & Misanchuk (1993:246) has indicated that graphics can add substantially to learning from text. Schwier & Misanchuk stress the fact that the graphic must still support the message of the text. Graphics used for the mere reason of decoration only distracts the learner's attention from the communication.

Hannafin and Hooper (1989:157) are of the opinion that the use of graphics should be avoided unless high redundancy exists between the information

Graphic elements like lines, icons and boxes should only be used to organise text presentation, (Schwier & Misanchuk, 1993:247).

Phillips (1997:107) states that the content and the look and feel of the web site should co-ordinate. This implicates that specific ideas should be consistent, e.g. colours scheme, the style of illustrations and the ideas for animation. The **"index"** or **"home page"** needs a graphic to look inviting. Think about it as the sign over your storefront that beckons your customer inside. Wilson (1996) is of the opinion that no graphics, is the easy way out but definitely to dull. When applying clip art, he stresses that one must make sure that the images used are copyright free and then convert it to a GIF image because of the smaller size compared to JPEG.

JPEG compresses better and thus more suitable for photograph graphics and it has a shorter loading time.

Wilson (1996) advises to utilize a scanned-in graphic when the logo is already available. Even this should then be converted to a GIF image. GIF works best when used with other images created in a graphics program.

Tips for successful graphics:

- Try to keep your images under 40K, or your customer may lose interest.
- Not all your viewers have 256-color capability, but only 16 colours. Test the graphics with 16 colours.
- The best combination is a single sparkling graphic combined with text.
- The overall look of your **"home page"** needs to be graphically balanced, pleasing, informative.
- The **"index"** or **"home page"** needs to entice the customer in the door to look at the rest of what you have to offer.

Sachs and Stair (1997:25) state that it is better to use GIF images because all graphic browsers can read them.

According to Wilson (1996) a small graphic at the top of each page helps to unify the web pages. It is also acceptable to use a smaller version of the main **"index page"** graphic.

Wilson (1996) and Sachs & Stair (1997:27), suggest that thumbnail images are a useful application to test the interest of the reader. The image size is a relevant information and the reader can decide whether he wants to open the image or not.

2.7.7 Buttons

As these represent areas on the screen, which should constitute a response and cause a certain action when clicked upon with the mouse, it is important that these buttons work effectively. The placement of the buttons needs careful planning. (Schwier & Misanchuk, 1993: 253)

Bullets are available as an HTML option to set of lists. Coloured balls arrows and pointers can be applied, but it should be used appropriately. (Wilson 1996)

2.8 Summary of Review

The review is focussed on the use of the computer as a communication tool. The researcher differentiates between communication with students, lecturers, and other design principles. The different facilities available through the Internet and the World Wide Web are discussed e.g. e-mail, a bulletin board and a listserv.

The collection of information from all over the world is made possible through the rapid development of technology. This thought brings the researcher to the issue of the WWW, the relevant search tools for specific information searches and the aspects related to the Internet.

All of the above aspects are considered in the development of the web site. Relevant building blocks and the applicable design principles should lead to an effective product. The final product should therefore accommodate all the needs of the target population, ensure a safe learning environment and add value to the educational institution.

Chapter 3

Design, Development and Implementation

Chapter 3

Design, Development and Implementation

3.1 Introduction

This chapter describes the design, development and the production of the multimedia program. The different phases in the development process will be described. A model by Alessi and Trollip (1991:245) was used as guide line for this study.

The importance of the different stages in the development of a program are accentuated by the following quotations:

"The design step is critical to the effectiveness of the lesson."
(Alessi & Trollip, 1991:293)

"Far less important than the number of steps involved in creating CBT is the realisation that there are discrete steps at all"
(Gery, 1988:88)

"It guides the designer to systematically plan, develop, implement and evaluate the attainment of intended learning outcomes by learners."
(Floura, 1989:20)

The stages in the development of the program were categorized in analysis, design, development and production. (Reeves, 1997) All the activities conducted during these phases are set out in Table 3.1.

Table 3.1 Stages in the development process of the program

Stages and Activities	Output
Analysis	
Conduct analysis	
♦ Goal	• Effective learning and communication for students and lecturers.
♦ Target group	• Students in different year groups • Lecturers
♦ Content	• Supplied by client
♦ Project	• Project plan/structure • Develop the site
♦ Media	• Text, hypertext, graphics, animation
Design	
♦ Objectives/outcomes	• Design the proper tools for effective communication • Screens that will gain attention and stimulate learning through the use of colour, style of the layout, use of graphics and animation.
♦ Delivery system	• WWW (Web) • CD-ROM will be a hand out at the Program in Interior Design.
♦ Sequencing of content	• Primary and secondary content. • General and specific content. • Site map that will include all possible navigation.
♦ Design specifications	• These specifications are discussed in the Literature Review. • Individual screens discussed with regard to specifications mentioned. • Statistically designed questionnaires for students and lecturers.
♦ Design evaluation instrument	• Questionnaire (convenience sampling) without statistic data.
Development	
♦ Authoring tool	• *Dreamweaver Vs Front Page*
♦ Planning/ Storyboarding	• Paper
♦ Prototype	• 1.44/ Stiffy • CD and WWW
♦ Formative evaluation (Phase 1 - 4)	• User comments. • Suggestions from the client. • Expert advice. • Adapting prototype
Production	
♦ Multimedia product on computer in *Dreamweaver*	• Web site available on different URL's. • Available on Stiffy and CD • Ready for evaluation.

3.2 Stage 1: Analysis

The analysis stage describes the **purpose, limitations, methods, instruments** and **samples** used for the research.

A guide for the analysis was taken from an analysis report template of Reeves (1994) and the stages are described in detail throughout the chapter. To conclude this stage, **results** from the analysis are provided.

The **result of the needs analysis** provided the opportunity to develop an Internet-based information resource to assist students and other involved individuals to ensure effective communication and learning.

3.2.1 Purpose

According to Reeves (1997) the purpose of a needs assessment analysis is to confirm the existence of needs or clarify the nature of needs that others have perceived. Reeves believes that an **Analysis Report** will ensure a clear, readable, and concise presentation of the results of the analysis activities.
Table 3.2 summarizes the different analysis and the purpose of each analysis.

Table 3.2 Purpose of the Analysis stage

Analysis	Purpose of each analysis
Goal analysis	• To describe effective information gaining (learning) through an Internet based information resource. • To describe the communication of students with other students and students with lecturers through convenient and comfortable channels.
Target population analysis	• To clarify the demographic situation of the students. • To specify the needs of the students in terms of information and communication. • To identify their level of computer skills. • To determine their average age, their gender and language preference.
Content analysis	• The client provides all the content. • To present the content in an effective manner in order to promote the use of the program.
Project analysis	• To ensure that the project is easily accessible. • To make sure that the content is relevant and functional. • To provide the needed communication channels.
Media analysis	• To select the best combination of graphics, text, hypertext and movement to enhance the specific site. • To ensure that the media elements applied to the site serve the relevant purpose.

3.2.2 Limitations

The fact that the project dealt with a Department with limited students; the number of **questionnaires** successfully completed, was a limitation. At the time of handing out the questionnaires the majority of students and lecturers were away on a seminar/conference for a period of ten days. That affected the way in which the researcher planned to administer the procedure. Control over the people involved was minimal and there was no assurance that all the questions were fully understood and interpreted correctly.

Concerning the **Focus groups**, the different Departments in the design field e.g. Architecture, Landscape Architecture and Interior Design, resorting under the School of the Built Environment, had a different perspective of the project as a whole.

3.3 Analysis methods

The researcher made use of methodological triangulation. This method implicates the use of more than one analysis instrument, which is indicated in Table 3.3 and described thereafter.

Table 3.3 Data collection methods during the analysis phase.

	Interview	Research Diary	Questionnaire	Focus Group	Literature Review
Goal analysis	✓	✓	✓		
Target analysis		✓	✓		✓
Task analysis				✓	✓
Content analysis			✓		✓
Project analysis	✓				

- **Interview**

Interviews were held with the Head of the Program, also lecturer in the Program in Interior Design, in an informal manner. He informed the researcher about the possible target population and supplied more specific details about the student audience to whom the project would provide essential information regarding their studies.

Interviews with students on the **Open day** of the University of Pretoria informed the researcher about the need concerning the content of the project and general background information about the target population.

- **Research Diary**

During the analysis phase a research diary was kept to follow the changes which affected the development of the project. The client made changes to the overall 'look and feel' of the web site. The client corresponded with the researcher via e-mail to provide essential information regarding the content of the site. The need for specific tools, which could promote learning and communication, was also specifically mentioned.

- **Questionnaires**

The **first** questionnaire was handed out at the **Open day** of the University of Pretoria. This questionnaire consisted of general questions divided into 5 categories with yes/no options and open-ended questions to establish their general background and status of computer literacy.
(See Appendix A)

The **second** questionnaire was more structured. Questions in 5 sections were formulated in multiple choice options to gain specific information regarding the target population. Questions with a value of 1-5 presenting most frequent to least frequent were supplied to obtain richer data concerning their learning needs and communication means.
(See Appendix B)

A **third** questionnaire was aimed at the evaluation of the web site after development. This questionnaire was statistically compiled and divided into different categories (layout, navigation, content, communication and support)
(See Appendix C)

A **fourth** questionnaire was compiled as a compressed version of the third questionnaire for the experts and was send by electronic mail to the individual experts. Ample blank space was made available for comments and suggestions. These comments will be added to the findings in Chapter 4 and it added valuable information about the success and shortcomings of the program.
(See Appendix D)

- **Focus Groups**

The researcher attended an official meeting where the different Departments of the School of the Built Environment were present. The prototype was discussed in terms of the general layout and structure.

- **Literature Review**

In-depth literature study was done to motivate the relevant design principles for a workable and functional prototype for this specific purpose. Recent articles published on aspects of an Internet-based information resource as well as relevant URL's were listed as references in the literature survey

3.4 Sampling

- **Students** (undergraduates and postgraduates)

20 Potential students attending the Open day completed the **first** questionnaire. 25 Students in different year groups enrolled in the School of the Built Environment completed the **second** questionnaire. These students also completed the **third** questionnaire after evaluating the web site in class.

Informal interviews developed between the researcher and students mentioned above on the Open day.

- **Lecturers**

Telephonic communication and informal meetings with Head of the Program (client) established the content of the prototype. Lecturers involved in the Program in Interior Design completed the **third** questionnaire after assessment of the site.

- **Professionals/Individuals**

Different interested individuals completed the **second** questionnaire to establish their interest in the design field.

Experts in the Information Technology environment, Design Industry and in the educational environment filled out the **fourth** questionnaire.

A group enrolled for a two-year course in Computer-Based Training, participated in the completion of the **fourth** questionnaire.

3.5 Results

3.5.1 Goal analysis

The results of the goal analysis were gathered by the second questionnaire. The two main questions regarding the goal are:

- How can this web site promote effective learning?
- In what way will the Internet based information resource (web site) stimulate the communication possibilities between students and fellow students, and between students and lecturers?

The results of issues concerning the above questions from the **first** and **second** questionnaires were calculated and reveal the following situation as shown in Figure 3.1 and Figure 3.2.

Figure 3.1 Profile of the potential students in terms of computer skills [⌖]

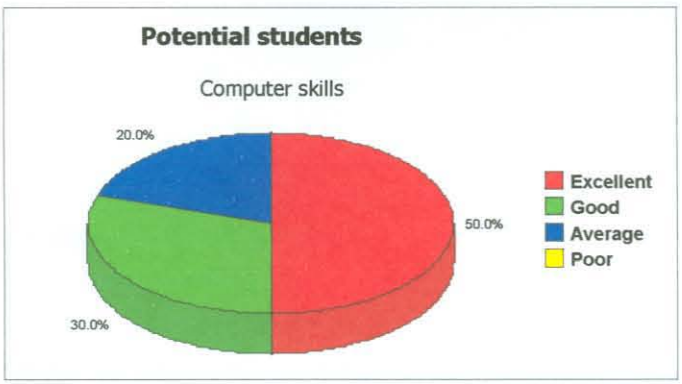
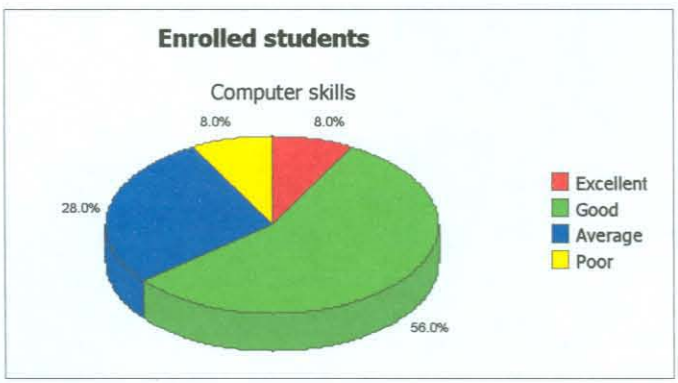


Figure 3.2 Profile of the enrolled students in terms of computer skills [⌖]



In order to promote learning through use of the computer and the Internet (web site), the level of computer skills of the target population is an important factor. According to Figure 3.1.and Figure 3.2 it is clear that computer skills of both groups are above average. The outcome reveals that all the students are able to use the computer for general and/ or specific purposes.

Figure 3.3 and Figure 3.4 reveal the accessibility and need of students for a web site as planned.

Figure 3.3 Computer access, Internet connection and need for a web site (Potential students)

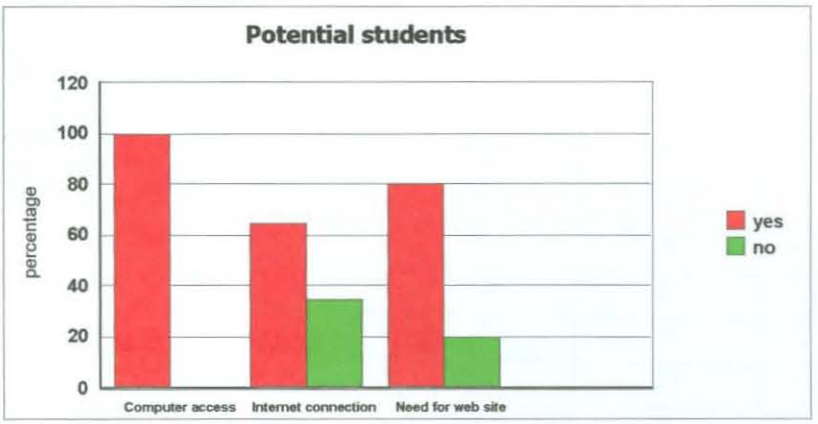
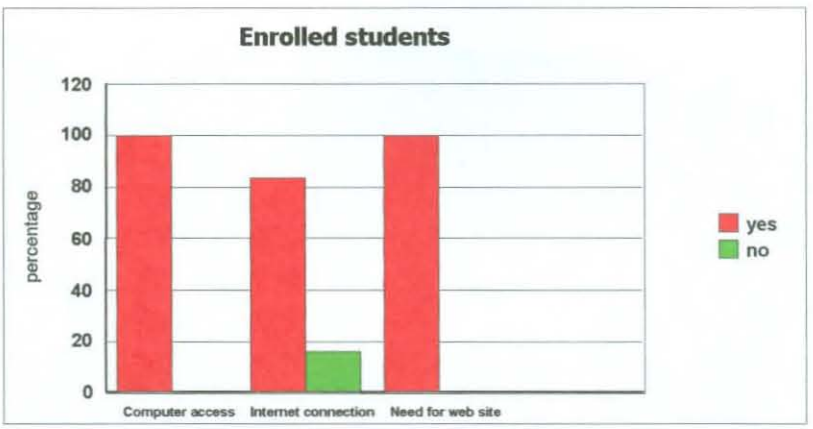


Figure 3.4 Computer access, Internet connection and the need for a web site (Enrolled students)



The goal analysis thus shows that the students (target population) have a need for the planned program and the majority of students are in reach of utilizing such program in terms of their skills and facilities.

3.5.2 Target group analysis

Through convenience sampling, 20 enrolled students and 15 potential students participated in questionnaires to establish the characteristics of the target audience and provide information about their general need and computer skills.

A comparison was made between the two groups with regard to general background information, language abilities and computer literacy. The results of the comparison are set out in Table 3.4.

Table 3.4 Results of the target population analysis with regard to the general information. [⌖]

	Variables	Potential students (20)	Enrolled students (25)	% ▲
Age	Under 18	15	0	
	Above 18	5	25	
Gender	Male	9	5	25%
	Female	11	20	25%
Language preference	Afrikaans	10	15	10%
	English	7	10	5%
	Sepedi	1	0	5%
	German	2	0	10%
	Other	0	0	
Read and write English	Yes	20	25	0%
	No	0	0	
Demographics	Gauteng	14	18	2%
	North West	3	4	1%
	Namibia	1	0	5%
	Northern province	0	1	4%
	Mpumalanga	0	1	4%
	Free State	2	0	10%
	Other	0	1	4%
Computer skills	Excellent	10	2	42%
	Good	6	14	26%
	Average	4	7	8%
	Poor	0	2	8%
Computer access	Yes	20	25	0%
	No	0	0	
Internet connection	Yes	13	21	19%
	No	7	4	8%
Need for a web site	Yes	18	25	20%
	No	2	0	10%

The profile of the target population displayed in Table 3.4 is interpreted in Figure 3.5 as follows:

Figure 3.5 A comparison between the enrolled students and the potential students

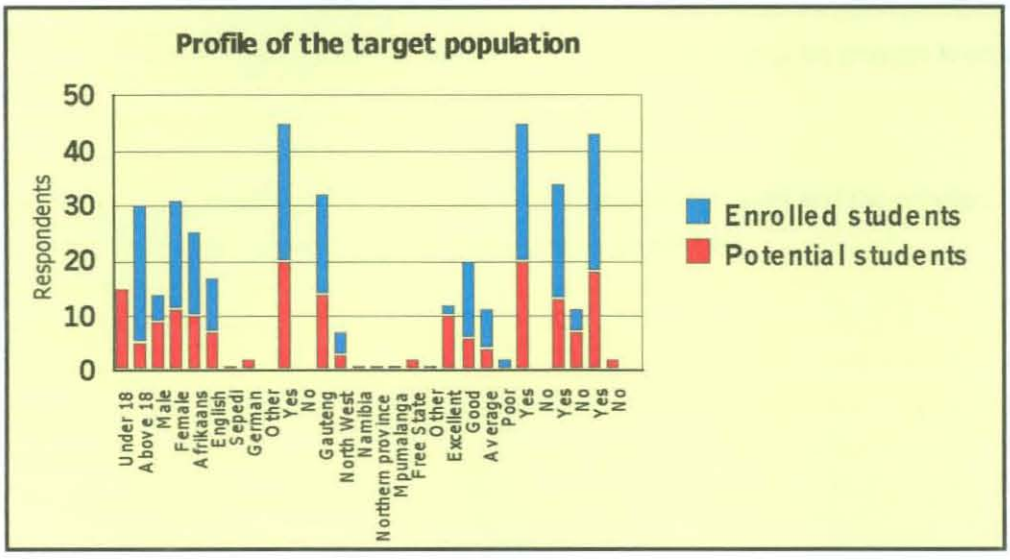


Figure 3.5 reveals that the majority is Afrikaans-speaking females. All the students can read and write English (100%).

Of the total number of students, 70% are situated in Gauteng.

Computer skills of the potential students are 80% good and above, whereas the enrolled students rated their skills as 64% good and above. The difference of the results between the two groups could be imputed to the fact that the younger generation are more exposed to the use of computers.

All the students have access to computers and 84% of the enrolled students have Internet connection. Only 65% of the potential students have Internet connection. The researcher assumes that it could be due to the fact that most of them are still living with their parents who are not in desperate need of the Internet

All the respondents revealed an interest in a web site for the Program in Interior Design.

To identify the need for a communication facility for the students and lecturers, the following results were gathered from Questionnaire 1 and 2. These results are set out in Table 3.5.

