

Chapter 6



Conclusions and Recommendations

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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.

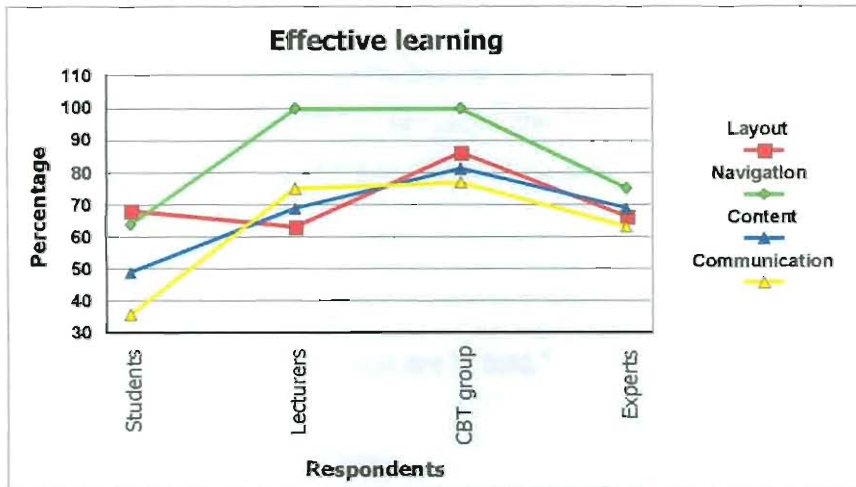
Table 6.1 Aspects of the dimensions relevant to question 1 (effective learning)

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.

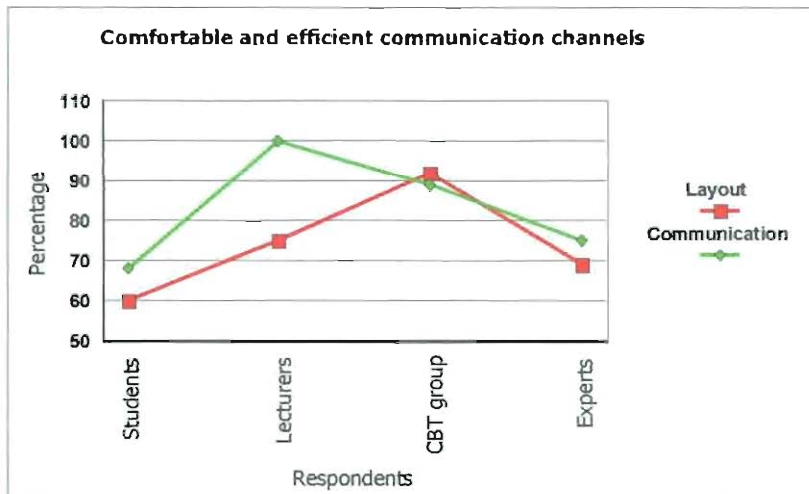
Table 6.2 Aspects of the dimensions relevant to Question 2 (Communication)

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.

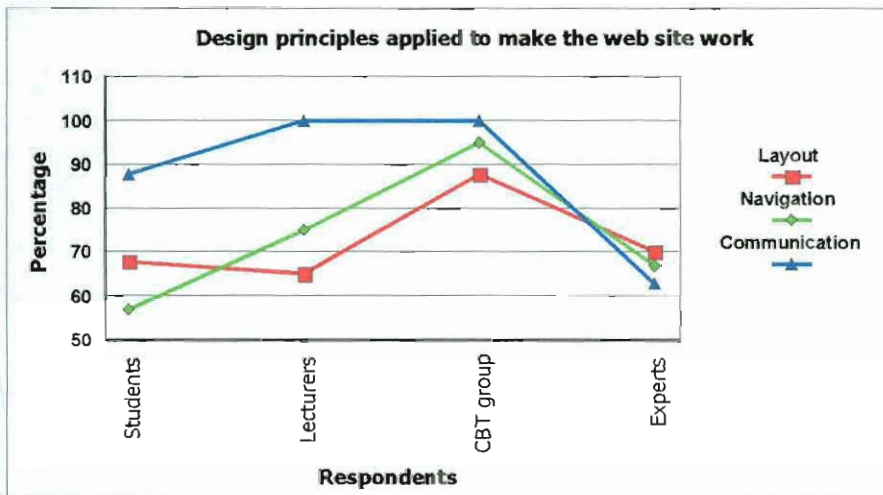
Table 6.3 Aspects of the dimensions relevant to Question 3 (design)

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.

