# A virtual field hospital for military nurses

A thesis

by

Marilla van der Spuy

submitted in partial fulfilment

of the requirements for the degree

**Magister Artium**

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Supervisor: Prof Dr Johannes Cronjé

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# Opsomming

'n Virtuele veldhospitaal vir militêre verpleegkundiges

'n Verhandeling deur

Marilla van der Spuy

Studieleier: Prof Dr J. Cronjé

Departement: Inligtingkunde

Graad: Magister Artium

Die doel van die studie was om te bepaal hoe multimedia gebruik kan word vir die ontwikkeling van 'n rekenaarprogram waardeur die ontplooiing van die veldhospitaal gesimuleer en inligting aan militêre verpleegkundiges oorgedra kan word. Die redes vir die ontwikkeling word aangevoer. Die daarstelling van so 'n program benodig kennis van die beginsels vir die ontwerp, ontwikkeling en produksie van die program. 'n Literatuurstudie is uitgevoer. Die fases in die ontwikkelingsproses van die program word beskryf. Besonderhede word verskaf oor die verkryging en evaluering van die resultate en die evalueringsproses word omskryf. Die bevindings word bespreek. Program spesifieke aanbevelings aangaande uitbreidings en verdere navorsing wat uitgevoer behoort te word, asook algemene aanbevelings vir die ontwikkeling van soortgelyke programme, word gedoen.

Sleutelwoorde: Virtuele veldhospitaal, militêre verpleegkundiges, multimedia program.

# Summary

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Study leader: Prof Dr J. Cronjé

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The aim of this study was to determine how multimedia could be used for the development of a computer program whereby the deployment of the field hospital can be simulated and information be made available to the military nurse. The reasons for the development of this program are explained. The creation of such a program needs in-depth knowledge of the principles for the design, development and production of the program. The phases of the development process of the program are discussed. Particulars regarding the acquisition and evaluation of the results and the evaluation process are described. The findings are presented. Program-specific recommendations regarding expansion and further research to be executed, as well as general recommendations for the development of similar programs, are made.

Key words: Virtual field hospital, military nurses, multimedia program.

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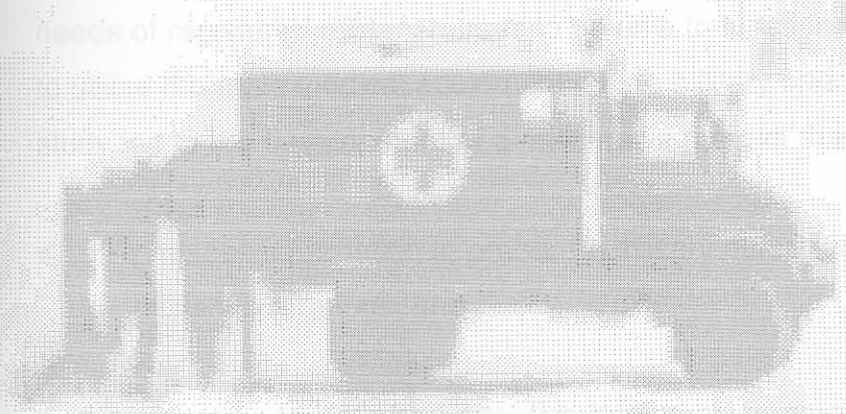
# Chapter 1

## *Formulating the problem*



# CHAPTER 1

# *FORMULATING THE PROBLEM*

## 1.1 Introduction

This thesis reports on research to determine the feasibility of the use of multimedia in the simulation of a field hospital and the provision of information which will prepare military nurses for military operations. The main research question is:

> How can multimedia be used to create and develop an attention-getting, realistic environment to simulate the deployment of the field hospital and provide information to prepare military nurses for functioning during military operations?

In order to achieve this, it was necessary to identify the educational and training needs of registered military nurses to be able to function within the field hospital and to utilize the main medical equipment during military operations. Results from this study led to the development of a multimedia product that

- provides information to prepare a military nurse for functioning during military operations; and
- creates a realistic and attention-getting environment to simulate the deployment of the field hospital.

This research also generated guidelines for the future development of the program and recommendations for further research.

### 1.1.1 Background

#### 1.1.1.1 Expected new roles for the South African National Defence Force (SANDF)

Since the election in 1994, the South African National Defence Force's (SANDF) requirements of its members have changed. According to the White Paper on Defence (1996:29), military personnel should be prepared for regional security co-operation and possible future involvement in international peace operations (peacekeeping/ peacemaking/ peace enforcement). The SANDF may also be called upon by neighbouring countries to play a number of supportive roles. Therefore, within this context, the role of the South African Military Health Service (SAMHS) would be to provide assistance with respect to disaster relief, dealing with large numbers of refugees, the outbreak of diseases and the provision and maintenance of essential services.

#### 1.1.1.2 Developed gap in the preparedness for involvement in military operations

Since the end of the Border War in 1989 the functional scope and application of the military multi-professional team have changed and a perception was created that there was no further need to incorporate the special needs of the soldier under war conditions while educating and training military health personnel. Furthermore, no experience had been gained regarding peace support operations and what these might entail. Consequently, a gap developed in the preparedness of health personnel, especially nurses, for involvement in military operations.