Table 3.5 Results from the target analysis regarding communication issues [↟]

Issues	Response from enrolled students	Response from potential students	% ▲
Internet used for :			
• General information seeking	48%	70%	22%
• Specific information seeking (research)	84%	79%	5%
• Communication	48%	60%	12%
• surfing	52%	58%	6%
Obtain information on a specific subject by:			
• search engine	84%	63%	19%
• time-consuming effort	50%	25%	25%
• trial and error	60%	40%	20%
• specific address	88%	80%	8%
A web site will be beneficial for:			
• advertising	96%	No data	
• communication	88%	No data	
• access to information regarding this site	88%	No data	
• learning and participation internationally	60%	No data	
A communication facility on the web site of the Program in Interior Design will create an effective channel of interaction for all parties involved			
• Yes	100%	80%	20%
• No	0%	20%	20%

The results in Table 3.5 indicate that the target population needs communication facilities for different reasons. The fact however remains that a general communication channel is almost essential.

Figures 3.6 to 3.8 indicate a comparison between the potential students and the enrolled students regarding the difference in need for communication and information.

Figure 3.6 **A comparison between the communication needs of the enrolled students and the potential students.**

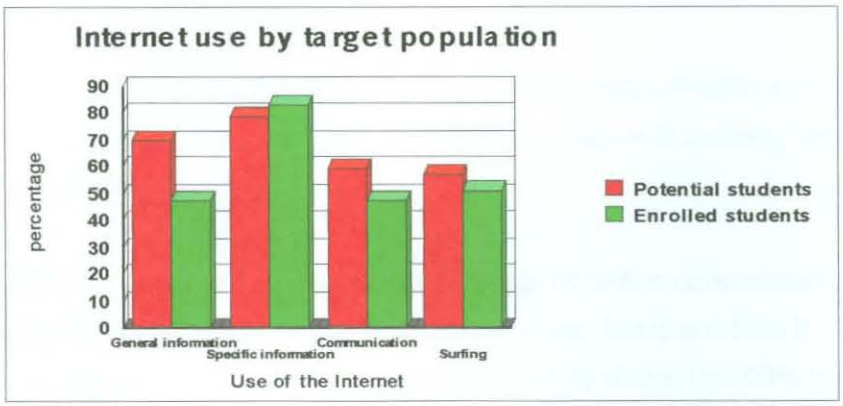


Figure 3.7 **Ways of searching for information on the Internet by the target population**

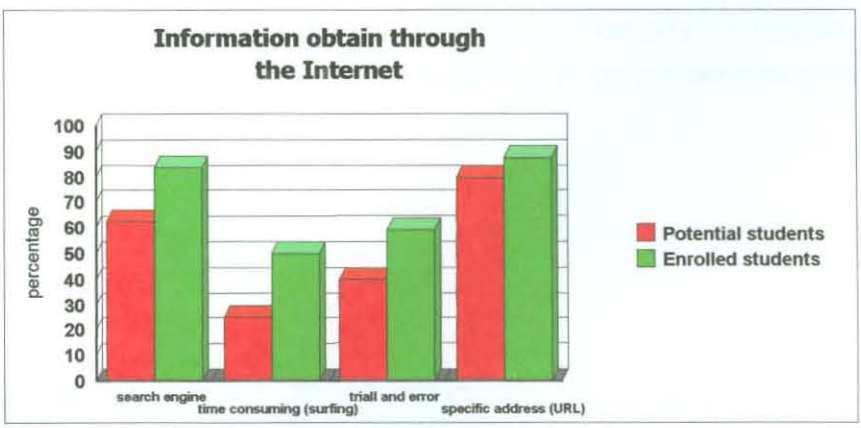
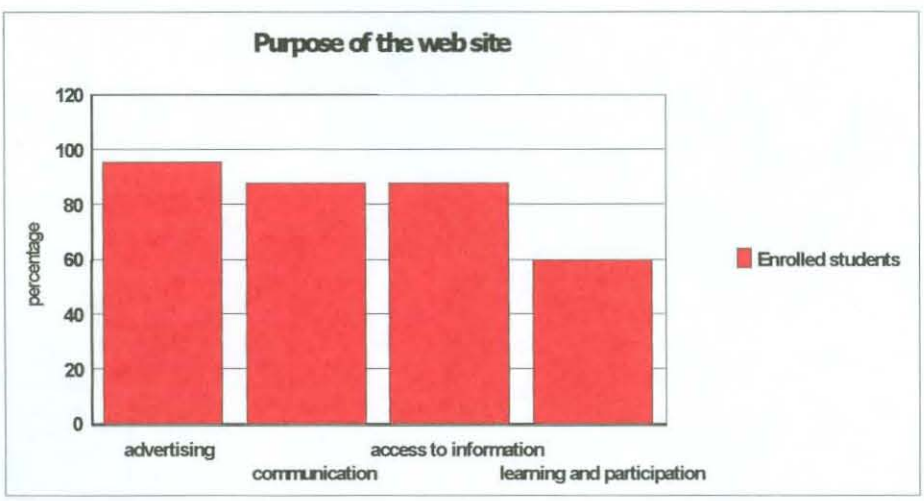


Figure 3.8 **Purpose of the web site**



3.5.3 Content analysis

Bearing in mind that the client provided all content, not much analyzing was done in terms of the information included in the program. The presentation of the information however, was dictated by the design principles relevant to an educational web site. Design principles are discussed in Chapter 2 (Literature Review) but the principles relevant to this specific site will be discussed in the design stage.

Essential content e.g. student work, projects done by the Future Trends Laboratory and other learning material which was initially decided upon, was not included in the prototype at this stage, due to circumstances.

The incorporation of the communication channels (bulletin board, Listserve, e-mail) which form part of the content will be added by the webmaster of the University in order to keep to the prescribed structure and requirements.

Needs and general requests from the students and lecturers concerning the current content were revealed by the **second questionnaire.**

3.5.4 Media analysis

The combination of media elements applied in the program is very important and the success of the web site is greatly dependent upon this matter.

By creating multimedia, a combination of text, graphics, high quality sound, animation and video, delivered by computer or any other electronic means, is presented. (Lappas & Kekkeris, 1996:1; Stratfold & Laurillard, 1993:488; Coetzee, 2000:64).

According to Bass (1997:5) and Coetzee (2000:67) only an average of 10% is remembered of what is read, 20% of what is heard, 30% of visuals related to what was heard and 50% if watching someone do something while explaining it. Bass concludes by stating that 90% is remembered when a person is involved in a job it self, even if only as a simulation.

Bearing in mind that the main purpose of the web site is that of learning and communication, the chosen media should fulfil the function of promoting these two objectives. Using Gagne's nine events of instruction (cited in Reeves, 1997), and Bloom's Cognitive Taxonomy for cognitive learning outcomes, the following media elements appropriate for the web site are summarized in Table 3.6.

Table 3.6 Media elements applied to promote learning and communication

Media element	Gagne's nine events	Bloom's Taxonomy
Graphics/Animation	Gaining attention	
Text	Informing learner of objective	Comprehension (2)
Hypertext	Stimulating recall of prior learning	Knowledge (1)
Video/Sound	Presenting stimuli with distinctive features	Analysis (4)
Text/Hypertext	Eliciting performance	Application (3)
Text	Providing assessing feedback	Evaluation (6)
Hypertext	Enhancing retention and learning transfer	Synthesis (5)
Sound/Movie	Stimulating change	
Graphics/Text/Animation	Appealing to the learner's interest	

Media is incorporated in the following ways throughout the web site:

- **Text**: A great amount of text is used in order to convey information to the new and interested students. Course content will be added relevant to the different levels of study. The text is in black for easy readability and in a popular and effective typeface (Arial). Using a bigger fontface with style difference as headings creates the necessary accent. For the main headings, a different font is used with colours to identify the sections.

- **Hypertext**: The text on the navigation bar is linked to the appropriate pages. This is known as internal links and part of hypertext. Named anchors are used to move directly to certain places on a page within the program. This makes it easier for the user to get to specific content more speedily. From the navigation bar which is visible on each page of the web site to specific text on a page is possible with hypertext.

  External links will be used on the **"Useful Links"** page to connect users to another site for relevant information. This function helps the user to reach important text (content) from a central starting point.

  Contact with other professional and academic institutions are also done with hypertext.

- **Graphics:** Keeping in mind that this web site is informational as well as design orientated, graphics are an integral part of the site. Suitable graphics are used to demonstrate student work but also for aesthetic purposes. Most of the graphics were provided with the content, while others were chosen to suit the Interior Design Industry.

Three-dimensional graphics will most probably be incorporated later as more student work will be displayed.

- **Animation:** Initially the researcher and developer added a little animation to the home page. Subsequently the home page changed and with a new classical "look" to the home page the animation was not suitable.
  It is actually still a possibility to add animation to the **"What's on"** page to attract attention and advertise events and announcements.

Through the **third questionnaire** the media elements applied to the web site are evaluated and the need for other media such as animation, movement and sound will be determined.
(See Appendix C)

Questions from the questionnaire that address the different media elements, are:

Q 1 Appearance of web site and overall "look" - **combination of media**
Q 2 Readability on the pages - **Text**
Q 5 Choice of fonts - **Text**
Q 6 Layout of site map - **Hypertext (Internal links)**
Q 11 The link page will attract more visitors - **Hypertext (External links)**
Q 14 The way in which the content is presented gain the attention of the visitor - **combination of media**
Q 15 The choice of graphics - **Graphics**

Refer to Chapter 2 (Literature Review) for detailed description of all the media elements used in the program.

3.6 Stage 2: Design

The importance of design is "to identify and document the best means of achieving the desired results" (Hannafin & Peck, 1988). According to Allesi and Trollip (1991:293) the design phase is essential to assure the effectiveness of a program. The elimination of ideas concerning the content and methodologies takes place during this phase. All reviewers should be satisfied with the project when the design phase is completed. The design phase is the answer to the needs analysis, where the design objectives should be met and motivated.

The objectives were met by making use of different design strategies. The client suggested the overall look, the sections of content and provided the graphics. Other matters, which were taken into consideration during the design phase, are set out in Table 3.7.

Table 3.7 Matters taken into consideration during the design stage.

The theme (metaphor)	A trendy 'look and feel' to represent a Design Industry and to draw the attention of users.
The content	The general information is given first with more specific detail about course material etc. to follow. It was decided in advance to present the content in a priority of primary and then secondary importance.
The sections (Matters)	The information was divided into logical sections : Background / Educational Matters / Future Trends / Workshops / Links / Contact Details
Icons and navigation	The graphic representing the Program in Interior Design developed into a metaphor, appearing on each page. The home page icon (ID) was taken from the original image.
Communication facilities	The need for specific communication and learning facilities were agreed upon: Bulletin Board, Listserve, E-mail
External links	A "Useful links page" with links to a variety of design related industries is incorporated hoping to promote the return of visitors.

The design objectives and the way in which they will be met, can be summarized as follows in Table 3.8:

Table 3.8 Design objectives

Objectives	How will objectives be met?
Promote **effective learning** in general and specific	• Relevant information for students. • Content well indicated and outlined in the site map. • Use of fashionable colours to attract the attention of the students. • Present the content in manageable chunks.
Develop comfortable and **efficient communication** channels for students and lecturers.	• Introduce e-mail for convenient individual communication. • The incorporation of a bulletin board for general announcements and appointments. • The availability of a Listserve for problem-solving and interclass discussions.

3.7 Designing for a specific delivery system

According to Bates (1995:2) and Le Page (1999:31), the choice of a suitable vessel is essential for the success of an undertaking. That is why it is important to ensure that the majority of your target population including "users" with old browsers should be able to enter a web site.

Students involved in the Program in Interior Design at the University of Pretoria will be the primary users of this web site. From information gathered through the analysis of the target population, it was clear that the majority of the potential students and the enrolled students have access to the WWW through the Internet. The communication channels incorporated in the site are also dependent on Internet connection. Therefore the decision was made to use the WWW as the delivery system.

Because the web site provides general information e.g. the requirements for enrollment, course layout, and background of the Program and administrative matters, the client in conjunction with the researchers decided to provide the site on CD. This would inform potential students and their parents about the Program in Interior Design. Another reason for providing it on a compact disc (CD) is to inform related industries about the courses and projects presented by the Program in Interior Design.

Barriers restricting the use of the Internet and the World Wide Web are a concern when planning the development of a web site. In the environment in which this site is planned, technical restrictions, which should be taken into consideration, are:

- Old hardware, including modems and incapable CPU's that can not support modern graphical browsers needed for successful surfing. (Maddux, 1998:24)
- Limited bandwidth and large file sizes, which affect the downloadtime. (Remmers, 1998:17)

With the target population being involved in interior design and related industries the researcher assumes that they should be in possession of the required hardware and appropriate bandwidth.

3.8 Sequencing of content

"Proper sequencing of instructional objectives and teaching points is essential as it can have a significant impact on the efficiency and effectiveness of the learning situation."
(Van Dyk et al cited by Hodgkinson & Cronje ,1999:29)

It is essential that the content be mapped out in order to create a logical flow to the structure as a whole. For this purpose it is wise to create a navigation map (site map) and preferably display it up front as a second screen. The user who visits the site for the first time will be able to relate to links and connections made between the different sections.

According to Hodgkinson & Cronje (1999: 29), different approaches can be followed to sequence a learning experience. The content can either be in order from general to specific or vice versa. It can also be sequenced from concrete to abstract or from known to unknown.

During the design of the program these guidelines were followed and the content is sequenced accordingly. Table 3.9 indicates the sequencing of content in the program:

Table 3.9 Sequencing of the content

Topic/Sub-topic	Sequencing
Site map	Colour identification All the main topics with sub topics
Background	General to specific
Education	General to specific Information for all students Information for the different study levels Study material and content
Workshops	General to specific Student work Contributions from individuals
Future Trends Laboratory	Known - unknown
Professional links	Only Specific information and links to academic and Design institutions
Useful links	General information and links
Contact Details	Specific information to all interested users

3.9 Design Specifications

Specifications concerning the design of a multimedia program were discussed in the literature review (Chapter 2). According to Adendorff (2000), computer-assisted learning delivers no better results than traditional methods, only because the program 'was poorly designed'. This is enough reason to realize the importance of a thorough design process.

Appropriate design elements were implemented in this program and is set out in Table 3.10 (text) and Table 3.11 (graphics, white space, colour)

Table 3.10 Design specifications regarding text as implemented in the program for effective learning and communication.

Design specifications	Implementation in program
Text attributes	
Type face	Comic Sans is used for the main headings and the navigation. Content is written in Arial. Both typefaces are Sans Serif and the readability is good.
Size	Heading 1 is written in a 16 pt, the sub-headings are written in 14 pts. and the body text is written in 12 pts. These sizes accommodate the readers as well as the printing. Table content is in a 8 pt.format. The reason for this is so that the tables appear more compact and streamlined.
Colour	Black text. It is best readable and complements the background colour of the pages.
Type styles	The main headings are **bold** to indicate importance. Other important keywords in the body are also in bold to emphasize the words. Underline is only used to identify links.
Justification	Body text is left justified. Recommended in the literature.
Case	A combination of upper and lower case. Best suitable for easy reading.
Icons/ Symbols	An arrow is used to indicate that a next page of the same subject follows. A variety of symbols and logos on the **'Useful Link'** page refer to external URL's. All these icons and symbols are eye-catching and the colours create an exciting look.
Buttons	The logo (image) of the Program represents the home button. This image button relates to the rest of the theme set by the Program. Text buttons are used on the navigation bar for easy and clear access to the different subjects. Text buttons are also used for the sub-navigation appearing just below the main headings on each page.
Animating text	This is still not incorporated but will be in the form of a banner on the **'What's on'** page to attract the attention of the user and advertise the current events. For this purpose it will have to be changed and updated regularly.
Layout of text	Scrolling of text was kept to a minimum. According to the literature, the ideal is not more than 2 screens at a time. Scrolling to left and right was avoided. Blank lines divided text into paragraphs and an image called "leaf scroll" also divided the text into separate thoughts. It appeared at the end of each page to indicate the closure. The central 10cm were used for text with enough white space on either side to display the text clearly.

Table 3.11 Design specifications regarding graphics, white space and colour

Design specifications	Implementation in program
Graphics and Images	Graphics used in the different sections were provided by the client and represents work by students and other design related parties. Therefor the graphics fit in with the general theme and look of an Interior environment. The Development team created the image appearing on the Home page. It was the original logo image, faded out to blend into a background taken from the dominant colour in the image. This created an uncluttered, flimsy feel to the site. Most of the graphics and images have alternative text to accommodate a text-only browser.
White space	There is not too much information on a page and effective communication can take place. The white space on the left and right side as well as in between text illustrates the relationships and separate ideas. Chunking is created through the application of white space. The well-planned white space enhances balance in the site.
Colour	All colours used in the web site are web safe, meaning that it should not change on other browsers used to view the WWW. All colours were derived from the image representing the Program in Interior Design. From the above, the background colour of all pages was set on a sand colour. The client provided a palette of desired colours in earthy shades and that was adapted to the nearest web safe equivalent to represent the different sections/ subjects. The user could identify the different subjects/sections with a colour throughout the site. Text is all in black to complement the background colour and is easy readable. The navigation is on a dark green background and the same on all pages to avoid confusion. It is clearly visible.

3.10 Screen design principles

Table 3.12 indicates the different screen design principles and the way in which they are applied to the program.

Table 3.12 Screen design principles applied to the program

Screen design principles	Implementation in Program
Consistency	Main headings were always the same size and placed in the same spot. Caps are always used in the same way. Navigation throughout the same. The top structure on all pages is the same with exception of colour.
Simplicity	Only 2 typefaces are used (Arial and Comic sans). The layout is in a single column format. The content is understandable for the target population.
Clarity	The use of colour in the web site identifies the different sections. The navigation is clear and easy to follow. Bulleted lists where applicable.
Aesthetic considerations:	
Balance	An asymmetrical balance creates an informal feel by the uneven top structure. Elements of differing shapes and sizes are added to ensure a stable unity.
Harmony	Graphics, colour and text are applied in a consistent manner and harmony prevails throughout the site.

Figure 3.9 and Figure 3.10 are examples of screen design principles applied to this program:

Figure 3.9 An example of consistency [⌖]

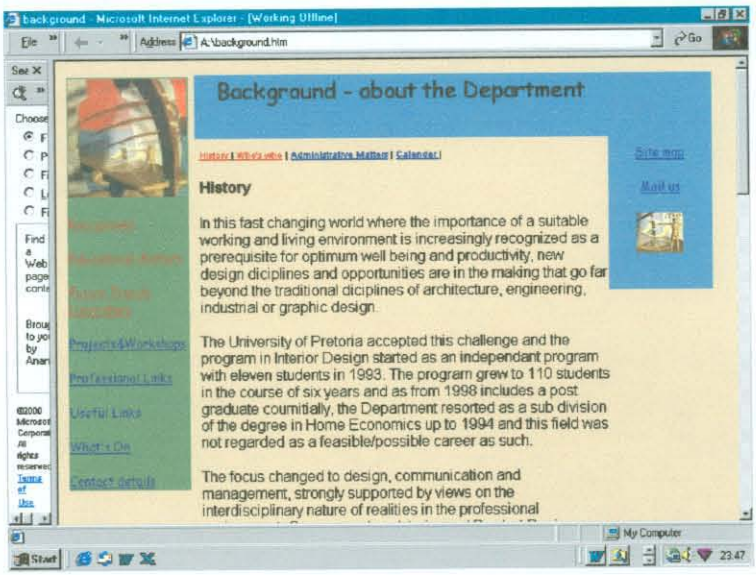


Figure 3.10 An example of simplicity [♦]

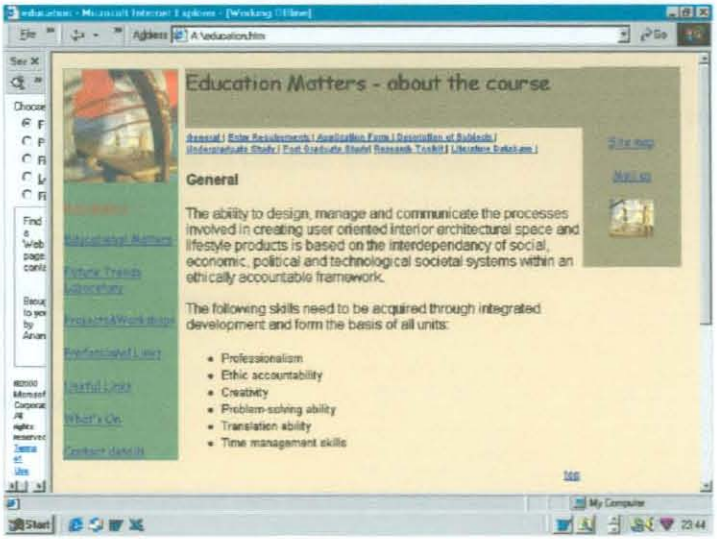


Table 3.13 and Table 3.14 were compiled to indicate where the design principles derived from and the application of the specifications in the web site. The first table describes it from the client's point of view and the second table indicates the composition of the site with regards to the relevant design specifications.