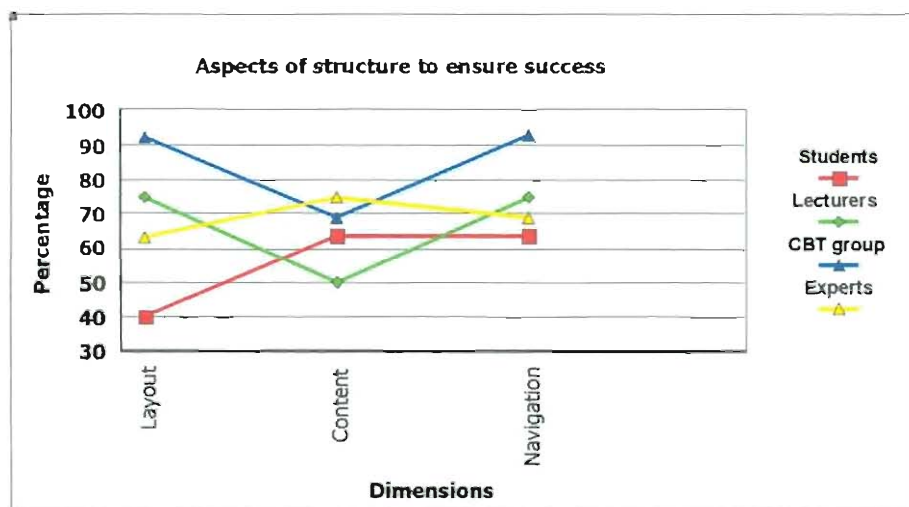
Table 6.4 Aspects of the dimensions relevant to Question 4 (Structure)

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)

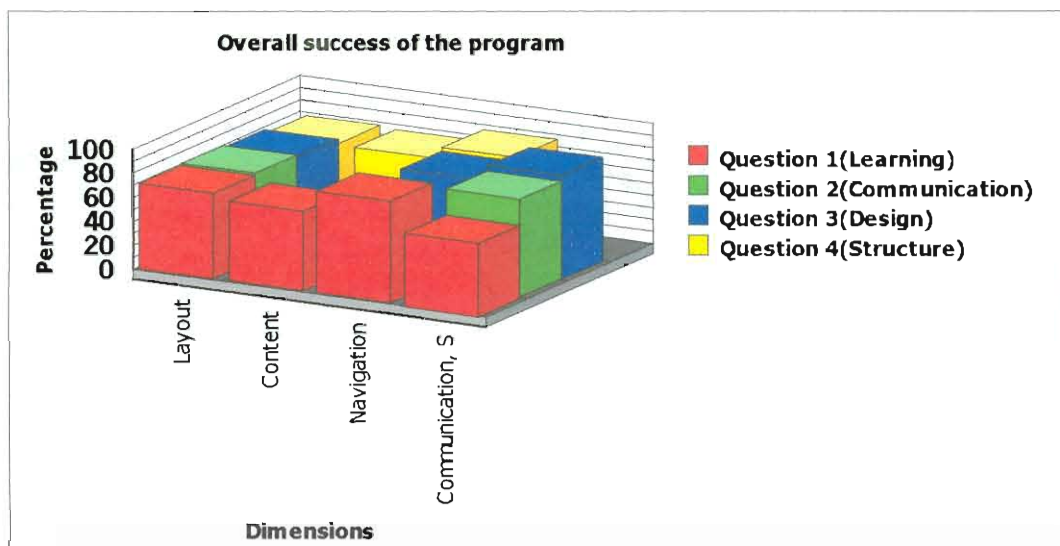
"Home buttons can be more prominent." (CBT)

"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.	Colour adaption to something exciting.
	""Font kan kleiner en scrolling' minder."	Content divided into "subs"
	"Home page te 'boring'	Add movement, colour etc."
	"Some pages too long."	Remove unnecessary info.
	"Check text colours on some of the backgrounds."	Make text colour visible
Content	"Grafika kleiner om inhoud nie te steur."	Resize images where necessary.
	"Vermy scrolling by grafika"	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	<p>Target population</p> <ul style="list-style-type: none"> • Availability • Control • Changes in Faculty 	<ul style="list-style-type: none"> ✓ 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	<ul style="list-style-type: none"> • Client availability • Content/ Information • Perspectives from the different departments 	<ul style="list-style-type: none"> ✓ 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	<ul style="list-style-type: none"> • Knowledge of the authoring tool. • Bandwidth/ Browsers of the targetgroup. 	<ul style="list-style-type: none"> ✓ 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	<ul style="list-style-type: none"> • Respondents • Facilities 	<ul style="list-style-type: none"> ✓ 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. ☺ Add more design orientated images	⊗ N/A ⊗ 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-dimensional** 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.