The training of nurses at the South African Military Health Service (SAMHS) College for Nursing is based only on the prescribed guidelines of the South African Nursing Council (SANC). **A change in the focus and purpose of nursing within the military context is thus imperative.** The outcome of education, development and training within the SAMHS must increase the adaptability, ingenuity and deploy

ability of nurses to meet the socio-economic, socio-political and military roles in **peacetime** throughout the spectrum of **conflict** (low, medium and high intensity).

1.1.1.3 Masters degree in military nursing

A degree in Military Nursing, through a tertiary institution, was approved by the Defence Staff Council. The aim of this course is to

- provide the opportunity for professional development and advanced education in specialised fields of nursing practice in relation to military nursing; and

- prepare military nurses to be involved in the primary and secondary functions of the SANDF, e.g.:

  - Involvement in international peace support operations;

  - involvement in humanitarian support operations, i.e. disaster relief, assistance to refugees or displaced persons and humanitarian aid;

  - functioning in field conditions and anticipating and providing for patients'/clients' needs in those specific conditions; and

  - functioning in a field hospital and utilisation of the main medical equipment.

The degree course will comprise various modules, but this research focused on the Nursing in Field Conditions module which entails, amongst other aspects, the deployment of the field hospital and utilisation of the main medical equipment.

### 1.1.2 Needs assessment

The non-availability of realistic scenarios resulted in inadequate training and lack of

skills. Only a few of the registered nurses who had previously been part of SANDF exercises were familiar with the deployment of the field hospital and the main medical equipment. None of them had, however, received formal training in the mentioned aspects. The following factors contributed to the need for this product:

- Peace operations is a new focal point to South Africa.
- Instructors/lecturers are not readily available and/or there is a lack of experience and practical skills present because of the non-availability of realistic scenarios as well as inadequate training opportunities.
- Registered nurses, from different cultural backgrounds, are stationed at sickbays, military base hospitals and military hospitals scattered throughout the country, some in big cities like Bloemfontein and Pretoria and others in small bases e.g. the Kruger National Park or Pomfret.
- The SAMHS Training Formation, where the practical phases of the modules with a strong military element (e.g. Nursing in Field Conditions, Nursing: Defensive Biological and Chemical Measures) will be presented and/or co-ordinated, is situated in Thaba Tshwane. Nurses have to travel long distances and take time off from work in order to participate in practical exercises.
- To enable the nurses to attend the practical phases, the SAMHS is responsible for the expenses of travelling, housing and providing meals for the students. The students also receive a daily allowance. All these entail high expenditure for the SAMHS.
- The deployment of the field hospital is extremely expensive and time-consuming and every time the equipment is transported to and unloaded at the deployment area, wear and tear occur.

## 1.2 Research question

The question that arose was:

How can multimedia be used to create and develop an attention-getting, realistic environment to simulate the deployment of the field hospital and provide information to prepare military nurses for functioning during military operations?

### 1.2.1 Research sub-questions

The sub-questions emanating from the above research question are presented in the following table:

**Table 1.1 Research sub-questions**

| Topic Addressed | Questions |
|---|---|
| **Content** | * What are the *role* and *functions* of the military nurse during **military operations**?<br>* What are the *role* and *functions* of the military nurse to be able to function in a **field hospital** during military operations?<br>* What information does the nurse need to be able to function in the field hospital during military operations?<br>* What information/content should be made available to the nurse? |
| **Presentation of media** | * How can text, images, graphics and animation be combined to create and develop an attention-getting, realistic environment to simulate the deployment of the field hospital and provide information to prepare the military nurse for functioning during military operations? |
| **Delivery of media** | * Which delivery system will be best suited taking into consideration the constraints and restrictions of the SANDF? |
| **Project plan** | * How can this program be designed and developed? |
| **Evaluation** | * How well is this program working? |

## 1.3 Value of this research

The value of this research is the following:

- The educational and training needs of registered nurses were identified to enable them to function within the field hospital during military operations and to utilise the main medical equipment.

- Results from this study lead to the development of a multimedia product which creates a realistic environment for simulating the deployment of the field hospital and provide information to prepare the military nurse for functioning during military operations.

- Nurses will be able to make use of the program at home in their own time, or will be able to view it on the Intranet.
- Recommendations for further study and development of multimedia products of identified aspects in military education and training were made.

## 1.4 Clarification of concepts

### 1.4.1 Field Hospital

Military hospitals serve as base hospitals during peace time and military operations. A field hospital can be seen as a mobile extension of the military hospital during war and peace operations. The operational capabilities of the field hospital are amongst others

- the triage of patients, and surgical, radiological and laboratory services;
- a capacity to accommodate patients, including the intensive care of patients and dealing with outpatients; and
- the sterilisation of equipment and instruments.

Other services rendered include

- oral health care;
- psychological care;
- social work support;
- pharmaceutical utility; and

- pastoral support.

These functions and services are supported by patient administration, logistics, and personnel administration functions.

### 1.4.2 Main medical equipment

The field hospital consists of main medical equipment which are fully-equipped containerised units, namely the surgical theatre, pathology laboratory, radiology unit, sterilisation unit and laundry, as well as non-containerised units which are deployed in tents, e.g. the triage area and patient wards.

### 1.4.3 Deployment of the field hospital

The field hospital is deployed in a tactical area which was previously chosen through reconnaissance and an intensive planning process in order to be able to treat patients in the most expedient manner before being evacuated to the nearest military base hospital or military hospital.