Table 3.13 Derivation of design specifications

Target group characteristics	Exposure	Accessibility	Hypertext	Mod/classic look	Sections	Communication	Mail facility	Movement	Colors	Layout of text	What's on	Graphics	Corporate logo	Delivery system	Site map	**Design implications**
Age 17-24				✓				✓	✓							Funky colours/ animation
Artistic flair				✓												Symmetric/ Asymmetric
Logical					✓										✓	Clear structure/
Computer access		✓														Use web
Need information	✓					✓					✓					Easy contact/ Eye catching
Research			✓													Exposed to content
Internet knowledge														✓		WWW
3-Dimentional								✓				✓				Visual animated
Creative				✓						✓						Text centered
Assessment						✓	✓									Contact / student-lecturer
Inquisitive			✓													Use URL's for info
Academic content					✓						✓		✓			Metaphor/Clear/ Understandable
Geographical						✓	✓									Promote learning

Table 3.14 Derivation of the design specifications regarding composition of the site

Design implications	Home page	Menu bars	Page layout	Sections	Font	Symbols	Navigation	Link page	URL's	Headings	Projects	Specifications
Understandable/ Clear			✓	✓								Clarity
Corporate logo	✓											Buttons/ Icons
Eye catching						✓		✓				Animating text
Trendy colour		✓								✓		Balance
Symmetric/ Asymmetric			✓									Consistency
Chunking				✓								Simplicity
WWW/Links								✓	✓			type face
Content				✓	✓							White space/ Simplicity
Visual impact											✓	Animation

3.11 Evaluation instruments

The evaluation instruments were designed to establish the target population for the program in the first instance, and secondly to determine the success of the design and workability of the program through a questionnaire. This questionnaire was designed to produce rich data regarding a variety of relationships and variables within the target group. More detail about the evaluation instruments and procedures can be found in Chapter 4, while the results of these questionnaires will be discussed in Chapter 5 (Findings).

3.12 Stage 3: Development

3.12.1 Introduction

The development of the prototype was initially experimental. The client provided a variety of elements, which the researcher experimented with, to end up with a "look and feel" to suit the different parties. No hard and fast rules were laid down at this stage.

3.12.2 Authoring Tool

The developers had no knowledge of HTML and therefore decided on an authoring tool, *Front Page*, produced by *Microsoft*. While the developers are familiar with other *Microsoft* programs, it appeared to be the most appropriate choice.

A change of plans occurred after the first stage and instead of *Front Page*, the developers decided to experiment with *Dreamweaver,* which is a Macromedia program. This decision was brought about by fellow students, purely for the fact that one can place images or text in layers, which can be moved around at any time and to any spot on the page.

According to an article published in a computer magazine,"Macromedia designed it so you can extend it yourself." (Hodge, 2000)

Dreamweaver pre-empted the confusion between *Netscape* and *Windows Explorer* of what DHTML is. This was the first mainstream drag-and-drop-authoring tool to include support for DHTML through JavaScript. *Dreamweaver* allows you to build interactivity into pages that will run happily on either browser without learning a single line of code. (Hodge, 2000)

This authoring tool is a professional visual design solution for creating Web sites. The use of this tool enhances team efficiency and promotes users to automate production. It is possible to integrate *Dreamweaver* with other Web applications such as *Microsoft Office. Dreamweaver* can be customized using HTML, JavaScript and XML for advanced Web site building.

A very important feature of *Dreamweaver* is the fact that it can design and manage cross-browser Web sites without sacrificing the HTML control. (Dreamweaver information,1999)

FrontPage works well on *Netscape Navigator* as well as *Internet Explorer*. The tool can create a form, which can send data to a text file. It can also place graphics and text anywhere on the page - even layer content. *FrontPage* is great for wrapping text around an image. It chooses web safe colours for graphics and text. (FrontPage information, 2000).

A more detailed motivation is set out in Table 3.15 comparing *Dreamweaver* with *Front Page.*

Table 3.15 Comparison between *Front Page* and *Dreamweaver*
(PCFormat, *Tried and Tested*)

Dreamweaver-92%	***Front Page-72%***
Work with tables and layers.	Work in tables.
The layers can be moved around.	Tables are fixed.
Interface superb.	Similar to the rest of Office package.
WYSIWYG authoring tool - drop and drag.	Menu and buttons not logical.
Support for HTML frames - easy splitting windows in two.	Customized theme for instant look and feel.
Library to store frequently used objects.	None.
JavaScript functions - e.g. for mouseovers go to **Behaviors.**	Neglected the use of JavaScript.
Strip unnecessary code from Web pages.	None.
Preserve code - Roundtrip HTML.	Roundtrip idea from Macromedia.
A web design killer application.	It has improved from previous versions.
Excellent site management.	Site management on par.

3.12.3 Planning/ Storyboarding

Planning was done on paper before the development started on the computer. Hannafin & Peck (1988:61), describes this as the "illustrations depicting each change to the computer screen and conveying other important information to the reviewers and programmers"

The design and development of the program was done by the researcher and a second party who is involved in the research of the marketing aspect of the same program. The storyboarding was therefore done together and functioned as a structure and guide for the two developers working on the same web site.

3.13 Prototype and evaluation

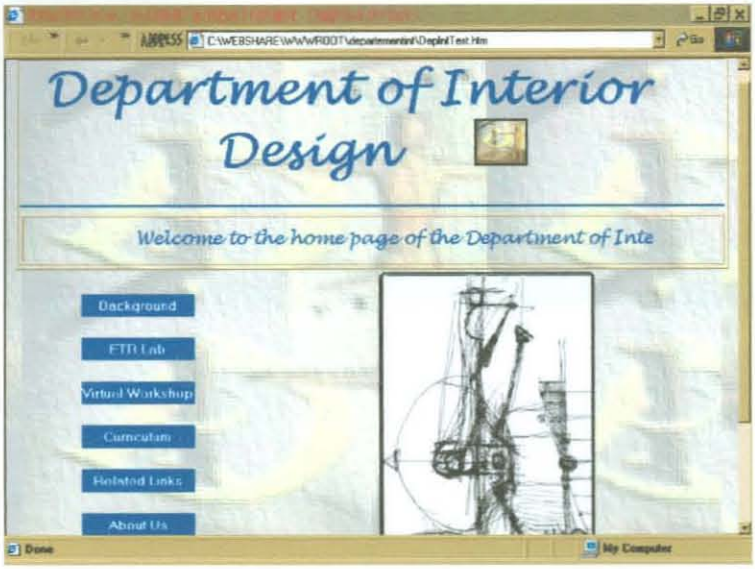
3.13.1 Phase 1

The initial home page was designed from a section taken from an image representing the **Department of Interior and Product Design**. This section was enlarged to a background image and as a result of the enlargement, a tiling effect was caused.

An embossed texture was added to the background. The colour of the text was blue, corresponding with the blue in the background. The developers decided upon a font, which would suit the Design world (*Lucida Handwriting*).

The developers added a text animation to welcome the user to the site. The animation appeared only for a few seconds and then remained stationary. The home page of the first phase was captured and is displayed in Figure 3.11

Figure 3.11 Home page of phase 1 [↟]



3.13.2 Evaluation of phase 1

There was no formal evaluation in the first phase. The developers showed the home page to a selection of people and different comments and suggestions were received.

The look of the page appealed to most of the people. The tiling effect however, was disturbing. Pages to follow had a different texture, which affected the consistency.

The different headings were not placed exactly on the same level and it caused the eye to jump when screens changed.

3.13.3 Phase 2

At this stage the client informed the developers that the name of the site had to be changed due to the restructuring. It was now called **Program in Interior and Product Design.** Except for the change of the name, there was still no prescribed look for the home page and something totally different was presented in order to provide alternative options.

The developers and the client agreed on a trendy, modern appearance. The original image from the first phase was used, but as a button to indicate the home page.

The developers produced a possible prototype with bright colours. This was a second starting point. Lime green and bright orange reflected a trendy design feel. An abstract design was placed in the centre of the screen and lead to a square and structured layout, with the navigation square on the left hand side of the screen. Other navigation was aligned at the bottom of the graphic design. The font being **Comic Sans** complimented the informal and 'fun' look. The text was in black.

The first specification, which had to be incorporated, was the logo of the University of Pretoria and that was placed at the bottom right hand corner.

The following pages displayed a structured look, as the navigation and main heading almost formed a frame at the top of each screen. Each section was identified by a specific colour captured from the center design on the home page.

Figure 3.12 displays the bright and trendy appearance of the home page in phase 2 and Figure 3.13 reveals the structured layout of the other screens.

Figure 3.12 Home page of phase 2 [⌖]

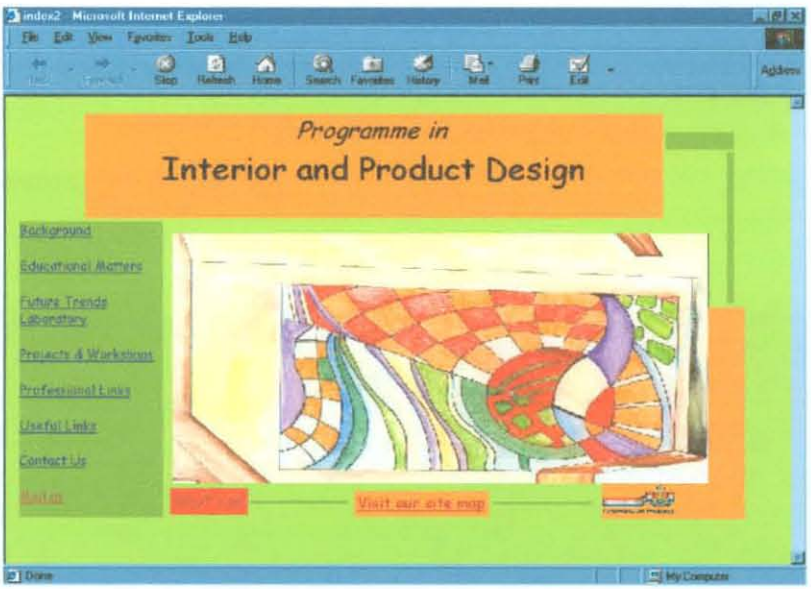
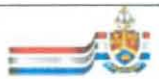


Figure 3.13 An example of a web page in phase 2 [⌖]

Icons used in phase 2 create the feel of unity and a corporate theme consisting of the colour combinations and these icons meet the principles of design as well as the prerequisite of the university. Figure 3.14 displays an icon.

Figure 3.14 An icon used in phase 2 [⌖]

University Logo	

3.13.4 Evaluation of phase 2

The developers had a meeting with the client and discussed the proposed prototype.

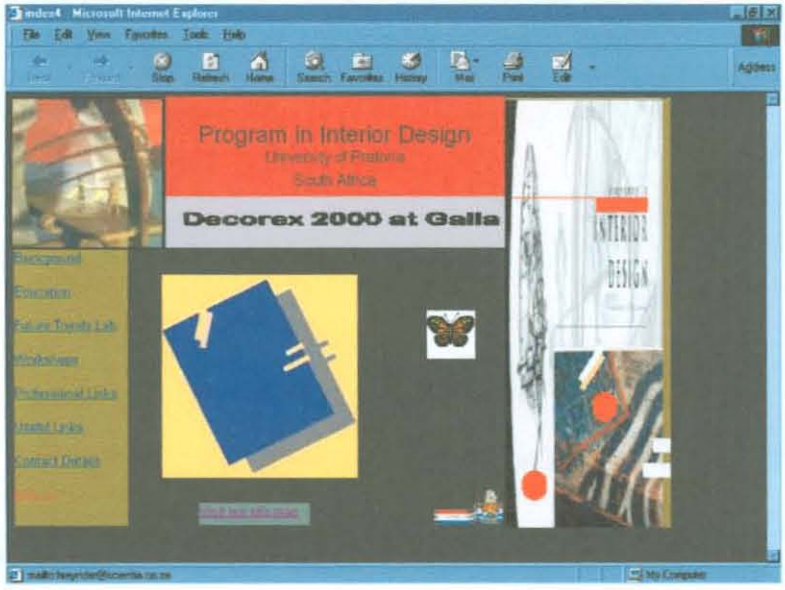
- The client preferred the shade of the chosen colours more subdued.
- A brochure with the desired colours was provided.
- The client approved of the general layout of the pages to follow the home page and the present colours had to be changed to resemble the provided brochure.
- The client however agreed to design a home page, which would represent the **Program in Interior and Product Design** and would please the majority of the Department.
- People in general found the home page attractive and the colours exciting and funky.

3.13.5 Phase 3

During this phase the client provided the designed home page. Again this was a total change. Primary colours were used and a theme of Africa and ethnical influence were supposed to represent the Design Industry for the new Millenium.

The developers added animated text to the home page in order to advertise current and forthcoming events. Figure 3.15 displays the home page of the third phase.

Figure 3.15 Home page of the third phase [↟]



3.13.6 Evaluation of phase 3

The download time of this home page was very slow because of the amount of images taken from a Word document/ PowerPoint presentation.

- A focus group comprising of representatives of the School of Built Environment decided that a uniform theme would be more appropriate bearing in mind that the above Departments resorts under the same School.
- This proposal was completely unacceptable. The representatives suggested that they should sit together and design a suitable homepage to accommodate all the involved disciplines (Interior Design, Architecture, and Landscape Architecture).

3.13.7 Phase 4

Because of limited time the client and developers decided upon a neutral home page. At this stage the client was absent for a substantial period of time. The proposed design of a new home page by the representatives of the School for the Built Environment did not realize.

The developers used the representing image for the final home page. The edges were softened to blend into the background and the pages to follow were adapted to blend in with the background of the home page. Figure 3.16 displays the home page of phase 4 and Figure 3.17 is an example of a content page of the web site.

Figure 3.16 Home page of the fourth phase [⌖]

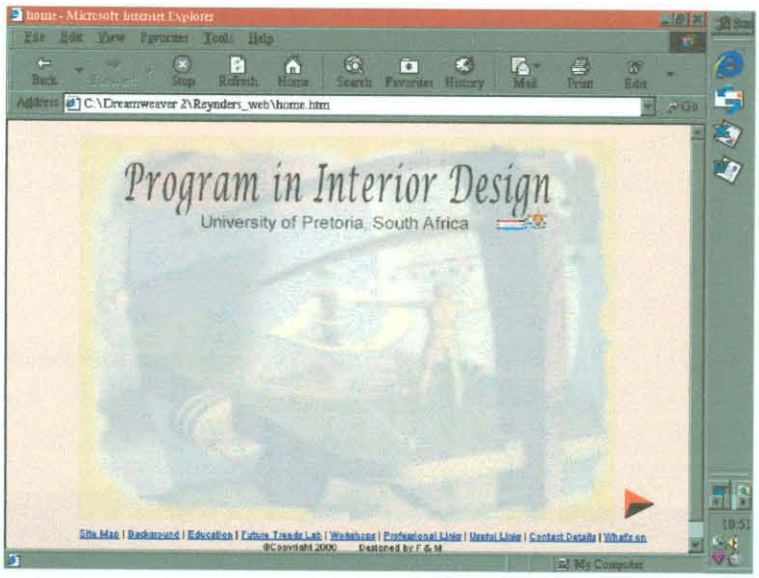
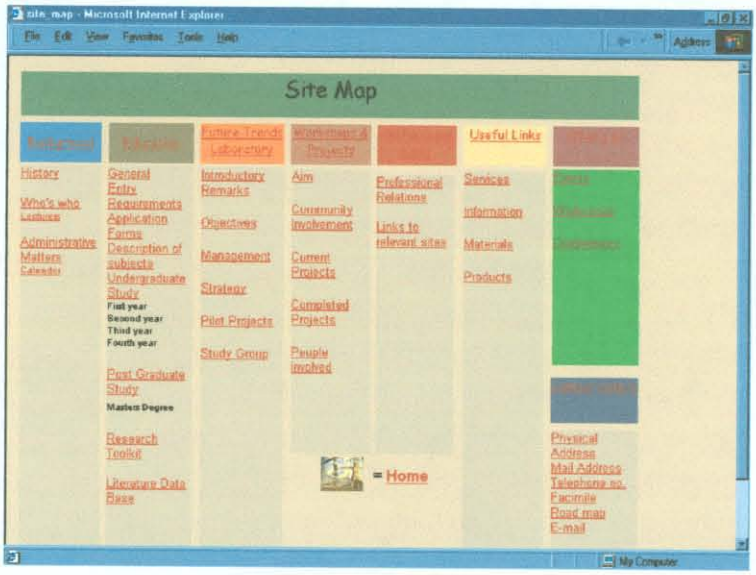


Figure 3.17 An example of a page in phase 4 [⌖]

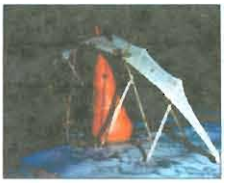


3.14 Stage 4: Production

3.14.1 Introduction

According to Lynch and Horton (1997), "the safe area" dimensions for layouts should be designed to print a maximum of 535-pixel width and 295-pixel height. The average screen size is between 14 and 15 inches and is set to display a 640 x 480-pixel screen. In the design of this site, which is mainly informational, it was of utmost importance that the content would fit into the available space. This would ensure easy printing and avoid the loss of any information. Vaughan (1998:497) recommends that the design should fit into the working space on the monitor, being 600 x 300 pixels. Bearing in mind that the controls and slider bars of the browsers take up the additional space. He suggests that the developer include eye catchers, which would be viewed by the user without having to scroll in the above-mentioned space.

The fact that the general information will be available on CD-ROM is very appropriate, keeping in mind that it can hold large amounts of data (up to 660 MB), be reproduced relatively quickly and inexpensively. It is also a standardized format and can be utilized by most available CD players.



Chapter 4

Evaluation

Chapter 4

Evaluation

4.1 Introduction

"Evaluation is the systematic assessment of the worth or merit of some object."
(Trochim, 1999)

Trochim states that the "generic goal" of most evaluations is to provide "useful feedback" to different audiences and that evaluation should influence decision-making. Trochim describes the planning and evaluation of a multimedia program very clearly in Figure 4.1

Figure 4.1 Planning-Evaluation cycle (Trochim 1999)

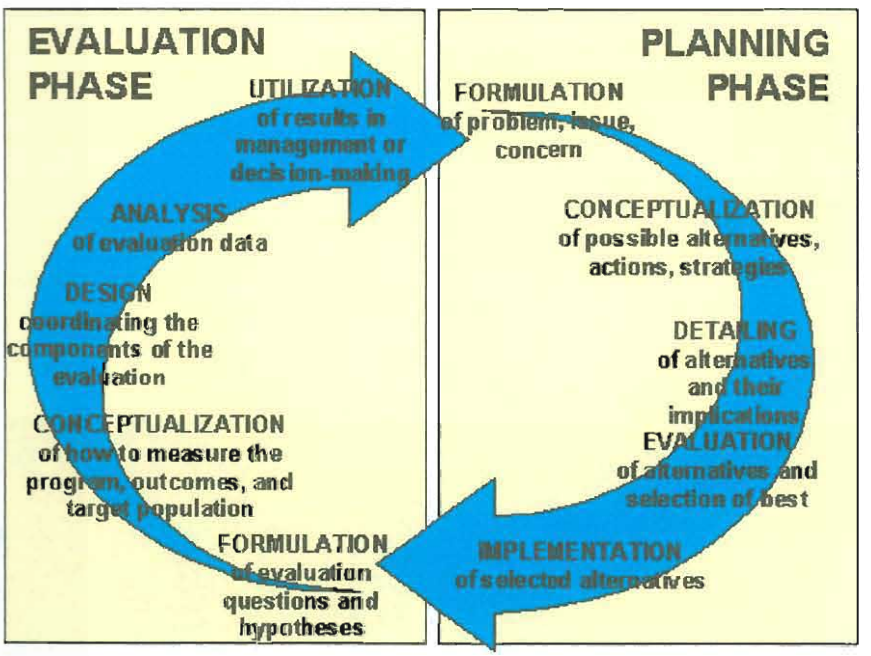


Table 4.1 reveals the instruments versus the questions answered through out the research.