### 1.4.4 Military operations

Military operations may include conventional war operations, peace operations (peacekeeping, peacemaking, peace enforcement) or humanitarian support operations (disaster relief, humanitarian aid, assistance to refugees).

### 1.4.5 Multimedia environment

Through a multimedia environment, various graphic, text and computer technologies are integrated into a single, easily accessible delivery system. CD-ROM technologies can be incorporated into computer-based instructional units and learning environments.

## 1.5 Research methodology

### 1.5.1 Research design

The research design used was evaluation research. Trochim (1999) defines evaluation research as "the systematic acquisition and assessment of information to provide useful feedback about some object" and explains that the term "object" could also refer to a program, technology, need or activity. He also explains that this definition emphasizes *acquiring* and assessing *information* rather than assessing worth or merit.

### 1.5.2 Population and sample

The target population used for this study was registered nurses, male and female, who were Permanent Force members of the SANDF (SAMHS).

The samples for this study were selected as follows:

- A purposive sampling of registered nurses that had been previously deployed in an SANDF operation.

- A convenience sampling of other registered nurses.

### 1.5.3 Data collection technique

The survey was used as the data collecting technique.

### 1.5.4 Data collection methods

The research questions and the data collection methods are summarised in Table 1.2 on page 11.

Data was collected through the process of data and methodological triangulation. According to Burns & Grove (1997:241) data triangulation involves the collection of data from multiple sources for the same study. The intent is to use data from one source to validate data from another source. In methodological triangulation two or three different quantitative instruments might be used e.g. questionnaires, interviews and observation (Burns & Grove, 1997:242).

## Table 1.2 Research questions and data collection methods

Note : The following abbreviations are used in the table :
Lit/Doc = Literature review/Documentation
Ques = Questionnaire
Inter = Interview
Insp = Inspection
Focus = Focus group

| Topic addressed and questions | Lit/ Doc | Ques | Inter | Insp | Focus |
|---|---|---|---|---|---|
| **Information/content:** | | | | | |
| **Phase 1:** | | | | | |
| What are the role and functions of the military nurse during **military operations**? | ✔ | ✔ | ✔ | ✔ | ✔ |
| **Phase 2:** | | | | | |
| What are the role and functions of the military nurse to be able to function in a **field hospital** during a military operation? | ✔ | ✔ | ✔ | ✔ | ✔ |
| What information does the nurse need to be able to function in the field hospital during a military operation? | ✔ | ✔ | ✔ | ✔ | ✔ |
| What information/content must be made available to the nurse? | ✔ | | ✔ | | |
| **Presentation:** How can text, images and animation be combined to create an attention-getting, realistic environment to simulate the deployment of the field hospital and provide information to prepare the military nurse for functioning during military operations? | ✔ | | | | |
| **Delivery:** Which delivery system will be best suited? | ✔ | | | | |
| **Project plan:** How can this program be designed and developed? | ✔ | | | | |
| **Evaluation:** How well is this program working? | | ✔ | ✔ | | |

## 1.6 Output

### 1.6.1 Description of the product

- A multimedia computer program in which text, data, graphics, still images, and animation are combined and integrated for use on CD-ROM and/or the web.
- The program provides the information that was indicated by the military nurses as important foreknowledge to enable to function in a field hospital during military operations.
- The "deployment" of the field hospital is animated through "tents" and "containers" that can be moved around by the user to plan the most appropriate deployment of the field hospital.
- The user is able to control the sequence in which the content of the program is presented by interacting with the computer (non-linear).
- Hypertext, which allows for any word or phrase in one document to reference another document, allows for easy navigation between and within many documents in the program.

### 1.6.2 Overview of research report

- Chapter 1: Formulating the problem.
- Chapter 2: Literature review.
- Chapter 3: Design, development and implementation.
- Chapter 4: Evaluation procedure.

- Chapter 5: Findings.

- Chapter 6: Conclusions and recommendations.

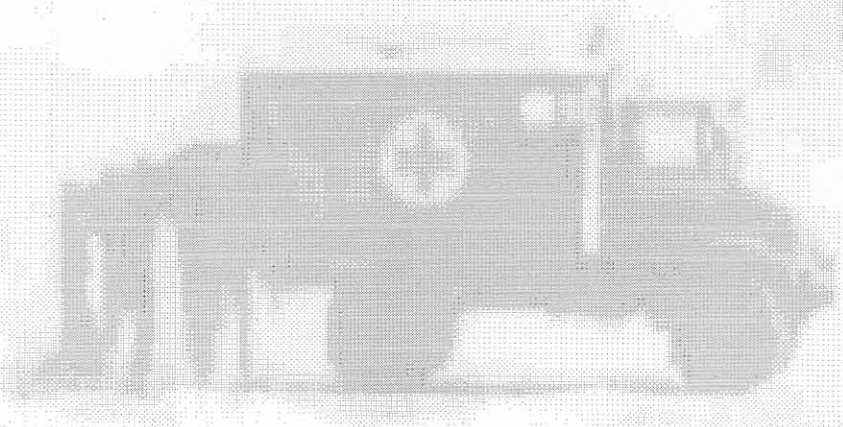
### 1.6.3 Limitations of this research

A large number of experienced people had left the SANDF recently as a result of the transformation process, and hence it was found that the majority of people questioned or interviewed, had mostly gained their experience during operational military exercises and not through actual military operations.