Table 4.1 Topics addressed by the Research Questions

Topic addressed	Questions	Discussion
Content	♦ What does the target population need to know - general info and specific info? ♦ How will effective learning take place on a web-based program? ♦ What is the level of skills and ability of the learner within the program? ♦ In what way will distance learning be combined with real class contact?	➢ Questionnaire 2 ➢ Chapter 2 (Literature) ➢ Questionnaire 1 ➢ Questionnaire 2 To be answered in Chapter 4
Communication issues	♦ What methods of communication are necessary to ensure effective learning? ♦ What does the learner need to have access to these communication channels? ♦ What different groups will be communicating through this web site?	➢ Chapter 4 ➢ Questionnaire 1&2 Known through meetings with client and notes in Research diary.
Structural issues	♦ How should a web site be structured to ensure logic and easy use for the target population?	➢ Chapter 2 ➢ Questionnaire 2
Design issues	♦ What will make a web site work? ♦ Which design principles should be applied to ensure an effective site?	➢ To be answered in Chapter 4. ➢ Chapter 2

The **formative evaluation** was done during the development of the program to ensure that the essential design principles were followed. For detail on the samples, instruments and methods refer to the development phase in Chapter 3 (54-55).

Formative evaluation, which includes different types of evaluation according to Trochim (1999), is displayed in Table 4.2.

Table 4.2 Formative evaluation during the development phase.

Evaluation types	Activities
Needs assessment	
Who needs the program? How great is the need? How will we meet the need?	✓ Target population questionnaire 1/Questionnaire 2 for enrolled students ✓ Needs analysis indicates the extent. ✓ Informal interviews with students on Open day and Questionnaire 2
Evaluability assessment	
Is an evaluation feasible? How can the users help to create its usefulness?	✓ Formative and summative evaluation to improve product. ✓ Suggestions and comments from fellow students, friends and colleagues to improve the program. The needs of the target population were incorporated into the program and the users evaluated the effectiveness thereof through questionnaire 3.
Structured conceptualization	
Will the program, the target population and possible outcomes be defined?	✓ The client defined the program during a meeting with the researcher. ✓ The target population was roughly defined by the client and described in more detail through questionnaire 1&2. ✓ Expectations by the researcher and the client regarding the possible outcomes.
Implementation evaluation	
How successful is the delivery of the program?	✓ Expert evaluators have positive comments about the site. ✓ Other users agree to a large extent as to the usefulness and effectiveness of the site.
Process evaluation	
Is the process of delivery appropriate or should an alternative procedure be considered?	✓ Delivery on the U.P web space (WWW) and a CD-ROM is practical, convenient and appropriate. Prior knowledge gained through questionnaire 1. ✓ The client suggested the CD-ROM for advertising purposes and presentation of the course material.

4.2 Model for evaluation

4.2.1 Participant-oriented model

The centre of importance is the evaluation participant. This is especially relevant where the user expresses his/her opinion on a program designed for a specific purpose (Trochim, 1999). According to Trochim it is more important to distinguish between the formative and summative evaluation.

Formative evaluation means that the program being evaluated, is "strengthened or improved" (Trochim, 1999). The evaluators examine the delivery of the program, the quality of the implementation and the context.

Summative evaluation on the other hand, examines the outcomes of the program. This includes the activities after the delivery of the program, the impact the program has on the target group and in case of expenses, the estimated costs associated with the project.

Hannafin & Peck (1988:301) stress the fact that the purpose of **summative evaluation** is not to modify or revise. It is an end in itself and does not result in major changes of the content or the procedures.

The **summative evaluation** was conducted after the development of the program and the evaluation stage is described in Table 4.3.

Table 4.3 Evaluation stage of the program

Stage	Activities	Output
Evaluation ▪ Summative	♦ Conduct the summative evaluation. ♦ Revise the program	♦ Evaluation of the site by experts and users. ♦ Make the changes to the program and refine
Report	♦ Describe the **findings** and make the appropriate **recommendations** to enable further development.	♦ Research Report ♦ Delivering the final program.

4.2.2 Summative evaluation

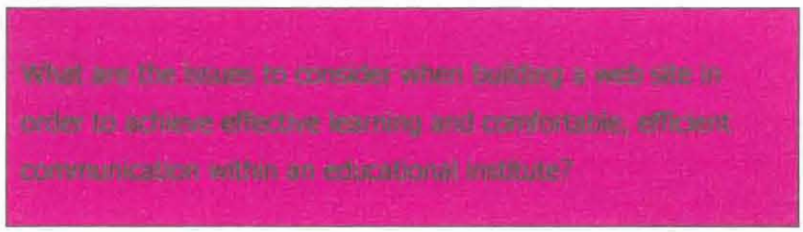
The summative evaluation is divided into the following categories according to Trochim (1999). Table 4.4 indicates the different categories of the summative evaluation.

Table 4.4 Summative evaluation process

Evaluation categories	Activities
Outcome evaluations: (whether the program has an effect on specifically defined target outcomes)	• A prominent effect on the communication of students with other students and students with lecturers. • The value of the program in terms of learning
Impact evaluation: (assesses the overall effects of the program)	• Provides a comfortable facility through which the learners can obtain information. • The economical benefits of the program are a concern for most students. • The convenience of gathering information at any time is a great advantage.
Secondary analysis: (re-examines existing data and addresses new questions)	• New questions arose from the data gathered through the expert interface rating. • Relationships between data in the different questionnaires were drawn.
Meta-analysis: (integrates the outcome from multiple studies and concludes in an overall judgement on an evaluation question)	• Other similar studies are used to compare the outcome of this study and the recommendations are made from that.

The research question that needed to be answered by the summative evaluation, was:

In order to decide whether the program accommodates the main research question successfully, a summative evaluation was conducted. The main research question that needed to be answered is:



4.3 Samples used to conduct the summative evaluation

The target population was mainly students involved in the Program in Interior Design.

During the evaluation process a variety of individuals participated in the evaluation of the web site. This resulted in a much broader spectrum of opinions from users outside the Interior Design industry.

The samples comprised of the following:

- All levels of enrolled students.
- Lecturers within the Department of the Built Environment (Interior Design, Architecture).
- Students busy with a Diploma in CBT (Computer Based Training).
- Colleagues and friends.
- Experts in Information Technology (IT) and web design.

4.4 Evaluation instruments

4.4.1 User interface rating form

Questionnaire 3 was designed to accommodate the user in general. The questions were aimed at the layout of the web site, the navigation, the content and the ease of use. A scale from 1-5 was provided to evaluate the different aspects. There was sufficient space provided to add comments or make suggestions in order to maximize the effectiveness of the site.
(See Appendix C)

4.4.2 Expert interface rating form

The researcher compressed the above questionnaire and compiled Questionnaire 4, which was sent via electronic mail to 12 experts in the field of web design. The expert evaluators were given the opportunity to comment on every specific aspect. The completed evaluation form had to be returned to the address within a week.
(See Appendix D)

4.5 Other data collection methods

During a focus group, the client and the researcher discussed and assessed the program.

The researcher kept a research diary up to date by entering all the relevant and significant data gained via electronic conversations and informal meetings with the client.

The researcher gathered all the data by means of the methods mentioned and significant relationships and comparisons are discussed in Chapter 5 (Findings).

Chapter 5

Findings

Chapter 5

Findings

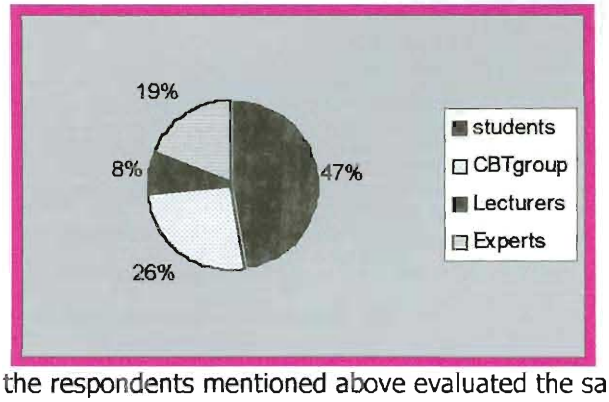
5.1 Introduction

This chapter deals with the results of the data gathered through the summative evaluation in Chapter 4.

The samples that participated in the evaluation comprised of users and experts. Students already identified as the target group in the analysis phase, lecturers, and a group of postgraduate students in Computer-based training (CBT) represented the users. The experts were representative in the web design field and educational environment.

Figure 5.1 indicates the composition of the groups who evaluated the program.

Figure 5.1 Compositions of respondents.



All the respondents mentioned above evaluated the same dimensions of the web site. The experts however, had the opportunity to comment on each question. The instrument used for the experts made provision for comments and suggestions (Questionnaire 4). The researcher expected different outcomes, knowing that the respondents evaluated with different values and knowledge.

5.2 Objectives to be met by the evaluation instruments

Referring to the research questions in Chapter 1 of this thesis, it is essential to determine whether these questions were answered by the questions in the different questionnaires. Table 5.1 indicates where each objective is met through the evaluation instruments.

Table 5.1 Evaluation instruments to meet the objectives

Objectives	Questionnaire 3 Questionnaire 4 (Evaluation)	Questionnaire 2 (Target analysis)	Questionnaire 1 (Open day)
What are the characteristics of the target population?	N/A	Section A Q 4- Geographical Q 5- Gender Section B Q 8- Attendance Section C Q 13- Computer skills Q 12- Computer access Q 15- Computer use	Section 4 • Computer skills
How will effective learning be achieved? (Content issues)	Q 2- Readability Q 12- Content in manageable chunks Q 13- Content understandable Q 17- Promotes learning Q 19- Easy to use	Section C Q 12- Access to computer Q 16- Access to Internet Q 18- Obtaining information from the Internet Q 20- Benefit of a web site	Section 4 • Computer access • Computer skills • Internet connection
How can comfortable and efficient communication be incorporated? (Communication issues)	Q 2- Readability Q 9- Layout of site map Q 16- Contact details	Section A Q 3- Age Q 4- Geographical Q 6- Language Section B Q 8- Class attendance Q 10- Current communication between students Q 11- Current communication between student/lecturer Section C Q 12- Computer access Q 16- Access to Internet Q 20- Benefit of web site Q 21- Communication facility	Section 4 • Internet connection • Information obtain • Information search method

Objectives	Questionnaire 3 Questionnaire 4 (Evaluation)	Questionnaire 2 (Target analysis)	Questionnaire 1 (Open day)
What will make a web site work? (Design issues)	Q 1-Overall look Q 3-Consistency Q 4-Colour use Q 8-Consistency of navigation (buttons) Q 14-Content presentation Q 15 Choice of-graphics	Section C Q 22- Most important thing to find on site Section D Q 23- Overall look Q 38- Graphics	N/A
How should a web site be structured? (Structural issues)	Q 5- Choice of fonts Q 6- Layout of site map Q 7- Navigation to homepage Q 11- "Useful Links" page Q 18- Download time	Section D Q 28- Layout of site map Q 32- Navigation options Q 34- Chunking	N/A

According to Table 5.1 it is possible to indicate whether the research questions have been met. The researcher will make appropriate recommendations in Chapter 6 according to the findings in this chapter.

5.3 Findings

5.3.1 Results from the user interface rating form (Appendix C)

The results of the three different user groups are set out in Tables 5.2 to 5.4 and an interpretation of each table will follow.

For the purpose of the findings the researcher divided the data into categories representing:

Good (option 1 and 2 on the Likert scale)
Average (option 3 on the Likert scale)
Poor (option 4 and 5 on the Likert scale)

5.3.1.1 Students

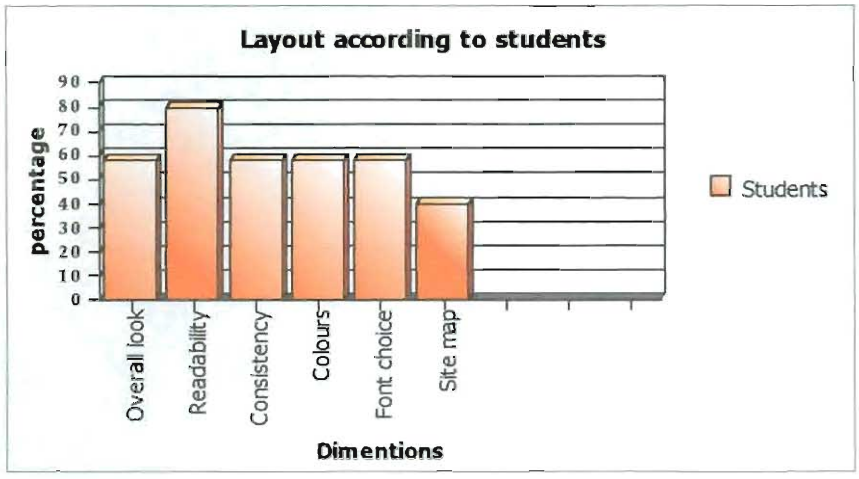
A group of 25 students involved in Architecture, and the Program in Interior Design participated in the evaluation of the web site. They ranged from 1st year to 4th year students. The questionnaires were not handed in separately and the results are therefor not divided into the different levels of study. Table 5.2 displays the results from the students.

Table 5.2 **Results from the students** (Questionnaire 3=25 respondents) [↟]

Questions	25 Respondents evaluated the web site							
Layout of the web site	**E**	**G**	**%**	**A a**	**%**	**A**	**Poor**	**%**
1. The appearance of the web site and the overall "look" is:	6	8	56 %	4	16 %	4	3	28 %
2. The readability (size and space of writing) on the pages is:	6	11	68 %	3	12 %	2	3	20 %
3. The consistency of all the elements through out the web site is:	3	11	56 %	7	28 %	4	0	16 %
4. The use of colours in the web site is:	6	8	56 %	3	12 %	4	4	32 %
5. The choice of fonts (type of writing) is:	2	12	56 %	5	20 %	4	2	24 %
6. The layout of the site map is:	3	7	40 %	7	28 %	8	0	32 %
Navigation								
7. The navigation to and from the homepage is:	6	11	68 %	4	16 %	3	1	16 %
8. The consistency of the buttons through out the web site is:	7	8	60 %	4	16 %	6	0	24 %
9. The layout of the site map for navigation purposes is:	4	7	44 %	8	32 %	5	1	24 %
10. The different options of navigation in the site is clear and easy to follow:	6	11	68 %	4	16 %	4	0	16 %
11. The **"Useful link "** page will attract more visitors:	4	7	44 %	4	16 %	8	2	40 %
Content								
12. The amount of content per page is presented in manageable chunks:	4	12	64 %	7	28 %	1	1	8%
13. The content is understandable and appropriate:	3	13	64 %	9	36 %	0	0	0%
14.The way in which the content is presented gain the attention of the visitor:	1	7	32 %	7	28 %	8	2	40 %
15. The choice of graphics is:	3	5	36 %	5	20 %	6	5	44 %
Communication, support and ease of use								
16. The possibility of communicating with other students and lecturers, with a bulletin board and listserve will be:	3	12	60 %	6	24 %	3	1	16 %
17. The contact details on the web site is easy accessible and clear:	6	13	76 %	3	12 %	3	0	12 %
18. The web site enables and promotes learning:	0	9	36 %	14	52 %	2	1	12 %
19. The download times of the web pages is:	6	8	56 %	8	32 %	3	0	12 %
20. The web site is easy to use:	7	15	88 %	3	12 %	0	0	0%

Figure 5.2 indicates the proportion of the different elements regarding the layout according to the students.

Figure 5.2 Elements of layout rated by the students



5.3.1.2 Interpretation of the data [⌖]

Interpreting the results gathered from the students, it indicates the need for something to make the site more exciting.

"Need more young and spunky design..."

The sections as a whole were evaluated and the interpretation thereof reflected a different outcome.

Section 1: Layout

Regarding the layout, the majority of students rated the **overall "look"** above 50%.
16% of the respondents evaluated the layout as average.

The **readability** was evaluated very high by scoring an 80%.

The **consistency** of the elements through out the site received 56%. Opposed to that, an average score of 28% indicated that the consistency was above good and above.

The **colours** used in the web site were not very popular with the students. The researcher is of opinion, that changing the colours would affect the "look" in a way more likeable for younger people (students).

Concerning the **choice of fonts**, the majority of 56% agreed that the fonts were suitable. It is clear however that the possibility of another font could enhance the layout of the web site.

The result on the **sitemap** indicated that the majority of respondents had difficulty in understanding this screen. A 40% positive outcome, a 28% average and a 32% negative reaction describes the matter.

To conclude, only one issue in the layout dropped below 50%, being the layout of the site map.

Section 2: Navigation

Three (3) out of five (5) issues related to the navigation were evaluated above 60% percent, which indicates a good navigation structure.

The navigation options available through the **site map** are not effective according to the students. This issue received a 44% with 32% being the average score and 24% of the students rating it average to poor.

The **ease of use** and clear presentation of the navigation scored a 68% with 16% average and 16% towards poor.

The majority of students found the navigation to and from the **home page** good.
The fact that the researcher made the statement that the **"useful links"** page will attract more visitors to the web site, was meagerly supported by the students with 44%.

The **navigation buttons** indicated to be consistent.

Section 3: Content

The majority of students approved of the **chunking** of content.

The majority (64%) rated the content **understandable and appropriate**.

According to the respondents the **consistency** regarding the presentation of the content was acceptable scoring above 50%. A very low 8% experienced the consistency poor.

The result of the content **gaining attention** received a score of 40% opposed to 32% of the respondents who felt that the content was attention gaining.

According to the students the choice of **graphics** was not successful. The negative outcome was higher than the positive reaction.

Section 4: Communication, Support and ease of use

The general results of this section were positive.

The **communication possibilities** for students and lecturers appeared to be successful with a 60% rating.

The clarity and easy accessibility of the **contact details** received an excellent rating of 76%.

Only 36% of the respondents supported the issue of **learning** over the web with the majority of 52% being neutral about the issue and 12% indicating an average to poor interest.

The **download time** of the web pages received a score of above 50%, which indicates that it is acceptable.

The workability and **ease of use** of the web site appeared successful.

5.3.1.3 Lecturers

Four (4) lecturers involved in Architecture and Program in Interior Design evaluated the web site. One of the lecturers was the client who initially presented assistance in the design of the program. Their participation in the summative evaluation was of specific importance, because utilizing the site in future as a learning- and communication aid is possible.

Table 5.3 reveals the results for all the sections rated by the lecturers with an interpretation of the results to follow.

Table 5.3 Results from lecturers [♦]

Questions	4 Respondents evaluated the web site							
Layout of the web site	**E**	**G**	**%**	**A a**	**%**	**A**	**Poor**	**%**
1. The appearance of the web site and the overall "look" is:	0	2	50 %	2	50 %	0	0	0%
2. The readability (size and space of writing) on the pages is:	1	2	75 %	1	25 %	0	0	0%
3. The consistency of all the elements through out the web site is:	0	2	50 %	2	50 %	0	0	0%
4. The use of colours in the web site is:	1	2	75 %	1	25 %	0	0	0%
5. The choice of fonts (type of writing) is:	1	2	75 %	0	0%	1	0	25 %
6. The layout of the site map is:	2	1	75 %	1	25 %	0	0	0%
Navigation								
7. The navigation to and from the homepage is:	2	0	50 %	2	50 %	0	0	0%
8. The consistency of the buttons through out the web site is:	3	1	100 %	0	0%	0	0	0%
9. The layout of the site map for navigation purposes is:	0	3	75 %	1	25 %	0	0	0%
10. The different options of navigation in the site is clear and easy to follow:	1	3	100 %	0	0%	0	0	0%
11. The **"Useful link "** page will attract more visitors:	0	2	50 %	1	25 %	1	0	25 %
Content								
12. The amount of content per page is presented in manageable chunks:	0	1	50 %	2	25 %	0	1	25 %
13. The content is understandable and appropriate:	2	1	75 %	1	25 %	0	0	0%
14. The way in which the content is presented gain the attention of the visitor:	1	2	75 %	0	0%	1	0	25 %
15. The choice of the graphics is:	1	2	75	1	25	0	0	0%
Communication, Support and ease of use								
16. The possibility of communicating with other students and lecturers, with a bulletin board and listserve will be:	4	0	100 %	0	0	0	0	0
17. The contact details on the web site is easy accessible and clear:	3	1	100 %	0	0%	0	0	0%
18. The web site enables and promotes learning:	1	2	75 %	1	25 %	0	0	0%
19. The download times of the web pages is:	2	1	75 %	1	25 %	0	0	0%
20. The web site is easy to use:	4	0	100 %	0	0%	0	0	0%

5.3.1.4 Interpretation of the data [↟]

A very positive experience is obvious from the evaluation of the lecturers. In general, most dimensions evaluate between GOOD and EXCELLENT, a few aspects rated AVERAGE and a small minority evaluated POOR. Because of the significant majority, the researcher provided a general interpretation.

Section 1: Layout

Readability, use of colours, fonts and **layout of the sitemap** are good.
The **"overall look"** and **consistency** of elements are above average.

Section 2: Navigation

All the **navigation** dimensions are good and above average.

Section 3: Content

The presentation of content in **manageable chunks** needs attention.
One respondent experienced the **attention gaining** factor as poor, but the majority evaluated it good.

Section 4: Communication, Support and ease of use

The lecturers rated this section very good. One of the respondents was not sure whether the site could **promote learning** and whether the **download time** is fast enough.

It is clear from the interpretation that the lecturers feel the site has a pleasing **layout**, the **navigation** is clear and **easy to use**. The presentation of the **content** however, needs a little attention to satisfy all.

5.3.1.5 Computer-based Training (CBT) group

This group consisted of 13 respondents who is currently in the final year of a diploma in Computer Based Training (CBT) at the University of Pretoria. With an established knowledge of web design and the design principles, their evaluation of the program was of great value. The researcher expected that these results would differ mentionable from those of the students. Table 5.4 displays the results of this group.

Table 5.4 Results of the CBT group [↟]

Questions	13 Respondents evaluated the web site							
Layout of the web site	**E**	**G**	**%**	**A a**	**%**	**A**	**Poor**	**%**
1. The appearance of the web site and the overall "look" is:	6	4	77 %	2	15 %	1	0	8%
2. The readability (size and space of writing) on the pages is:	6	6	92 %	0	0%	1	0	8%
3. The consistency of all the elements through out the web site is:	7	4	85 %	2	15 %	0	0	0%
4. The use of colours in the web site is:	5	7	92 %	0	0%	1	0	8%
5. The choice of fonts (type of writing) is:	6	6	92 %	0	0%	1	0	8%
6. The layout of the site map is:	8	4	92 %	1	8%	0	0	0%
Navigation								
7. The navigation to and from the homepage is:	7	4	85 %	1	8%	1	0	8%
8. The consistency of the buttons through out the web site is:	7	6	100 %	0	0%	0	0	0%
9. The layout of the site map for navigation purposes is:	7	6	100 %	0	0%	0	0	0%
10. The different options of navigation in the site is clear and easy to follow:	7	6	100 %	0	0%	0	0	0%
11. The **"Useful link "** page will attract more visitors:	8	3	85 %	1	8%	1	0	8%
Content								
12. The amount of content per page is presented in manageable chunks:	4	5	69 %	4	31 %	0	0	0%
13. The content is understandable and appropriate:	7	4	85 %	2	15 %	0	0	0%
14.The way in which the content is presented gain the attention of the visitor:	9	2	85 %	1	8%	1	0	8%
15. The choice of the graphics is:	7	4	85 %	1	8%	1	0	8%
Communication, Support and ease of use								
16. The possibility of communicating with other students and lecturers, with a bulletin board and listserve will be:	7	4	85 %	2	15 %	0	0	0
17. The contact details on the web site is easy accessible and clear:	10	2	92 %	1	8%	0	0	0%
18. The web site enables and promotes learning:	6	4	77 %	2	15 %	1	0	8%
19. The download times of the web pages is:	7	4	85 %	1	8%	1	0	8%
20. The web site is easy to use:	11	2	100 %	0	0%	0	0	0%

5.3.1.6 Interpretation of the data [↑]

A total different outcome is revealed by the evaluation results of the CBT group. It is obvious that these respondents focused more on effective layout, functionality and workability of the program.

An interpretation of the results on the questionnaire used for this evaluation was as follows:

Section 1: Layout of the web site

The majority of the group approved of the **overall "look"** of the web site (77%). A minority of 15% was not quite convinced and only 8% rated the site average too poor.

The majority in this group supported the **readability**, the **colours** used, the **choice of fonts** and the **lay out of the site map**. Only 8% of the respondents rated these components average too poor.

Concerning the **consistency** of the elements used throughout the site, 15% evaluated it as average and 85% rated it good.

The layout of the site is successfully presented and appealing to a large majority of the respondents.

Section 2: Navigation

This group had a positive opinion regarding the navigation as a whole.

Navigation to and from the **home page** received an 85% rating.

The purpose of the **"Useful links"** page to attract more visitors to the site was 85% supported by the respondents and only 16% evaluated it between average and poor.

The **consistency of the buttons** for navigation, the navigation purposes of the **site map** and the clarity of the different **options of navigation** all scored a 100%. No negative feedback was received on these issues.

Section 3: Content

The presentation of content in **manageable chunks** was not as successfully experienced by the respondents, as was the rest of the site. A total of 69% was awarded for this content issue as good.

The **understandability and appropriateness** of the content, the **attention gaining** aspect of the content and the **choice of graphics** all received 85%

Section 4: Communication, Support and ease of use

This section was evaluated with a very positive outlook.

All the **contact details** are easy accessible (92%). As soon as the **bulletin board and Listserve** are available to the site, it will offer various ways of communicating (85%). The majority of the respondents feel that the web site would **promote learning** and the issue received a 77%.

The **download time** was accepted by most of the respondents. It is clear to the researcher that peak times on the Internet are very busy and it will affect the download times. The developers kept the images and graphics to the minimum and changed the format of images and graphics, which was initially too large.

The CBT group rated **ease of use of the web site** a 100%. This implicates a workable web site.

5.3.2 Results from the expert interface rating form (Appendix D)

5.3.2.1 Experts

The questionnaire was sent to ten (10) experts in related fields via electronic mail. 8 responded within a week and because of limited time available the researcher could not wait for late responses. Ample space for comments and suggestions were made available at the end of each section. Personal input from the different experts lead to the necessary refinement of the program.

Table 5.5 Results from expert interface rating form [♦]

Questions	8 experts evaluated the web site							
Layout of the web site	**E**	**G**	**%**	**A a**	**%**	**A**	**Poor**	**%**
1. The appearance of the web site and the overall "look" is:	1	6	87 %	1	13 %	0	0	0 %
2. The readability (size and space of writing) on the pages is:	3	3	75 %	1	13 %	1	0	12 %
3. The consistency of all the elements through out the web site is:	2	3	63 %	2	25 %	1	0	13 %
4. The use of colours in the web site is:	3	2	62 %	3	37 %	0	0	0 %
5. The choice of fonts (type of writing) is:	3	2	63 %	2	25 %	1	0	13 %
6. The layout of the site map is:	3	2	63 %	2	25 %	1	0	13 %
Navigation								
7. The navigation to and from the homepage is:	1	4	62 %	2	25 %	1	0	13 %
8. The consistency of the buttons through out the web site is:	4	2	75 %	0	0%	2	0	25 %
9. The layout of the site map for navigation purposes is:	4	1	63 %	2	25 %	1	0	13 %
10. The different options of navigation in the site is clear and easy to follow:	3	3	75 %	2	25 %	0	0	0%
11. The **"Useful link "** page will attract more visitors:	0	4	50 %	2	25 %	2	0	25 %
Content								
12. The amount of content per page is presented in manageable chunks:	3	3	75 %	0	0%	2	0	25 %
13. The content is understandable and appropriate:	3	3	75 %	2	25 %	0	0	0%
14.The way in which the content is presented gain the attention of the visitor:	2	3	63 %	2	25 %	1	0	13 %
15. The choice of the graphics is:	4	0	50 %	3	38 %	1	0	12 %
Communication, Support and ease of use								
16. The possibility of communicating with other students and lecturers, with a bulletin board and listserve will be:	1	6	87 %	1	13 %	0	0	0%
17. The contact details on the web site is easy accessible and clear:	3	1	50 %	3	38 %	1	0	12 %
18. The web site enables and promotes learning:	0	4	50 %	3	38 %	1	0	12 %
19. The download times of the web pages is:	1	3	50 %	2	25 %	2	0	25 %
20. The web site is easy to use:	4	1	63 %	2	25 %	1	0	12 %

5.3.2.2 Interpretation of the data [♦]

The experts who evaluated the program seemed positive about the general layout and workability of the program. The evaluation by the experts resulted in high ratings for all the sections.

5.3.2.3 Comments and suggestions from the experts

Layout:
"Fonte kan kleiner wees;dit sal te veel 'scrolling' verhoed en lees vergemaklik"
"Verander fonte van navigasie kolom sodat dit meer uitstaan"

"At first the site map did not make sense to me, but after surfing a little I understood the purpose and layout better. I would have liked a simpler, more explanatory site map."

" Site map se uitleg is goed, maar van die agtergrond kleure veroorsaak dat die teks moeiliker leesbaar is."

"The blue font of the links does not always show clearly on the coloured backgrounds."

Navigation:
"The link to the application form goes to the University home page. Try to link directly to the form."

Content:
"Choice of graphics is stunning."

General comments:
'Produk voldoen aan basiese ontwerpbeginsels en indien enkele logistiese aanpassings gemaak word, kan dit n bydrae lewer om leer te bevorder en te ondersteun."

"Great look and feel.Odd punctuation mistakes. Check layout for consistency. Good piece of work."

"Site is rustig, met n professionele voorkoms. Groot sukses! Geluk!"

Figure 5.3 to Figure 5.6 compare the results of the ratings by the different respondents.

Figure 5.3 Outcome of the Layout as rated by the different respondents

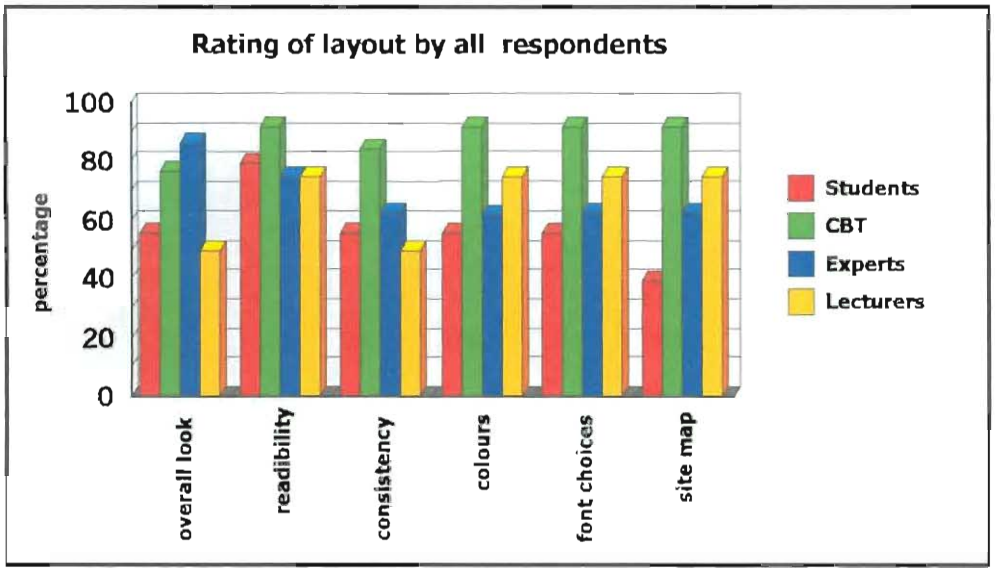


Figure 5.4 Outcome of the Navigation as rated by the different respondents

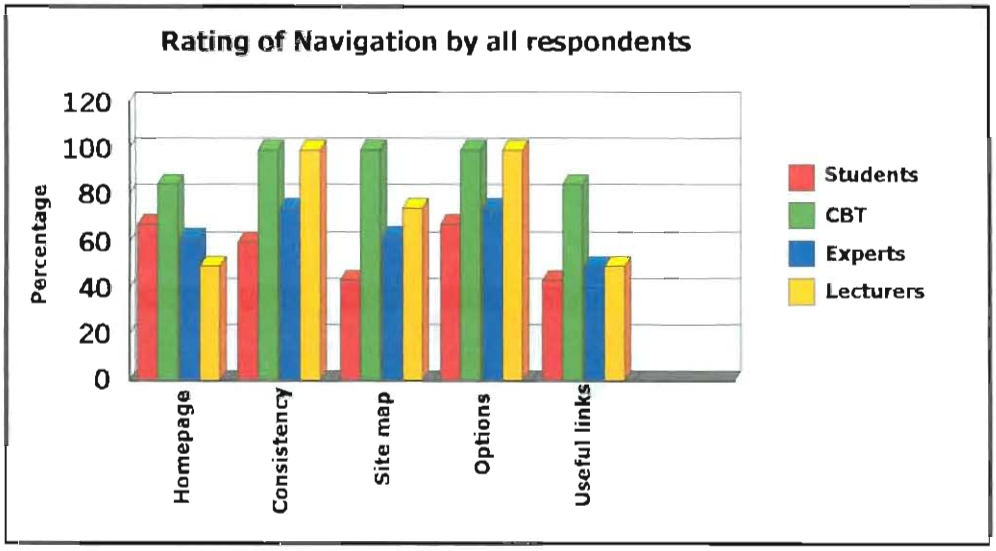


Figure 5. 5 Outcome of the Content rated by the different groups

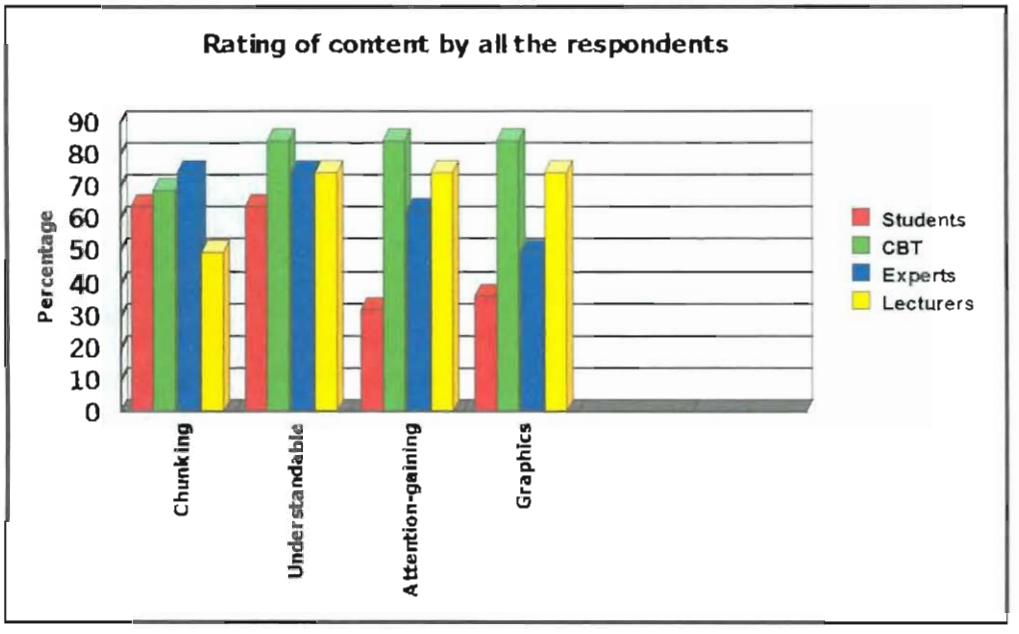
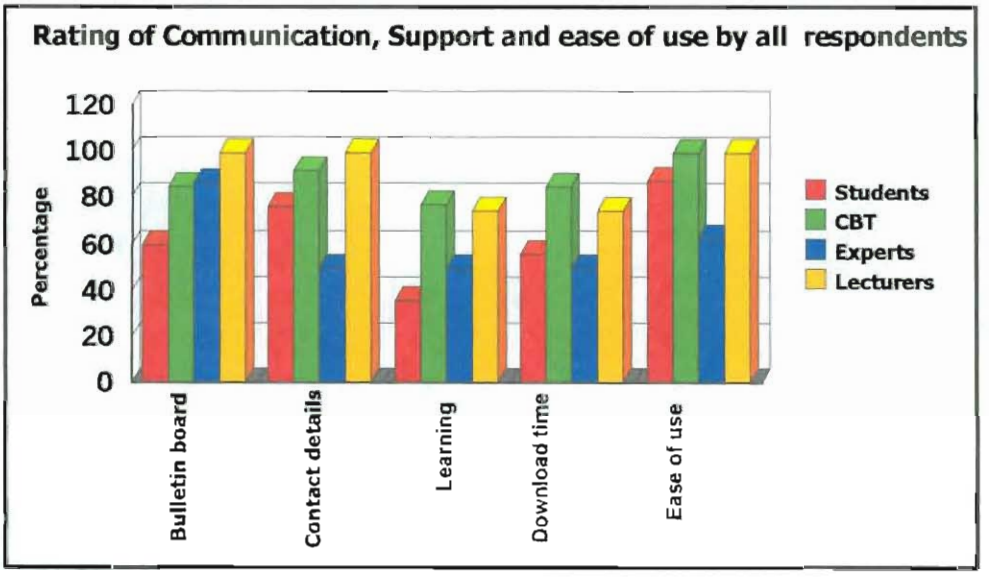


Figure 5.6 Outcome of the Communication, Support and ease of use rated by the different groups



Following are the research questions with an evaluation of the different dimensions from the questionnaires. Findings are derived from these results.

5.4 Research questions and findings

5.4.1 Research question 1

How will effective learning be achieved?

Specific questions with relevance to research question 1 were selected from the questionnaire. Averages of all the respondents were calculated on every question and this information is displayed in Table 5.6.

Table 5.6 Questions and comments regarding research question 1

Questions	Average of respondents (%)	Comments
(Layout) 2. The readability on the pages?	81	The average respondent rated the readability excellent. No need to make changes to the typeface/font.
3. Consistency of all elements in the site?	64	Consistency is relatively stable.
4. Use of colours in the site?	71	Students evaluated the colour below average. Brighter colours could be used.
5. Choice of fonts?	72	Students and experts evaluated font choice below average. Possible change to accommodate the target group.
(Navigation) 8. Consistency of buttons in site?	84	Students rated the consistency below average. It might need some attention but compared to the other 3 groups the researcher assumes that some students misunderstood the question or the terminology.
10. Navigation options clear and easy?	86	Two of the groups awarded this aspect 100%, which resulted in a very high average. Students however caused a drop but not mentionable.
(Content) 12. Content in manageable chunks?	65	Lecturers had a negative feedback about this aspect. Improvement on the content issue will be easy as a lecturer supplied the content.
13. Content are understandable/ appropriate?	75	Students evaluated the content below average. This could mean that the presentation was unusual or they were not familiar with the specific content supplied by the lecturer. Since the content was not complete for all the sections it could have been confusing for the students.
14. Presentation of content gains attention?	64	The students experienced a huge problem with this aspect of content. A change in the presentation is very likely. The fact that more appropriate student work should still be incorporated could contribute to a more attention-gaining site.