A limited number of local protocols and doctrine regarding peace operations existed. The proposed policy on South African participation in Peace Missions was still in draft form and could therefore not be quoted. New doctrine, which emanated from the conduct of Exercise Blue Crane during May 1999, was still in the process of being developed, therefore the researcher had to rely on these limited protocols, doctrine and expertise for the development of the multimedia program.

# Chapter 2

## *Literature review*



# CHAPTER 2

# *LITERATURE REVIEW*

## 2.1 Introduction

This chapter gives an overview of the literature to address the following research sub-questions:

- **Presentation:** How can text, images, graphics and animation be combined to create an attention-getting, realistic environment to simulate the deployment of the field hospital and provide information to prepare military nurses for functioning during military operations?

- Which **delivery system** will be best suited, taking into consideration the constraints and restrictions of the South African National Defence Force (SANDF)?

## 2.2 Presentation

This section explores multimedia, multimedia building blocks, how to create or gain attention and simulation.

### 2.2.1 Multimedia

Multimedia is defined by Willis(1995) as :any document which uses multiple forms of communication, such as text, audio and/or video". When the end user is allowed to control what an when the elements are delivered, it is interactive

multimedia (Vaugh,1998:5). Schwier & Misanchuk (1993:6) argue that whether multimedia programs happen on one screen, two screens, a video wall or in virtual reality, matters very little. The resonance and interactivity of the program lend it its identity.

Fox, as quoted by Liu *et al.*, describes multimedia as a "software program or document containing media such as text, audio, video, animation, and graphics combined or hyper linked and presented in a non-linear and interactive mode for the purpose of exploring one or more ideas". Vaughan (1998:4) describes multimedia as any combination of text, graphic art, sound, animation and video delivered to an end-user by computer or other electronic means. When the end-user is allowed to control which and when the elements are delivered, it is referred to as *interactive* multimedia. When a structure of linked elements is provided through which the user can navigate, interactive multimedia becomes *hypermedia*. A multimedia project needs not be interactive to be called multimedia. When a multimedia project starts at a beginning and runs through to an end with no interaction from the viewer, it is known as *linear*. However, when users are given navigational control and can move through the content at will, multimedia becomes *non-linear* and interactive. The four fundamental organising structures used (often in combination) in multimedia projects are (Vaughan 1998:464):

- **Linear**. The user navigates sequentially, from one frame or bite of information to another.
- **Hierarchical**. The user navigates along the branches of a tree structure that is shaped by the natural logic of the content.
- **Non-linear**. The user navigates freely through the content of the project, unbound by predetermined routes.
- **Composite**. The user may navigate freely in a non-linear way, but is occasionally constrained to linear presentations, movies or critical

information and/or data that are most logically organised in a hierarchy.

According to Vaughan (1998:9) the use of multimedia is appropriate whenever an interface connects a human user to electronic information of any kind. Multimedia furthermore enhances traditional text-only computer interfaces and yields measurable benefit by gaining and holding attention and interest, since multimedia improves information retention. Multimedia is presently enjoying widespread use in education and training programs and will provoke radical changes in the teaching process of the future since teachers may become more like guides and mentors instead of the primary providers of information and understanding.

From the above-mentioned definitions of multimedia it is evident that multimedia can constitute any number and combination of different media for the manufacture of multimedia products. In order to produce a multimedia product, it is necessary to make use of individual building blocks. The most appropriate building blocks to be used for the intended multimedia product, are discussed below.

### 2.2.2 Multimedia building blocks

#### 2.2.2.1 Text

Text, and the ability to read and write it, are expected and necessary skills within most modern cultures and societies. Text is still the most widely used medium to deliver information that can have potent meaning, albeit distributed by means of electronic media. Computer screens provide a very small work space for developing and explaining complex ideas. At some stage, it will be necessary to deliver high-impact or concise text messages on the computer screen in as condensed a form as possible. The choice of font size and the number of headlines placed on a particular screen must be related to both the complexity of the message and its venue. When a message forms part of an interactive project where the user is seeking information, a large quantity of textual information can be placed on a screen before it becomes overwhelmingly busy. Too little text on a

screen, however, could require a large number of page turns and mouse clicks which can cause unnecessary waiting periods and delays. It is therefore necessary to attempt to put neither too much nor too little text on a single screen (Vaughan,1998:190).

With the recent explosion of the Internet and the World Wide Web (WWW), text has become more important than ever. During the last number of years, the meaning of the word "text" in its traditional sense, has however, gradually been eroded by its electronic counterparts on diskette, CD-ROM and the Internet, and "text" is becoming increasingly synonymous with "hypertext" (Kussler & van der Merwe, 1998:323). Hypertext refers to any computer application which allows non-linear exploration of information. According to Slatin (1991:153), hypertext in particular not only serves as a tool for presentation, but also as a device for the composition of thought.

#### 2.2.2.2 Text attributes

Text can have various attributes which have an effect on how the text is displayed. The various attributes of text and which can influence the way the text is seen and perceived by the user, is discussed below.