Questions	Average of respondents(%)	Comments
15.Choice of graphics?	65	The graphics were unacceptable to the students. Experts were not excited about the graphics. Definite attention should be given to this aspect of the content. The CBT group gave positive feedback regarding the graphics, the reason possibly being a lack of interest in the content as a whole.
(Communication, support) 18.Site will promote effective learning?	63	CBT group and lecturers evaluated the learning possibility above average, while the students did not experience a favorable learning environment. This may be due to the fact that the communication facilities were not in a working capacity at the time of production. Another possibility is that relevant and important information was not available at the time of evaluation.
An average of 71.8% of the respondents supports the success of research question 1		

5.4.2 Research question 2

How can effective communication channels be incorporated?

To determine whether this objective had been met, the following questions were selected from the questionnaires and an average was calculated from the evaluations of the four groups. The relevant questions that tested the sustainability of this objective are set out in table 5.7.

Table 5.7 Questions and comments regarding research question 2

Questions	Average of respondents(%)	Comments
(Lay out) 2. The readability on the pages	81	Positive evaluation from all respondents regarding the readability. An important aspect of the layout regarding communication.
6. Layout of the site map	68	The students appeared to have difficulty in reading the site map, which could affect the efficiency of communication in general. A definite change should be considered to promote the incorporation of communication channels.
(Communication, Support and use) 39. Use of bulletin board and listserve	83	The students and lecturers supported the incorporation of these communication channels. The experts and CBT group experienced it very positive. The communication issue was answered succesfully through this instrument.
40. Contact details are accessible and clear	83	Except for the experts who were not totally sure about the clarity and accessibility of the contact details, the other respondents rated this aspect of communication high. The researcher believes that communication as a whole will be promoted by the high evaluation on this question.
An average of 78.7% of the respondents supports the success of research question 2		

5.4.3 Research question 3

In order to determine whether this objective had been met, the researcher calculated the outcome of the design principles applied in the program. Questions relevant to this objective were selected from the questionnaires and are set out in Table 5.9 below. The average of the four respondent groups indicated in what way the objective had been met.

Table 5.8 Questions and comments regarding research question 3

Questions	Average of respondents(%)	Comments
(Layout) 1. Appearance of the web site/overall "look?	68	Workability regarding the overall look of the site was acceptable and no urgent changes were necessary. Minor adaptations should be made to accommodate suggestions from individuals.
2. The readability on the pages?	81	Readability was good and supported different aspect of workability.
3. Consistency of all elements in the site?	64	The consistency throughout the site was acceptable for all. Individual recommendations could be attended to.
4. Use of colour in the site?	71	The use of colour caused no urgent upset, however comments from students indicated that brighter colours could make the site more eye-catching and thus more popular and successful.
5. Choice of fonts?	72	The choice of fonts was accepted and no changes were necessary.
(Navigation) 7. Navigation to /from homepage?	67	No definite suggestions about the navigation to and from the homepage from any respondent. The evaluation was satisfactory.
8. Consistency of buttons in site?	84	Very good. The buttons remained unchanged and implicated that the choice of buttons promoted the clarity and workability of the site.
9. Layout of site map for navigation?	71	Evaluation on the sitemap appeared very negative from the students side It needs attention urgently. Although the other groups evaluated the sitemap positively, the students being the primary target population, should be satisfied with the sitemap.
(Communication, support and ease of use) 20.The site is easy to use?	88	All the respondents had easy access and moved through the site freely.
An average of 74% of the respondents supports the success of research question 3.		

5.4.4 Research question 4

How should a web site be structured?

In order to determine whether this objective had been met, questions relevant to the specific objective were selected from the questionnaire and the average taken from all four respondent groups indicated in what way the objective had been met.

Table 5.9 Questions and comments regarding research question 4

Questions	Average of respondents(%)	Comments
(Layout) 6. Layout of the site map?	68	The structure of the web site was displayed in the site map. The students misunderstood the map or disliked the total look of it and their evaluation of the site map was very negative. The other groups experienced the site map functional. To accommodate the target population, a change to the structure in that regard would be essential.
(Content) 12. Content in manageable chunks?	65	Lecturers appeared to be dissatisfied with the presentation of the content. The fact that a lecturer supplied the content indicated however that the result of this aspect could be rectified easily..
(Navigation) 7. Navigation to /from homepage?	67	This aspect of the **navigation** dimension was satisfactory to all the respondents. It seems as if every one managed his/ her way through the site quite easily.
8. Consistency of buttons in site?	84	The consistency of the structure appeared to be acceptable to all the respondents.
An average of 71% of the respondents supports the success of research question 4.		

5.5 Summary

Referring to Table 5.6 to Table 5.10, minor changes will maximize the success of the program as a whole. The findings, which derived from the results provided by the summative evaluation in this chapter, will be discussed in Chapter 6. The researcher will make the necessary recommendations in Chapter 6.

Chapter 6

Conclusions and Recommendations

Chapter 6

Conclusions and Recommendations

6.1 Introduction

This chapter deals with the aspects, which contributed to the success of the program deriving from the findings in Chapter 5. The findings indicated that the prototype program managed to meet the **essential issues to achieve effective learning and comfortable and efficient communication**.

In this chapter the researcher will also focus on the different opinions brought forward by the respondents who evaluated the program from different perspectives.

What are the issues to consider when building a web site in order to achieve effective learning and comfortable, efficient communication within an educational institute?

With the main research question in mind, the overall value and functionality of the program are discussed.

The researcher indicates limitations that affected the research throughout and makes recommendations for improving the program in order to enhance the value and functionality. The researcher suggests general recommendations for similar developments and discusses the possibility of further research to be conducted.

6.2 Research sub-questions supporting the main question

Following are the sub questions, which were evaluated in Chapter 5. This evaluation indicated how successful the different aspects of user interface, related to each individual question, were applied to the program.

- How will effective learning be achieved?

(Content)

- How can comfortable and efficient communication channels be incorporated?

(Communication)

- How should the web site be structured?

(Structure)

- What will make the web site work (which design principles should be applied)?

(Design)

6.2.1 How can effective learning be achieved?

According to the findings of this study, the possibility of **effective learning has been achieved** and is displayed in Table 6.1 as a percentage rated by each group of respondents.

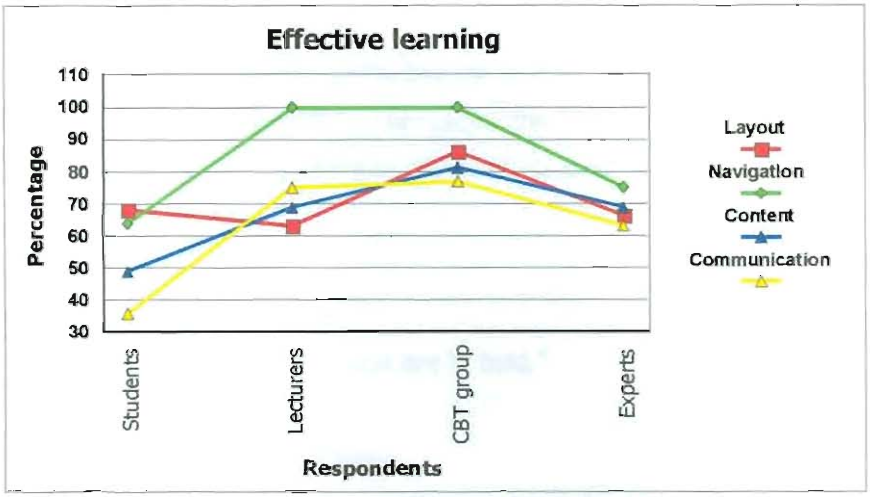
Table 6.1 Aspects of the dimensions relevant to question 1 (effective learning)

Research question 1.	Aspects evaluated	Dimensions of user /expert interface	Students	Lecturers	CBT group	Experts
How can effective learning be achieved?	2. The readability on the pages?	Layout	80 %	75 %	92 %	75 %
	3. Consistency of all elements in the site?	Layout	56 %	50 %	85 %	63 %
	4. Use of colours in the site?	Layout	56 %	75 %	92 %	62 %
	5. Choice of fonts?	Layout	56 %	75 %	92 %	63 %
	8. Consistency of buttons in site?	Navigation	60 %	100 %	100 %	75 %
	10. Navigation options clear and easy?	Navigation	68 %	100 %	100 %	75 %
	12. Content in manageable chunks?	Content	64 %	50 %	69 %	75 %
	13. Content are understandable/ appropriate?	Content	64 %	75 %	85 %	75 %
	14. Presentation of content gains attention?	Content	**32 %**	75 %	85 %	63 %
	15. Choice of graphics?	Content	**36 %**	75 %	85 %	63 %
	18. Site will promote effective learning?	Communication, Support	**36 %**	75 %	77 %	63 %

*Values in RED/BOLD indicate an urgent adaptation to the specific dimension.

Figure 6.1 indicates the success of the program in terms of effective learning.

Figure 6.1 Success rate of effective learning through the program



6.2.1.1 Dimension: Layout

Aspects of **layout** that addressed the issue of **effective learning** (Table 6.1) were calculated to reach an average for each respondent group. This average represents the success of the research question being met. The conclusions and recommendations can be made from the averages displayed in Figures 6.1.

For **effective learning** to take place use of colour, readability and consistency of elements were the relevant aspects to evaluate. Refer to Table 6.1 for percentages on all aspects evaluated by the different respondents.

According to Figure 6.1 all the respondents rated the layout in terms of **effective learning** average and above. The different aspects of layout are discussed in the literature review (Chapter 2). Schneiderman (1998) stresses that the user interface can cause a certain amount of fear with the user if the user does not meet "terminology, layout or level of complexity."

The literature supports the use of colours that coordinate with the look and feel of the site, which is relevant to this site. (Refer to 2.7.6)

- Comments from Experts

"Impressive, good colours, graphics and general layout"
"Voldoen aan basiese ontwerp beginsels en sal leer bevorder met enkele aanpassings"

- Comments by other respondents

"Good look and feel" (Students)

"More pictures and design" (Students)

6.2.1.2 Dimension: Content

Referring to Table 6.1 the content regarding **effective learning**, is satisfactory except for the choice of graphics and the presentation of content to gain attention, which was unfavorable according to the students. The average percentage represented by all the respondents for content **to achieve effective learning** is however acceptable and succeeds in answering this sub question.

Schwier and Misanchuk (1993) concluded in saying that graphics can add to learning from text but graphics for the mere reason of decoration distracts the learner's attention from the communication. (Refer to 2.7.6)

The comments about the visual excitement and boring layout by the students are therefore not crucial to the overall success of the program. It is also quite possible to say that the students misinterpreted the purpose of the site being informational more than decorative.

Schwier and Misanchuk (1993) support the use of the "scroll leaf" between sections or at the end of a page for organizing text presentation. Comments about the "scroll" being too big is an aspect, which the researcher will attend to.

Schwier and Misanchuk (1993) advise the use of a 9-12-point font for body text, which is the case in this site and should therefore accommodate the majority of users. The minority of respondents who had a problem with the font size is thus of no concern.

- Comments by experts

"Keuse van grafiese werk is goed."
"Bar that divides paragraphs or ideas are to bold."

- Comments by other respondents

"Dull! Interior Design should be something exciting. Font also to small." (CBT)
"Long text phrases" (Students)
"More info on subjects and lecturers." (Students)
"Visually boring, dull colours" (Students)

6.2.1.3 Dimension: Navigation

From Figure 6.1 it is clear that the average respondent found the navigation successful. The conclusion made from these findings is that the navigation has succeeded in supporting **effective learning.**

Schwier and Misanchuk (1993) believe that the consistency of navigation elements is an important factor in the success of a program. (Refer to 2.6.2.2)

Respondents were confused with navigation to and from the site, the reason being that the home button was not visible on the screen without scrolling. It is therefore recommended that the button should be moved and made more prominent.

- Comments by experts

"From some pages the access to other pages aren't direct e.g. from site map."

- Comments by other respondents

"Works well!" (Student)
"Site is consistent, enables user control." (Student)
"Clear and easy except for site map" (CBT)

6.2.1.4 Dimension: Communication, Support and ease of use

Table 6.1 reveals the weakness in this dimension. According to the students the program does not promote **effective learning.** The researcher concludes that urgent attention be given to this dimension and specifically to the relevant aspect concerning this research question.

With the incorporation of e-mail and the bulletin board it is believed that effective learning will be promoted. Broholm and Aust (1994) state that the essential learning process of interaction can only take place when a computer-mediated-communication is installed. The fact that the communication facilities were not workable at the time of the evaluation possibly caused the negative feedback on communication promoting **effective learning** by the majority of students.

The general feeling about the communication and support towards effective learning is positive.

- Comments by experts

"Useful information, informative and friendly."

- Comments by other respondents

"Good information." (Student)

6.2.2 How can comfortable and efficient communication channels be incorporated?

Table 6.2 indicates the values given by the respondents to aspects of the dimensions, which affected the communication issue.

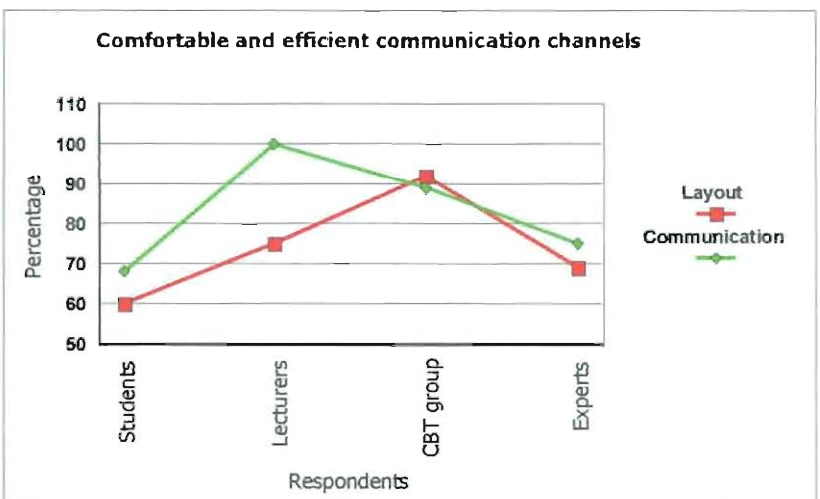
Table 6.2 Aspects of the dimensions relevant to Question 2 (Communication)

Research question 2.	Aspects evaluated	Dimensions of user /expert interface	Students	Lecturers	CBT group	Experts
How can comfortable and efficient communication channels be incorporated?	2. The readability on the pages	Layout	80 %	75 %	92 %	75 %
	6. Layout of the site map	Layout	**40 %**	75 %	92 %	63 %
	20. Use of bulletin board and Listserve	Communication, Support	60 %	100 %	85 %	87 %
	16. Contact details are accessible and clear	Communication, Support	76 %	100 %	92 %	63 %

*Values in RED/BOLD indicate an urgent adaptation to the specific dimension.

According to the findings in Table 6.2 it is clear that the majority of the respondents were satisfied with the incorporation of comfortable and effective communication channels as displayed in Figure 6.2.

Figure 6.2 Success rate of the communication channels incorporated in the program



6.2.2.1 Dimension: Layout

The layout of the site regarding **comfortable and efficient communication** is indicated in Figure 6.2 as successful (above 60%).

6.2.2.2 Dimension: Communication, Support and ease of use

Communication facilities for the purpose of comfortable communication between students and other students as well as students and lecturers appeared to have been successful.

- Comments by experts

"Link to application form goes to university home page. Is it possible to go directly to the application for better communication?"

6.2.3 What will make a web site work?

Under this dimension the researcher refers to the aspects which will attract visitors to the site, make the program enjoyable to the user, create a friendly and easy to use interface etc. To summarize the above, the researcher took all design principles applied to the program, into consideration.

Table 6.3 indicates the success of the design principles applied to the program according to the various respondents.

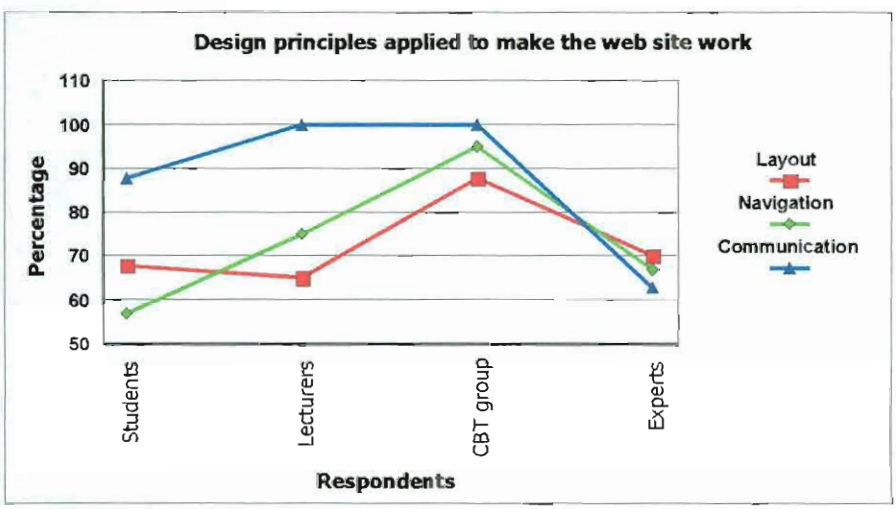
Table 6.3 Aspects of the dimensions relevant to Question 3 (design)

Research Question 3.	Aspects evaluated	Dimensions of user/ expert interface	Students	Lecturers	CBT	Experts
What will make a web site work?	1. Appearance of the web site/overall "look?	Layout	56 %	**50 %**	77 %	87 %
	2. The readability on the pages?	Layout	80 %	75 %	92 %	75 %
	3. Consistency of all elements in the site?	Layout	56 %	**50 %**	85 %	63 %
	4. Use of colour in the site?	Layout	56 %	75 %	92 %	62 %
	5. Choice of fonts?	Layout	56 %	75 %	92 %	63 %
	7. Navigation to /from homepage?	Navigation	68 %	**50 %**	85 %	63 %
	8. Consistency of buttons in site?	Navigation	60 %	100 %	100 %	75 %
	9. Layout of site map for navigation?	Navigation	**44 %**	75 %	100 %	63 %
	20. The site is easy to use?	Communication, Support	88 %	100 %	100 %	63 %

*Values in RED/BOLD indicate an urgent adaptation to the specific dimension.

According to the findings in Table 6.3 it is clear that the majority of the respondents were satisfied with the design principles applied to the web site in order to make it work. A graphic representation of the findings in Table 6.3 is displayed in Figure 6.3.

Figure 6.3 Success rate of the design principles applied to promote the functionality of the program



6.2.3.1 Dimension: Layout

An average of 80% has approved of the design principles applied to the layout. According to some of the experts the visibility of text on the site map is not satisfactory and needs to be changed. Minor changes to perfect the style of headings are recommended by the experts.

- Comments by experts

"Die site map is goed uitgelê, maar kyk na kleure wat teks moeilik laat lees."
"Check layout for exact same style and punctuation mistakes."
"Font kan kleiner, minder "scrolling"

- Comments by other respondents

"The home page could be more interesting!"

6.2.3.2 Dimension: Navigation

The site map as an aspect of the navigation affected the evaluation by the students and experts. Seen as a whole, the navigation succeeded in supporting the design of the program and only minor changes are recommended.

- Comments by other respondents

"User-friendly but home button can be more prominent." (CBT)

6.2.3.3 Dimension: Communication, Support and ease of use

The average of the communication aspect supporting the design of the site is very good. The researcher is convinced that operational communication channels would definitely improve the workability of the site in terms of design.

Through the literature it is clear that the addition of an electronic mail facility and incorporation of bulletin board will offer the opportunity for students to interact as well as "opening a path to learning material by experts." (Harasim, 1996)

The application form provided as well as course information fulfills the need for potential students to enroll and to gain essential knowledge.

- Comments by other respondents

"Site is understandable and easy to use" (CBT)

6.2.4 How should a web site be structured?

Under this question the researcher included aspects like the site map, chunking of content, the composition of the different sections and the consistency of the navigation in general. According to the findings in Table 6.4 the issue concerning the structure of the program has been met successfully.

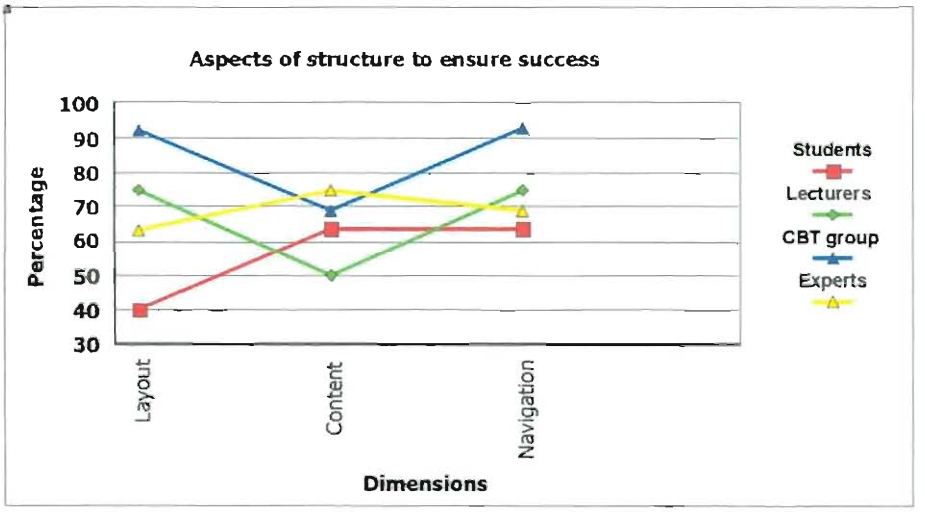
Table 6.4 Aspects of the dimensions relevant to Question 4 (Structure)

Research Question 4.	Aspects evaluated	Dimensions of user/ expert interface	Students	Lecturers	CBT group	Experts
How should the web site be structured?	6. Layout of the site map?	Layout	**40 %**	75%	92%	63%
	12. Content in manageable chunks?	Content	64%	**50 %**	69%	75%
	7. Navigation to /from homepage?	Navigation	68%	**50 %**	85%	63%
	8. Consistency of buttons in site?	Navigation	60%	100 %	100 %	75%

*Values in RED/BOLD indicate an urgent adaptation to the specific dimension.

According to the findings in Table 6.4 it is clear that the majority of the respondents were satisfied with the overall structure and workability of the web site. Only the students indicated a problem with the site map and a recommendation will be made. A graphic representation of the findings is displayed in Figure 6.4.

Figure 6.4 Success rate of the overall structure and workability of the program.



6.2.4.1 Dimension: Layout

The students indicated that they did not approve of the layout of the web site in terms of the structure. The aspect of this dimension that needs attention, is the site map.

- Comments by experts/ other respondents

"Site map initially confusing, understood it later however."

6.2.4.2 Dimension: Content

The lecturers indicated the lowest value for the content in terms of the structure. According to the lecturers the chunking was not efficient/successful. Bearing in mind that the client (lecturer) supplied the content, the researcher assumes that new/added content for the **Program in Interior Design** in future will be presented according to their preference. Recommendations will however be made.

- Comments by experts

"Some pages too long. Try to use little scrolling by dividing the pages into sub pages."

- Comments from other respondents

"Informative!"

6.2.4.3 Dimension: Navigation

All dimensions of navigation, which affects the structure, have met this sub question successfully.

- Comments from experts

"Check links to be active on all pages."
"Structure of the link page is brilliant!"

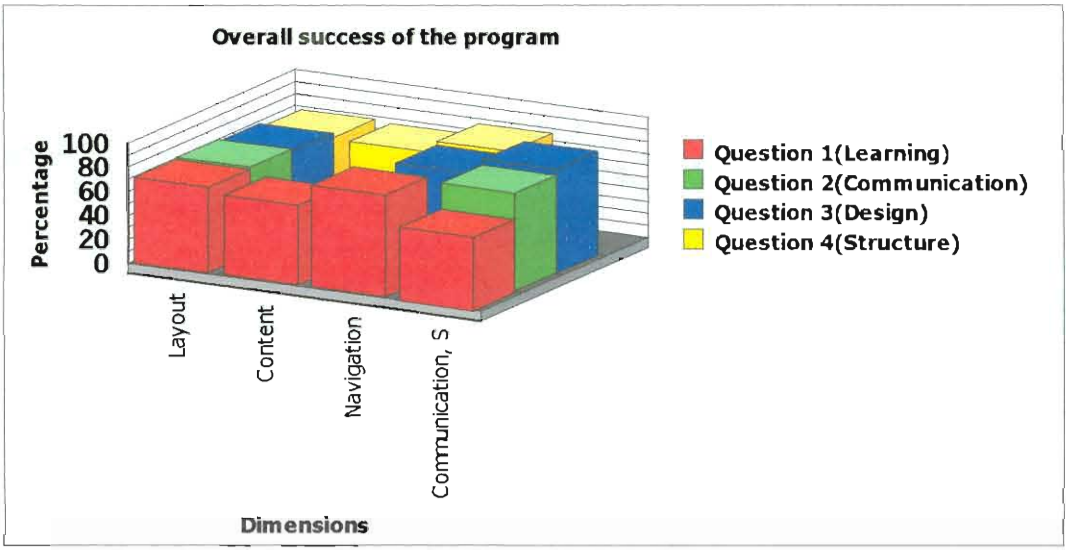
- Comments from other respondents

"Structure of navigation is clear and well designed." (CBT)
"Home buttons can be more prominent." (CBT)
"Site is consistent, enables user control." (Student)

6.3 Overall functionality of this program

The limitations, which the researcher experienced through out this study, had considerable effect on the final recommendations and conclusions. The overall success of the research in terms of the sub questions is displayed in Figure 6.5.

Figure 6.5 Overall success of the program in terms of the sub questions



Although students (enrolled and potential) were the target population for the development of this research, the researcher decided from the beginning that it would be wise to involve individuals for the purpose of the evaluation.

Lecturers, including the client, provided an evaluation perspective regarding the content. A group, with a meaningful knowledge of computer- assisted instruction (CBT group), focussed their opinions on the functionality of the program with regards to the effectiveness of the layout and the navigation as well as the principles of effective learning. Eight experts evaluated the program, focussing on the web design principles. Their comments and suggestions improved the functionality of the program as a whole.

Exceptions indicated in RED/BOLD print in Tables 6.1 to 6.4 and the comments made by respondents are summarized in Table 6.5. Recommendations for the final changes to the program are primarily formulated according to these exceptions.

Note: All values below 50% are interpreted as exceptions and are indicated in red/bold. Recommendations for the exceptions are made where applicable.

Table 6.5 Comments from respondents that lead to essential changes in the program.

Lay out		
Colours	Students	"Dull colours...."
Fonts	Students/ CBT	"Font on home page too small."
Sitemap	Students	"Sitemap can be more graphical."
Overall look	Students/ Lecturers	"Not appealing, new and exciting!"
Content		
Manageable chunks	Lecturers	"Long text phrases."
Presentation to gain attention	Students	"Boring, dull colours...." "More substance to grab the essence of Interior Design."
Choice of graphics	Students	"Not visually exciting...." "Use more design, graphics!"
Navigation		
To and from homepage	Lecturers	"Home buttons more prominent."
Sitemap for navigation	Students CBT	"Kleure op die veskillende agtergronde nie maklik leesbaar nie." "Clear and easy except for site map"
Communication, support and ease of use		
Promote effective learning	Students	"As soon as all the facilities are in working order it will surely promote learning."

Compared to the comments in Table 6.5, feedback from the experts displayed in Table 6.6 had great value in terms of the final recommendations.

Table 6.6 Comments from experts that affected the final recommendations

Dimension	Comment from expert	Recommendation
Layout	"Die site map is goed uit gelê, maar kyk na kleure. ""Font kan kleiner en scrolling' minder." "Home page te 'boring' "Some pages too long." "Check text colours on some of the backgrounds."	Colour adaption to something exciting. Content divided into "subs" Add movement, colour etc." Remove unnecessary info. Make text colour visible
Content	"Grafika kleiner om inhoud nie te steur." "Vermy scrolling by grafika"	Resize images where necessary. Resize graphics
Navigation	"Linkpage is 'n goeie idee."	N/A
Communication	"Useful information. Informative and friendly"	N/A
General	"Impressive!" "Rustige site en proffesioneel."	N/A

6.3.1 Exceptions

The exceptions in Figures 6.1 to 6.4 can be interpreted in terms of the research questions as follows:

6.3.1.1 Positive exceptions (above 70%)

- Lecturers and CBT group indicated that the Navigation supports **effective learning.**
- Experts indicated that the Navigation is favorable for **effective learning**.
- CBT's rated the Layout as very successful for **learning**.
- Lecturers and the CBT group evaluated the Content high, which affects the **learning** possibility positively.
- The lecturers and CBT group evaluated the Communication and support in terms of comfortable and efficient **communication** excellent.
- All the respondents rated the functionality of the program in terms of **design** above average.

6.3.1.2 Negative exceptions (below 50%)

- Students rated the functionality of Communication and support with regards **to effective learning** (Fig. 6.1), very low and recommendations will be discussed.
- Students evaluated the functionality of the Layout in terms of **structure** (Fig.6.4) not favorable and program specific recommendations will be discussed.

6.4 Limitations of the study

Table 6.7 displays a list of limitations, which affected the study. The effect of the various aspects on the study as a whole is indicated and recommendations will be made accordingly.

Table 6.7 Summary of the limitations and the effect on the research

Phase of the research	Limitation	Result /effect
Analysis	Target population • Availability • Control • Changes in Faculty	✓ Enrolled students were not readily available to fill out the questionnaire. This resulted in a smaller respondent group and a possibility of in-accurate data. ✓ Control/supervision was not sufficient, due to the fact that respondents participated in their own time. ✓ Changes made during this phase affected the design of the program as well as the content already included.
Design	• Client availability • Content/ Information • Perspectives from the different departments	✓ Due to a tight schedule, the client had minimal input in the design. Valuable time was wasted on changes and re-designing. ✓ Due to a lack of cooperative working between the researcher and the client, the presentation of the content was not effective enough. ✓ The announcement of a uniform theme for all the departments within the **School for Built Environment**, resulted in multiple changes leaving some individuals unhappy.
Development	• Knowledge of the authoring tool. • Bandwidth/ Browsers of the targetgroup.	✓ Due to limited knowledge the developer had to make use of additional advice and support which resulted in a different look regarding the product as a whole. ✓ Due to these technical aspects the developer was restricted to an outlay best viewed by the majority e.g. no frames etc.
Production	N/A	N/A
Evaluation	• Respondents • Facilities	✓ Student group could not evaluate together and resulted in external factors which influenced the data e.g. control over the evaluation procedures and misinterpretation of questions. ✓ The researcher wished for a larger lecturer involvement regarding the evaluation. ✓ Students made use of different venues for evaluation and resulted in a variety of settings, which had a huge effect on the viewing of the program and affected the findings to a great extent.

6.5 Recommendations

Recommendations regarding the multimedia program, which was developed to **ensure effective learning and a comfortable and efficient communication facility,** are discussed from the following perspectives:

- The program as a product of this research
- Similar programs for further study/research

6.5.1 Recommendations for the program as a product of this research

When dealing with the final recommendations, the evaluation of relevant dimensions in terms of each research question is calculated. Comments from the experts have a great influence on the recommendations to follow.

According to the content in Table 6.5 and Table 6.6 the researcher compiled the recommendations in order to improve the program as a product of the research study.

Table 6.8 displays the recommendations made to each dimension of the multimedia program.

Table 6.8 Final recommendations to the program as product of the research

Dimensions and aspects	Recommendations	Effect of limitations
Layout:		
♦ Colours	☺ Apply brighter colours	☹ Prescribed by client.
♦ Home page	☺ Add movement/animation	☹ N/A (no limitation)
♦ Font	☺ Enhance visibility of text on certain background	☹ No limitation
	☺ Resize font where necessary	☹ Personal preference
♦ Overall look	☺ Remove unnecessary info (page length/scrolling)	☹ Changes in Faculty ☹ Prescribed by client
Navigation		
♦ To and from home page	☺ Make home button visible on screen without scrolling.	☹ Settings of different computers
♦ Navigation options	☺ Make active link on the navigation bar more prominent.	☹ N/A (no limitations)
♦ Site map for navigation	☺ Avoid confusion among the users by resizing the site map to fit one screen.	☹ Control over target population lead to misunderstanding ☹ Settings
Content		
♦ Presentation to gain attention	☺ Make it more colourful ☺ Incorporate more student work	☹ Prescribed colour ☹ Work not available at the time.
♦ Choice of graphics	☺ Resize graphics to prevent scrolling.	☹ N/A
	☺ Add more design orientated images	☹ Prescribed content (including images)
Communication,Support and ease of use		
♦ Promote effective learning	☺ Communication channels must be operational	☹ Application according to the regulations of University of Pretoria
General		
♦ Addition of assessment strategy	☺ Place worksheets and projects on the web site	☹ Security should be rendered by the U.P web master
♦ Involvement of students	☺ Opportunity for students to design specifically for the web site.	☹ No limitations

6.5.2 Recommendations for similar programs/ further studies

This web site was developed during the repositioning of Faculties at the University of Pretoria. A universal theme for the Faculty of Engineering was not yet finalized. The final decision regarding the appearance of a web site for the **Program in Interior Design** has not been agreed upon.

During the beta-testing phase, the different Schools of the recently structured Faculty decided on a uniform look, which included a web site for the Faculty as a whole. The other Schools did not agree to the site specifically designed for the Program for Interior Design.

The research done for the purpose of this site will be utilized for future use. Whether people within the **Program in Interior Design** will compile a new design or somebody from outside is irrelevant. The fact is that the information gathered through this research concerning the target population, the content, the design elements and the application thereof would be of immeasurable value to an extension of this web site or similar projects in future.

The technology involved in educational and informational multimedia, which improves and expands daily, implicates new approaches and facilities to be added, to such a site.

The following applications could be researched as possible additions to an educational program in order to change the role of a full time lecturer/educator to that of a guide and consultant:

- **Virtual reality**-to partake in a real-time class discussion.
- **Assessment** of student work-insert the necessary security e.g. student number etc.
- Photographs from **thumbnails** (small scale) to be enlarged when clicked on with a description of the relevant object.
- **3-dimentional** graphics/ images to visualize the different dimensions to enhance the functionality of a creative and artistic program.

6.6 A final word on Internet based information resource

Although the actual communication channels and proposed Internet links were not active during the testing phase, the respondents were in favor of the outcome of these facilities. It might be because of other similar programs, which they are aware of or even have utilized for the purpose of learning and communication.

This program without doubt accommodated the initial needs brought forward by the majority of students. In case of an extension of the site, the applications mentioned in 6.5.2 would further promote and improve the learning possibilities.

In general, all aspects that are mentioned in Chapter 1 (1.2.1) as the research problems, will be solved to an extent by the implementation of an Internet based information resource.

A data base of the relevant topics, issues and books which are essential to these students as well as their lecturing staff and interested individuals can only be kept up to date and recent by accessing an Internet based information resource. With a discipline such as design, the importance of a web site would enforce the necessary adaptations and changes to keep the facilities effective and the information up to standard.

End Matter

References

Adendorff, D. 2000. *Instructional design principles for developing an interactive learning programme using Arel: a case study / an essay.* Pretoria [S.n.]

Alessi, S.M. & Trollip, S.R. 1991. *Computer-based instruction: methods and development. 2nd Ed.,* Englewood Cliffs, N J: Prentice Hall.

Alessi, S.M. & Trollip, S.R. 2001. 3rd Edition, Multimedia for Learning, *Methods and Development* Massachusetts: A Pearson Education Company.

Bacon, J. 1997. *The Future of Instructional Materials: From Giotto to Virtual Security to the Writing Process.* Johnson County Community College. [On-line]. http://www.jccc.net/~jbacon/future.htm [2000, March 20]

Bass, R. 1997. A brief guide to interactive multimedia and the study of the United States. [On-line]. http://georgetown.edu/crossroads/mltmedia.html [1999, October]

Bates, A.W. 1995. *Technology, open learning and distance education.* London: Routledge.

Berry, L. 1991. Visual complexity and pictorial memory: A fifteen year research perspective. In: Simonson, M.R. & Treimer, M. (Eds.). *Proceedings of selected research paper presentations at the 1985 Annual Convention of the Association for Educational Communications and Technology* (p. 92-102). Ames, IA: Iowa State University Press.

Bork, A. 1984. Computers in composition instruction. In R.Shostak (Ed.), *Courseware design. Design considerations.* Eugene, OR; ICCE

Boyd-Barrett, O. & Scanlon, E. 1990. *Computers and learning.* Addison-Wesley Publishing Company

Broholm, J.R. & Aust, R. 1994. Teachers and Electronic Mail: Networking on the Network. *Journal of Technology and Teacher Education,* 2(2), 167-182

Bruce, B. & Peyton, J.K. & Batson, T. 1993. *Network-Based Classrooms.* Cambridge University Press.

Bruemmer, P.J. 2000. The Directory Listing Advantage. [On-line]. http://www.clickz.com/cgi-bin/gt/article [2001, May]

Clarke, P. 1998. *Telematic teaching of adults via the World Wide Web: a university case study.* University of Pretoria: [S.n.]

Coetzee, H. 2000. *The development of a World Wide Web information resource for farmers with specific reference to yogurt production.* Thesis (PHD), University of Pretoria

Collier, D. & Cotton, B. 1989. *Basic desktop design and layout.* Cincinnati, OH North, Light Books.

Cotrell, J. & Eisenberg, M.B. 1997. Web design for Information Problem-Solving: Maximising value for users. *Internet Librarian,* May. 1997

Crawford, S. 2000. *Focus pocus: The Promise of Portals.* [On-line].
www.netcai.com [2000, June]

Cronjé, J.C. & Clarke, P.A. 1998. *Teaching 'Teaching on the Internet' on the Internet.* [On-line]
http://hagar.up.ac.za/catts/learner/patsy/rbo97c.doc [1999, October].

Cronjé, J. 1997. Interactive Internet: Using the Internet to facilitate co-operative distance learning. *South African Journal of Higher Education 11*(2): 149 – 156.

De Jong, T. & Sarti, L. 1994. *Design and production of multimedia and simulation-based learning material.* Dordrecht : Kluwer Academic Publishers

Dede, C. 1989. The Evolution of Distance Learning: Technology-Mediated Interactive Learning. *Report for the study: "Technologies for Learning at a distance"* (Science, Education and Transportation Program for the Office of Technology Assessment, Congress of the United States).

Draper, S. 1997. Adding (negotiated) learning management to models of teaching and learning. *ITFORUM paper*
[On-line] http://www.psy.gla.ac.uk/~steve/TLP.management.html [2000, April 15].

Dreamweaver information. 1999. [On-line]
http://www.macromedia.com/software/dreamweaver/ [2000, June]

Ely, Donald.P. & Plomp, T. 1996. *Classic Writings on Instructional Technology.* Libraries Unlimited, Inc. Englewood, Colorado.

Flouris, G. 1989. The use of an Instructional Design Model for Increasing Computer Effectiveness. *Educational Technology,* 29(1), 14-21

Franklin, C. 2001. How Internet Search Engines Work. [On-line]
http://www. howstuffworks.com/web-page.htm. [2001,July]

FrontPage information. 2000. [On-line].
http://www.microsoft.com/catalog/

Garner, K.H. 1991. 20 Rules for arranging text on a screen. In R.B. Frantzreb (Ed.), *Training and development yearbook, 1991 edition.* Englewood Cliffs, NJ: Prentice-Hall.