- Fonts and faces

The font, or typeface, is the name given to a collection of characters with a distinctive shape. In computer science, it generally includes not only the "normal" or plain appearance of the characters, but also the italics, boldface and combinations thereof. The names of fonts can thus be modified to include such descriptors. Fonts may furthermore assume different styles, e.g. outline, shadow, small caps, reverse and various combinations thereof. Venesky & Osin (1991:218) suggest being as near as possible to the excellence of the printed typography, since the resolution of the printed media is one order of magnitude above that of the standard screens.

- Print size

The golden rule for choosing a font is that it should be large enough to be read comfortably. The size of print required is partly influenced by the screen definition - the higher the definition, the more likely it is that small print can be read more comfortably (Schwier & Misanchuk, 1993:240).

- Type styles

Schwier & Misanchuk (1993:212) state that good writing style of instructional material dictates that the use of unusual type styles (e.g. italic, bold, reverse, shadowed etc.) be strictly limited. He suggests that plain text should be stuck to with the occasional use of bold or italics for specific purposes. The use of italics for mere emphasis, or for foreign words, is specifically discouraged and the use of italics is recommended only for

- introducing technical terms the first time they are used;
- titles of books, films, articles and periodicals;
- characters, words or phrases that are cited as linguistic examples;
- specialised applications (e.g. genera and species and statistical symbols); and
- distinguishing different types of material.

Schwier & Misanchuk (1993:242) quote the following suggestions regarding fonts and style as a synthesis of advice from various sources adding thereto some of their own:

- When reverse video is used to highlight text, one reverse video space should be left before and after the relevant text to provide a border around the characters.
- Since underlining text can make the following line of text difficult to read, and since most computers nowadays provide italic and boldface fonts, italic or boldface should be used instead of underlining.
- Blinking and flashing text should be used extremely rarely and cautiously and should never be used in more than one place on the same screen.

■ Cases

Some authors suggest that fonts should have lower case letters as well as variable character widths (proportional spacing) which seems to be a standard feature on most computers nowadays. A combination of upper case and lower case letters seems to promote legibility as opposed to the use of upper case letters only.

■ Serif versus Sans Serif

Serif and sans serif refers to the type's mechanical and historic properties. On printed pages, serif fonts are normally used for body text because it is believed that the serifs help guide the reader's eye along the line of text. Sans serif fonts are traditionally used for headlines and bold statements. Since the computer screen is not the same as printed text, Vaughan (1998:189) argues that sans serif fonts are far more legible and attractive when used in the small sizes of a text field on a screen. This author suggests to use what is right for the specific delivery system, which may not be the same as what is right when it is printed on paper.

- Justification of text

A large number of authors are of the opinion that the right-justification of text is detrimental to reading and when text is right-justified, it must be accompanied by proportional spacing. Right-justification of text typically creates "rivers of white", unless some words in a paragraph are hyphenated which further inhibits compression. Hyphenation can cause a reader to skip from the beginning of a line to the end of the previous line. According to Schwier & Misanchuk (1993:244) the bottom line seems "Don't right-justify text on the screen".

- Menus for navigation

Multimedia and web sites normally consist of a body of text content through which a user can navigate. Text is useful to users to provide perpetual cues about their location within the content. When a user must click through many layers of menus in order to reach a goal, they may get lost.

The simplest menu consists of a text list of topics from which the user can exercise a choice of what is to be accessed. The more locations included in the menu list, the more options will be available for navigation. The four fundamental organising structures often used in combination in multimedia projects have already been discussed in paragraph 2.2.1 (Multimedia) and will not be repeated here. Navigation within a project depends on the specific organising structure used and forms part of the user interface.

Many navigation maps are essentially non-linear which affords the user the opportunity to freely jump to an index, a glossary or various menus. Vaughan (1998:467) argues that it is important to give viewers a sense that free choice is available which empowers them within the content of the subject matter. Consistent clues regarding importance, emphasis and direction should still be provided by varying the typeface size and look, colouring, indenting or using special icons. He states that it is important to give users a sense of free choice,

but that too much freedom can be disconcerting and may result in viewers getting lost.

To overcome this problem, Vaughan (1998:468) suggests that content be organised along a steady stream of the major subjects, allowing users to branch outward in order to explore details. He furthermore suggests the provision of an anchor, with buttons leading to expected places and to build a familiar landscape to which the user may return at any time.

- Buttons for interaction

In multimedia, buttons are the objects that make things happen. They were invented to result in certain properties such as highlighting, other visual or sound effects to indicate to the user that what was intended, had been achieved. Vaughan (1998:195) states that the default buttons and styles supplied with multimedia and HTML page authoring systems seem overused or trite. However, by using common button styles, shapes, borders and highlights, the probability that the user will know what to do with them is increased; especially when they are also labelled. He suggests that a font be picked which is legible and then to adjust the text size of the labels to provide adequate space between the rim of the button and the text or label. Vaughan (1998:195) also proposes the highlighting of a button when the mouse is over it or when it has been clicked.

Schwier & Misanchuk (1993:228) are adamant that care should be taken to ensure that learners understand how they are to respond with regards to interactivity. While it may not be necessary to place elaborate instructions on each screen, at least some guidance should be given the first few times a particular response method is employed.