Gehlauf, D.N., Schatz, M.A. & Frye, T.W. 1991. Faculty perceptions of interactive television instructional strategies: implications for training. *American Journal of Distance Education,* 5(3), 20-28.

Gery, G. 1987. *Making CBT happen.* Boston, Ma: Weingarten Publications.

Glynn, S.M., Britton, B.K. & Tillman, M.H. 1985. Typographical cues in text: Management of the reader's attention. In Jonassen (Ed.), *The technology of text (volume 2): Principles for structuring, designing, and displaying text.* Englewood Cliffs, NJ: Educational Technology Publications

Grabinger, R.S. 1985. *Relationships among text format variables in computer-generated text.* Paper presented at the Annual Conference of the Association for Educational Communications and Technology, Research and Theory Division, Las Vegas, NV.
Greller, L.M. & Barnes, S. 1993. Groupware and interpersonal text: The computer as a medium of communication. *Interpersonal computing and Technology,* 1(2). [On-line]
http://jan.ucc.nau.edu/~ipct-j/1993/n2/greller.txt [1997, March 15].

Hannafin, M.J. & Hooper, S. 1989. An integrated framework for CBI screen design and layout. *Computers in Human Behavior, 5*(3), 155-165
Hannafin, M.J. & Hooper, S. 1991. The effects of group composition on achievement, interaction, and learning efficiency during computer-based cooperative instruction. *Educational Technology Research and Development, 39*(3), 27-40.

Hannafin, M. J. & Peck, K. L. 1988. *The design, development and evaluation of instructional software.* New York: Macmillan

Harasim, L.M. 1996. Computer networking for Education. In T. Plomp and D.P. Ely. (Eds.), *International Encyclopedia of Educational Technology (2nd edition).* Oxford: Pergamom.

Harvard Educational Review 32:1962

Heines, J.M. 1984. *Screen design strategies for computer-assisted instruction.* Bedford, MA: Digital Press.

Hiltz, R. & Wellman, B. 1997. Asynchronous Learning Networks as a Virtual Classroom. *Communications of the ACM,* 40(9), 44-49.

Hodge, K. 2000. Dreamweaver. ***.net***, Issue 31, March: 70-71

Hodge, K. 2000. Dreamweaver. ***.net***, Issue 32, April: 74-76

Hodge, K. 2000.Web Tech: Dreamweaver 3. ***.net***, Issue 34, June:72-73

Hodgkinson, C. & Cronje, J. 1999. Designing Effective Technology-Assisted Learning Materials. A Workshop.

Holden, M.C. & Wedman, J.E. 1993. Future issues of computer-mediated communication: The results of a Delphi study. *Educational Technology Research and Development*, 41(4), 5-24.

Isaacs, G. 1987. Text screen design for computer-assisted learning. *British Journal of Educational Technology*, 1(18), 41-51.

Kennedy, A.J. 1997. *The Internet and the World Wide Web: the Rough Guide.* London: Penguin Books Ltd.

Kennedy, D. & Taylor, P. 1994. *Hypermedia design for enriching conceptual understanding in chemistry.* Paper presented at the Second International Interactive Multimedia Symposium, Promaco Conventions, Perth, Western Australia.

Lang, K. 1987. *The writer's guide to desktop publishing.* London, Academic Press.

Lappas, P.D. & Kekkeris, G. 1996. Multimedia Guide. [On-line]. http://thrace.ee.duth.gr/multi/tableng/html [2000, September]

Laurillard, D.M. 1987. Computers and the emancipation of students: Giving control to the learner. *Instructional Science, 16*, 3-18.

Laurillard, D.M. 1993. *Rethinking University Teaching: A Framework for the effective use of educational technology.* London: Routledge.

Laurillard, D.M. 1994. *Multimedia and the changing experience of the learner.* Paper presented at the Asia Pacific Inf. Tech.

Laurillard, D.M. 1996. The Changing University. ITFORUM paper. [On-line] http://itech1.coe.uga.edu/itforum/paper13/paper13.html [2000, Nov 11]

Le Page, D. 1999. The new untouchables...On the Internet. *Mail & Guardian*, April 1 to 8, 1999:31.

Levine, R. 1999. Navigation/Audience. [On-line] http://www.sun.com/styleguide/tables/Audience.html [2001, March]

Lichty, T. 1989. *Design principles for desktop publishers.* Glenview, IL: Scott, Foresman and Co.

Lynch, P. J. & Horton, S. 1997. Yale C/AIM Web Style Guide. [On-line] http://info.med.yale.edu/caim/manual/index.html [1999, April]

Maddux, C.D. 1998. The World Wide Web: some simple solutions to common design problems. *Educational Technology,* 23(9-10): 24-28

Marzano, R.J. et al. 1988. *Dimensions of Thinking, a Framework for Curriculum and Instruction.* Alexandria, VA: Association for Supervision and Curriculum Development.

Merle. 1999. [On-line]. Www.eboz.com/cgi_bin/ads/redirect.cgi/5 [1999 October]

Misanchuk, E R. 1992. *Preparing Instructional Text: Document design using desktop publishing.* Englewood Cliffs, New Jersey: Educational Technology Publications.

PCFormat, 2000. *Tried and Tested*, Issue 39, April 2000, 63

Phillips, R. 1997. *The Developer's Handbook to Interactive Multimedia.* Pentonville Rd. Lodon, Stirling USA.

Pieters, J.M. & Simons, P.R.J. & De Leeuw, L. 1990. *Research on Computer-Based Instruction.* Amsterdam (etc.): Swets and Zeitlinger.

Reeves, T. 1997. *Multimedia Development Tools: Evaluation Tools.* [On-line]. http://mime1.marc.gatech.edu/MM_Tools/evaluation.html [2000, March]

Regian, J.W. & Shute, V.J. 1992. *Cognitive Approaches to Automated Instruction.* Lawrence Erlbaum Associates Publishers, Hillsdale.

Remmers, E. 1998. Guidelines for WWW-based support environments for education professionals. [On-line]. http://users.edte.utwente.nl/remmerse/litstudy/

Russell, T.L. 1999. The no significant difference phenomenon. [On-line]. http://cuda.teleeducation.nb.ca/nosignificantdifference/ [2000, April 28]

Sachs, D. &. Stair, H. 1997. *The 7 Keys to Effective Web sites.* Prentice Hall PTR Prentice Hall Inc.

Schneiderman, B. 1998. *Designing the User Interface: Strategies for Effective Human-Computer-Interaction.* The University of Maryland, Addison-Wesley Longman, Inc.

Schwier, R.A. & Misanchuk, E.R. 1993. *Interactive multimedia Instruction.* Englewood Cliffs, New Jersey: Educational Technology Publications.

Smith, R.M. 1983. *Learning how to learn: Applied theory for Adults.* Open University Press, Buckingham.

Stratfold, M. & Laurillard, D. 1993. Towards a new grammar of multimedia. *Educational Multimedia & Hypermedia Annual 1993*

Tinker, M.A. 1963. *Legibility of print.* Ames, IA: Iowa State University Press.

Trochim, W.M. 1999. The research methods knowledge database, 2nd edition. [On-line]. http://trochim.human.cornell.edu/kb/index.htm

Vacca, J.R. 1996. *Virtual Reality: Strategies for Intranet and World Wide Web Applications.* Charleston South Carolina U.S.A.

Van Brakel, P.A. 1996. Implementing Study guides via Internet's World Wide Web. *Proceedings of Conference on Information Technology in Tertiary Education, 1996.* University of Cape Town.

Vaughan, T. 1998. *Multimedia: making it work, 4th ed.* New York: Osborne/McGraw-Hill

Veen, J. 1998. The Foundation of Web Design. [On-line]. http://www.hotwired.com/webmonkey/templates/print [2000, March]

Venezky, R. & Osin, L. 1991. *The Intelligent Design of Computer-Assisted Instruction.* White Plains N.Y

Vockell, E. & Van Deusen, R.M. 1989. *The Computer and Higher-Order Thinking Skills.* Mitchell Publishing, Inc., Watsonville, CA

Wall Street Journal 1 March 1995, A1

Web builder. Advice and software to produce the perfect web site. 2000. ***.net***. Issue 32, April: 63

Web Course Evaluation Checklist. 2000. [On-line] http://iitclass.bloomu.edu/webeval/Summary.htm [1999, April]

White, J.V. 1983. *Mastering Graphics* N.Y: Bowker

Wilson, R.F. 1996. *Web Interactivity and Customer Focus.* Issue 20. [On-line]. http://www.wilsonweb.com/articles/web.inter.htm [2000, March]

Appendix A: Questionnaire 1 [↟]

Open day - Potential target population

You are requested to complete this questionnaire to assist us in determining whether there is a need for a web site for the **Program in Interior Design.**

Please answer this questionnaire as honest as possible. There is no right or wrong answer. Your answers will be handled in confidence and will be incorporated with those of others. You will remain anonymous, since you do not have to identify yourself.

Thank you for your time and participation.

1. **Personal information:**

Age :	Gender :
Interests/Hobbies :	Marital State :
Home language :	Current Job :
Means of transport : (indicate by circling the appropriate one) **Bicycle** **Car** **Bus** **Taxi** **Other**	

2. **Educational background**:
Highest level achieved_____

Symbol obtained in following subjects at school:

Mathematics :	Science :	Home Economics :
Accounting :	Computer science :	Geography :
Biology :		

If at a tertiary level, indicate major subjects: _____

3. Geographical and cultural information:
Where is your hometown:(indicate X in appropriate block)

Gauteng		Mpumalanga	
North West		Free State	
Namibia		Other	
Northern Province			

What is your language preference: _____

Which other languages do you **speak :** _____ **write :** _____ **read :** _____
What type of accommodation will you use when enrolled (tick applicable) : **Home** **Residence/Hostel** **Apartment/Flat** **Other (indicate) :**

4. Computer skills / Literacy:

Have you ever used a computer :
If yes, how often (indicate): **Daily** **Weekly** **Monthly** **Occasionally**
Do you have your own computer :
If no, do you have access to one :
What type of computer do you use regularly : **386** **486** **Pentium I** **Pentium II** **Pentium III**
How would you rate your computer skills : **Expert** **Good** **Average** **Poor**

5. Internet use:

Do you have an Internet connection : **Yes** **No**
For which purpose do you use the Internet? (circle all the applicable choices) • General information seeking • Specific information seeking • Communication • Surfing
If yes, which service provider do you use ?(e.g. *M-WEB, iAfrica, Intekom*, etc) :
Which browser do you use : **Internet Explorer** **Netscape** **Other**
How do you currently obtain information on a research topic (tick applicable) : **Library** **Magazines** **Internet** **Other (indicate) :**
If you search for information on the Internet, which method/s do you use : **Surfing** **Search engine (which) :** **URL from magazine** **Other (specify) :**

6. Marketing:

How did the information about the Open day reach you : (indicate ONE) **Poster** **Flyer** **TV** **Radio** **Newspaper** **Other (indicate) :**
Why are you interested in the design course : **Talent** **Job opportunity** **Financial prospects** **Interest** **Other :**
For which course did you initially attend the Open Day : _____
If the Open day changed your mind, what course are you now interested in : _____ And why : _____
Your general impression of the design presentation : **Excellent** **Good** **Average** **Poor**
Would a Web site for the Program in Interior Design have been helpful to you, in terms of • general information (entry requirements, directions to location etc.) • e-mail facility to obtain prior information **Yes** **No**

Appendix B: Questionnaire 2 [✞]

Target Population Analysis

Please answer the questions by **drawing a circle** around an appropriate number in a shaded block or write your answer(s) in the shaded space provided

SECTION A

Respondent VR

General Information

1. What is your involvement in the **Program in Interior Design**? (you may indicate more than one)

Lecturer	**1**
Student	**2**
Related Profession (e.g. Architect)	**3**
Interested Individual	**4**
Other (specify)	

V1 4
V2 5
V3 6
V4 7
V5 8

2. What is your occupation?

V6 9-10

Personal Information

3. How old are you? (age in completed years)

V7 11-12

4. In which province is your hometown situated? (only one answer)

Gauteng (South Africa)	**1**	V8	13-14
Mpumalanga (South Africa)	**2**		
Kwazulu Natal (South Africa)	**3**		
North West (South Africa)	**4**		
Northern Province (South Africa)	**5**		
Free State (South Africa)	**6**		
Cape Province (South Africa)	**7**		
Other (specify)			

5. What is your gender?

Male	**1**	V9	15
Female	**2**		

6. What is your language group (you may indicate more than one)

English	**1**	V10	16
Afrikaans	**2**	V11	17
Other (specify)		V12	18

SECTION B

7. Present Accommodation: (only one answer)

House	**1**	V13	19
Flat	**2**		
Rented Room	**3**		
University Residence	**4**		
Other (specify)			

8. Possibility to attend lectures/work shops/ classes:(only one answer)

Always	**1**	V14	20
Regularly	**2**		
Irregularly	**3**		
Seldom	**4**		
Never	**5**		

9. If you answered anything other than **"always"** state the main reason below

	V15	21-22

10. Consider the options below and rate how often you **communicate with fellow students** at each option. Use a scale of **1** to **5** where **1** = **least** frequently and **5** = **most** frequently.

Via Internet		V16	23
Telephone		V17	24
Social gathering		V18	25
Appointment		V19	26
Very seldom		V20	27

11. Consider the options below and rate how often you **communicate with your lecturers** at each option. Use a scale of **1** to **5** where **1** = **least** frequently and **5** = **most** frequently

Via Internet		V21	28
Telephone		V22	29
Social gathering		V23	30
Appointment		V24	31
Very rarely		V25	32

SECTION C

In this section information regarding computer literacy and computer use will be obtained.

12. Consider each option below and prioritize **your access to a computer** on a scale from **1** to **5** where **1** = **least** frequently and **5** = **most** frequently

Home		V26		33
Work		V27		34
Internet Cafe		V28		35
Learning Institution (e.g. University)		V29		36
None		V30		37

13. How do you rate your computer skills? (only one answer)

Excellent	**1**	V31		38
Above Average	**2**			
Average	**3**			
Poor	**4**			

14. How often do you work on a computer? (only one answer)

Daily	**1**	V32		39
Weekly	**2**			
Monthly	**3**			
Never	**4**			

15. Consider each option below and prioritize **your use of a computer** on a scale from **1** to **5** where **1** = **least** frequently and **5** = **most** frequently

Business		V33		40
Studies		V34		41
Internet surfing		V35		42
Other (specify & prioritize)		V36		43
		V37		44

16. Do you have access to the Internet? (only one answer)

Yes	**1**	V38	45
No	**2**		

17. Consider each option below and prioritize your **use of the Internet** on a scale from **1** to **5** where **1** = **least** frequently and **5** = **most** frequently

General information seeking		V39	46
Specific information seeking (e.g. research)		V40	47
Communication		V41	48
Surfing		V42	49

18. Consider each option below and prioritize **the way you obtain information on a specific subject on the Internet** on a scale from **1** to **5** where **1** = **least** frequently and **5** = **most** frequently

Search Engine		V43	50
Trial and Error		V44	51
Time-consuming effort		V45	52
Specific web site address		V46	53
Other (specify & prioritize)		V47	54
		V48	55

19. If information is obtained through trial and error in **question 18**, what would your link words be to search for a specific web site?

	V49	56-57

20. A web site for the Program in Interior Design will be beneficial for: (you may indicate more than one)

Advertising/marketing the Department	**1**	V50	58
Communication (e.g. e-mail, bulletin board)	**2**	V51	59
Access to information regarding the program. (e.g. study guides/ work shops)	**3**	V52	60
Learning & international participation in projects/ work shops	**4**	V53	61

21. Will a communication facility on the Web site of the Program in Interior Design, create a comfortable and effective channel of interacting with all parties involved? (only one answer)

Yes	**1**
No	**2**

V54 [ ] 62

22. What is the **most important** thing you would like to find on a web site for the Program in Interior Design in order to be functional and usable for you, the user?

V55 [ ][ ] 63-64

Thank you for your participation.

Appendix C: Questionnaire 3 [↟]

Evaluation of prototype web site

1.The purpose of this questionnaire is to evaluate a web site created for the Program in Interior Design, University of Pretoria.

2.Your assistance and input is greatly appreciated. It will be taken into consideration in the refining of the product and will contribute to the success thereof.

3. A critical observation of the web site is imperative.

4. Answer the questions in the following manner:

Answer by ticking the appropriate box or boxes (if more than one answer is possible)
Where no possibility is given or an indication is given to SPECIFY, supply your own written answer or place the numbers from 1 to 5 next to the appropriate option.

Answers for questions on a scale from 1 – 5 have the following values:

E = Excellent
G = Good
AA = Above average
A = Average
P = Poor

Thank you for your co-operation and your time.

Maryke Meter and Friedel van Zyl

Hand in after completion or return to the following e-mail address:
friedel@netactive.co.za

Office use only

Layout of the web site	**E**	**G**	**AA**	**A**	**P**	
1. The appearance of the web site and the overall "look" is:	**1**	**2**	**3**	**4**	**5**	
2. The readability (size and space of writing) on the pages is:	**1**	**2**	**3**	**4**	**5**	
3. The consistency of all the elements throughout the web site is:	**1**	**2**	**3**	**4**	**5**	
4. The use of colours in the web site is:	**1**	**2**	**3**	**4**	**5**	
5. The choice of fonts (type of writing) is:	**1**	**2**	**3**	**4**	**5**	
6.The layout of the site map is:	**1**	**2**	**3**	**4**	**5**	
Comments and/or suggestions:(Please complete)						

Navigation	**E**	**G**	**AA**	**A**	**P**	
7. The navigation from and to the home page is:	**1**	**2**	**3**	**4**	**5**	
8. The consistency of the buttons through out the web site is:	**1**	**2**	**3**	**4**	**5**	
9. The layout of the site map for navigation purposes is:	**1**	**2**	**3**	**4**	**5**	
10. The different navigation options in the site is clear and easy to follow:	**1**	**2**	**3**	**4**	**5**	
11. The "**Useful Links**" page will attract more visitors:	**1**	**2**	**3**	**4**	**5**	
Comments and/or suggestions: (Please complete)						

Content	E	G	AA	A	P	Office use only
12. The amount of content per web page is presented in manageable chunks:	**1**	**2**	**3**	**4**	**5**	
13. The content is understandable and appropriate:	**1**	**2**	**3**	**4**	**5**	
14. The way in which the content is presented gain the attention of the visitor:	**1**	**2**	**3**	**4**	**5**	
15. The choice of the graphics is:	**1**	**2**	**3**	**4**	**5**	
Comments and/or suggestions: (Please complete)						

Communication, Support and ease of use	E	G	AA	A	P	
16.: The possibility of communicating with other students and lecturers, with a bulletin board and listserv will be:	1	2	3	4	5	
17. The **"Contact Details"** on the web site are easy accessible and clear	1	2	3	4	5	
18. The web site enables and promotes learning:	1	2	3	4	5	
19. The download time of the web pages is:	1	2	3	4	5	
20. The web site is easy to use:	1	2	3	4	5	
Comments and/or suggestions: (Please complete)						

Office use only

Content	E	G	AA	A	P	
12. The amount of content per web page is presented in manageable chunks:	**1**	**2**	**3**	**4**	**5**	
13. The content is understandable and appropriate:	**1**	**2**	**3**	**4**	**5**	
14. The way in which the content is presented gain the attention of the visitor:	**1**	**2**	**3**	**4**	**5**	
15. The choice of the graphics is:	**1**	**2**	**3**	**4**	**5**	
Comments and/or suggestions: (Please complete)						

Communication, Support and ease of use	E	G	AA	A	P	
16.: The possibility of communicating with other students and lecturers, with a bulletin board and listserv will be:	1	2	3	4	5	
17. The **"Contact Details"** on the web site are easy accessible and clear	1	2	3	4	5	
18. The web site enables and promotes learning:	1	2	3	4	5	
19. The download time of the web pages is:	1	2	3	4	5	
20. The web site is easy to use:	1	2	3	4	5	
Comments and/or suggestions: (Please complete)						

21. General recommendations about the web site as a whole:

Office use only

Thank you for your time.