- Fields for reading

According to Vaughan (1998:198) research has shown that reading text on a

screen is slower and more difficult than reading text on paper. Unless the purpose of the multimedia project is to display large blocks of text, it is suggested that the user be presented only with a few paragraphs of text per page. A font that is easy to read should be used, and it must be attempted to display whole paragraphs on the screen, and to avoid breaks where users must switch pages to read an entire paragraph.

Treuhaft (1995:2) is of the opinion that many designers put too much text on the screen and therefore suggests that the number of lines of text should be limited to six or eight. Text lines longer than 60 characters are difficult to read, because the eye has to shift too wide a distance to read from line to line without losing the place (Reeves, 1994).

- Symbols and icons

Symbols are concentrated text in the form of stand-alone graphic constructs which convey meaningful messages. The value of icons for representing certain activities has become common. Icons can depict choices succinctly, thereby reducing the learner's memory load. Schwier & Misanchuk (1993:247) state that, for icons to be effective they must be

- unambiguous;
- relatively small; and
- simple line drawings.

Symbols and icons have become very popular for indicating highly repetitive actions or activities such as traversal through a sequence via arrows. Vaughan (1998:201) recommends that symbols and icons be treated as text because they carry meaning. Some symbols must be learned before they can be used as message carriers, but Vaughan (1998:201) warns that the developer of a

multimedia project should not be seduced into developing an own language of symbols and icons.

- Animating text

Animating text is one of the ways that can be used to retain a viewer's attention when displaying text. Text can, for example, be animated to "fly" onto the screen; to "grow" one character at a time; keywords can be stacked and made to fly past the viewer; others can be made to rotate, spin or dissolve (Vaughan, 1998:203).

Animated text must, however, not be overdone since such animations will inevitably become boring for the reader thereof.

- Layout of text

Alessi & Trollip (1991:35) devote a large section on text layout and their suggestions in this regard are summarised below:

- Scrolling should always be avoided since most people find it hard to read text when it is scrolling. Because it is difficult to distinguish between the boundary between new information and old, important information is sometimes erased unintentionally. Lynch & Horton (1997) state that less than 10% of Web readers ever scroll beyond the top of web pages.

- Sentences and paragraphs should be well formatted and the use of indentations or blank lines to indicate new paragraphs should be used. Text should not be squeezed into half of the display leaving the rest almost empty.

- Spacing between lines influences the readability and line spacing should be adjusted in such a manner as to make text readable and

attractive.

- When a combination of text and graphics appears on a display, it is useful to enclose the primary text in a box (isolation).
- Since blinking text is annoying and makes text difficult to read, it should never be used. Boxes and arrows are more effective in this regard.

Organising information requires that methods be used to allow users the ability to access information in a controllable fashion. Program information must be organised into manageable segments so that users are not overwhelmed by the amount of information contained in the program (Reeves, 1994).

#### 2.2.2.3 Screen design

According to Schwier & Misanchuk (1993:212) the purpose of interactive multimedia instruction is not to dazzle, impress, amaze or to delight, but rather to communicate. While gaining (and holding) attention are important concerns in any communication process, a tendency might be experienced to want to apply all facilities that multimedia offers. These authors suggest that the basic principles that should be followed in screen design are: simplicity, consistency, clarity, and aesthetic considerations such as balance, harmony and unity.

For the purpose of this study, the following table was constructed by the researcher in order to demonstrate the principles of screen design.

## Table 2.1 Principles of screen design

| Simplicity | Consistency | Clarity | Aesthetic considerations |
|---|---|---|---|
| Keep it simple and straightforward.<br><br>Present only the message.<br><br>Use as few textual and audiovisual stimuli as possible. | Level of discourse and style of presentation.<br>Placement of various items e.g.<br>* orientation information<br>* navigation devices<br>* student input<br>* feedback<br>* operating instructions<br>Use of colour.<br>Access structure.<br>Use of cues e.g.<br>* font (including size and style)<br>* bolding<br>* italics<br>* colour<br>Style of graphics.<br>Screen density and white space.<br>Terminology e.g.<br>* directions<br>* prompts<br>* menus<br>* help screens<br>Names of commands and manner of evoking them.<br>Interaction behaviour required. | Keep the instruction at a language level compatible with the learners.<br><br>Use "point form" (bullets) whenever possible.<br><br>Use the active rather than the passive voice.<br><br>Stay away from negative statements.<br><br>Use informal language.<br><br>Use personal pronouns.<br><br>Use familiar examples.<br><br>Use inclusive language. | Balance.<br>* formal vs informal<br>* symmetric vs asymmetric<br><br>Harmony.<br>* consistency (font & graphic style)<br>* repetition (font & graphic style)<br><br>Unity.<br><br>Lots of white space. |

Szabo & Kanuka (1998:27) describe the principles of screen design as to include unity (also referred to as harmony), focal point (also referred to as dominance or emphasis), balance, and colour (which was not used in their study). They add that when the designer strives for a technically good design, the inclusion and use of these design principles produces a much better visual image.

- Unity

Szabo & Kanuka (1998:27) state that if objects in a design appear separate and/or unrelated, the pattern falls apart and appears unrelated.

- Focal point

The purpose of a focal point is to draw attention, thereby encouraging the viewer to continue looking. The two techniques commonly used to create a focal point are contrast and isolation (Szabo & Kanuka, 1998:30).

- Balance

Szabo & Kanuka (1998:31) point out that a lack of balance is disturbing, and once a designer selects images for a composition, a decision must be made as to how the images are to be balanced within the page.

Szabo & Kanuka (1998:31) state that using a lesson with good screen design principles (as set out above) appears not to affect achievement one way or the other. These authors state that it indicates that the screen design principles chosen in their study do not affect recall learning, but that the poor use of these design principles is related to increased instructional time and a reduced completion rate.

#### 2.2.2.4 Colour combinations

The use of colour is closely related to that of graphics. New hardware and software make the use of colour increasingly easy. While colour is effective for attracting attention, colour is easily misused so as to be ineffective or even detrimental. The use of more colour decreases the effectivity thereof. Schwier & Misanchuk (1993:245) recommend a cautious approach to the use of colour, also because colour monitors frequently vary widely in their representation of colours which makes it difficult for a designer to predict what individuals will actually see on their screens.

Schwier & Misanchuk (1993:245) recommend two approaches that can bolster attractiveness where colours have to be used:

- The reduction of saturation (intensity) of the colours used. Adjusting the saturation of colours helps produce less garish displays since pastels can be more pleasing to the eye than computer default colour palettes.

- The restriction of the number of colours (hues) employed. Attractive displays can be made by using different shades of the same basic colour.

Alessi & Trollip (1991:42) suggest that whenever colour is used, it must be attempted to convey the information in another way as well. An example of this is that when graphs are presented in colour, they should be labelled with text as well.

Colour is perhaps the most abused characteristic and text should preferably be done in black and white or equivalent monochrome. The use of colour is only likely to make a difference when it is truly salient and seems unlikely to have a powerful effect when applied to text (Schwier & Misanchuk, 1993:243). Colours facilitate recognition equally, and both realistic and non-realistic colour materials are superior to monochrome materials for cuing (Berry, 1991). Treuhaft (1995:1) states that the visibility of text depends on the contrast between the text colour

and the background and suggests blue and black text on a white background. He suggests the use of red to highlight a single key word.

Alessi & Trollip (1991:42) point out that some colours, especially those near the centre of the visual spectrum such as yellow and green, are easier to perceive than others; while colours at the extremes of the visible colour spectrum (reds and blues) are the most difficult perceptual colours and should be avoided for text or detailed pictures. Some colour combinations are better than others, and combinations that should be avoided are red with green, blue with yellow, green with blue, and red with blue. The simultaneous use of more than four to seven colours should also be avoided. Alessi & Trollip (1991:43) are convinced that the use of colour should be consistent with common usages in society: using green to mean "stop" and red for "go" will result in errors. Colour should be used sparingly for important information and should be avoided in text.

Regarding to the use of colour in web-linking, Kussler & van der Merwe (1998:327) warn not to use non-standard link colours:

- Links to pages that have not been opened, are blue.
- Links to previously opened pages are purple or red.

According to Nielsen (1999) these colours are standard in most web browsers and should therefore be used consistently. Creative designers may sometimes intentionally violate screen design principles for effect or to otherwise focus the user's attention (Reeves & Harmon, 1994).

#### 2.2.2.5 Images

Most authoring systems available provide the necessary tools with which the graphical objects of multimedia can be created directly on the screen. Where these tools are not available, the authoring system normally makes provision for a

facility whereby images can be imported from another source.

Still images may be the most important element of a multimedia project. No matter what form such images are, still images are generated by the computer in one of two ways: as bitmaps (or paint graphics) or as vector-drawn (plainly- drawn) graphics.

Bitmaps are used for photo-realistic images and for complex drawings that require fine details, while vector-drawn objects are used for lines, circles, boxes, and other graphic shapes that can be mathematically expressed in angles, coordinates and distances. The appearance of both type of images depends on the display characteristics and resolution of the computer's graphics hardware and monitor. Both types of images can be stored in various file formats and can be translated from one type of file format to another and between computer platforms. Image files are normally compressed in order to save memory and disc space and many image formats use compression within the file itself. Vector objects are easily scalable without losing image quality or resolution. Most drawing programs offer several file formats for saving work (Vaughan, 1998:300).

#### 2.2.2.6 Graphics and animation

A major consideration regarding the effectiveness of graphic information is the importance of the information being presented. Attention should be focussed on the important information rather than on the unimportant information. Pictures, especially animated ones, capture attention more than text and therefore graphic presentations should be based on what is important in the text. Alessi & Trollip (1991:38) suggest three primary uses of graphics during the presentation part of a tutorial:

- As the primary information.
- As an analogy or mnemonic.

- As a cue.

Graphic information should be consistent with and integrated into the rest of the message and care should be taken to avoid excessive detail or realism, since detail can overload memory and cause confusion. Realistic pictures usually contain more detail than simplified ones. Graphics containing a vast amount of information should be broken down into its components or simpler parts. A useful technique is to produce *part* of a graphic and then to *overlay* the next part or add details (Alessi & Trollip, 1991:40).

The user should be allowed to control the length of time used for looking at graphics and pictures should not disappear after a predetermined time period. This should be controlled by the user. Pictures should be presented simultaneously with the related text so as to afford the user the opportunity to inspect the illustration and the explanation together. Willis (1995) states that pages which take too long to download frustrate the user, and if home pages require the extensive use of graphics, the user should be warned.

When confronted with the question as to which format (GIF or JPEG) is the better format to use for storing bitmap images, Wurtzel (1997) states that it depends on the type of image, how small the image file is to be, and the way in which the image is to load.

- JPEG format

According to Wurzel (1997) photographs and graphics which contain large numbers of graphics and particularly colours that blend and fade into one another, are best saved in JPEG format. The reason for choosing JPEG format for images with more complex colour patterns is that this format makes it possible to save images with millions of colours.

Another important issue is the file size. JPEG permits a greater degree of compression than the GIF alternative, enabling quicker downloading times for larger graphics. JPEG appears to retain almost complete image quality for most photographs.

The JPEG format does not work well for graphics that contain large fields of colour, since these colour fields can break up and fragment. Another disadvantage of JPEG format is that it cannot be animated.

- GIF format

If an image has flat colour fields, it will compress well into the GIF format. The GIF option, however, restricts one to the use of 256 colours only (Wurzel, 1997). As a result of this, photographs saved in GIF format produce dots which is the result of the GIF format's characterising adjustment of pixels within a graphic to simulate the display of colours not in the GIF format's colour palette. The background of a GIF format can be made transparent which results therein that the background colour of the browser window will be seen (Wurtzel, 1997).

Tashian (1998:5) states that GIF animations seem the best to use and lists some of the features of GIF animations as being

- smaller;
- faster;
- much easier to use than server push animations, since no special server access and configuration is necessary; and
- even if the browser does not support animated GIF images, the first frame of any GIF animation can still be seen.

#### 2.2.2.7 "Drag-able" screen objects

The recent emphasis on object-orientated programming environments has resulted in the fact that objects can be moved on the screen by clicking and dragging them. Schwier & Misanchuk (1993:250) see the dragging of screen objects as reasonable to use since it provides variety to keyboard response. Users must, however, be given the opportunity to develop the necessary eye-hand co-ordination required by a mouse. Alessi & Trollip (1991:68) sees the dragging of screen objects as a useful type of interaction and makes a distinction between the dragging of words to label a picture, construct a sentence, answer a matching exercise or alphabetise a list. Pictures may be dragged to construct an apparatus, create a map or diagram, or match pictures to words.

### 2.2.3 How to create/keep attention

Alessi & Trollip (1991:11) state that, for perception of proper lesson elements to occur, the attention of the student must not only be initially attracted, but maintained throughout the lesson. Since effective instruction depends on presentations designed for easy and accurate perception, perception may be facilitated by many presentation design factors: detail and realism, the use of sound versus visuals, colour, characteristics of text such as its size and font, animation, and position of screen elements.

Attention is furthermore affected by many additional considerations including the level of student involvement, personal interests and foreknowledge of the student, lesson difficulty, novelty and familiarity, pacing and variety.

Alessi & Trollip (1991:32) summarise the four factors of gaining and holding attention as challenge, curiosity, control and fantasy. According to Keller, as quoted by Alessi & Trollip (1991:33), attention, relevance, confidence and satisfaction are the four design considerations relevant to creating motivational instruction.

Alessi & Trollip (1991:38) are of the opinion that graphic presentations should be chosen based on what is important in the text, because pictures, especially animated ones, capture attention more than text.

Colour is effective for attracting attention, but care should be taken not to use too much colour. The more colour is used, the less it will attract attention. Alessi & Trollip (1991:42) clearly state that colour can and should be used, like graphics, to attract attention to important information, but also warn that there is a danger that information may be lost when a student is colour blind (about one in fifteen). Colour should therefore be used as a redundant cue, which means that information should be conveyed in another way as well.

With regards to the effect of text layout on motivation and attention, Alessi & Trollip (1991:38) are of the opinion that consistency is more important than varying layouts. They believe that motivation and attention can and should be maintained, but through vehicles other than variable text layout. Considerable advantages can be gained with conventions that clearly indicate when new topics are being introduced, where to look for directions, or how to answer questions.

Venezky & Osin (1991:218) state that the computer display has a clear advantage over the printed media in terms of gaining attention. The computer screen has the usual possibilities for highlighting as are present in books, but the dynamic features characteristic of the computer environment add a dimension not available in print. These dynamic features are particularly useful for remedial loops, where the student's attention may be focussed on a particular expression by highlighting it during the remedial explanation. After this, a list of attention-getting or highlighting devices follow.

### 2.2.4 Simulation

Simulations differ from interactive tutorials since, with a simulation, the student learns by actually performing the activities to be learned in a context that is similar

to the real situation. The purpose of simulation is to help the student build a useful mental model and to provide an opportunity to test it safely and efficiently (Alessi & Trollip, 1991:119).

The different types of simulations are summarised in the following table which was constructed by the researcher for the purpose of this study.

**Table 2.2 Categories and types of simulation**

| Simulation category | Type of simulation |
|---|---|
| *"About"* simulations | Physical simulations<br>Process simulations |
| *"How to"* simulations | Procedural simulations<br>Situational simulations |

Alessi & Trollip (1991:119) point out that the word simulation has different connotations to people of different disciplines and that most simulations do not distinctly fall into just one of these categories, but are rather a combination or synthesis of more than one type.

According to Alessi & Trollip (1991:130) simulation has several advantages as an instructional tool as compared to using real-life situations for learning purposes. For the purpose of this study, the following table was constructed by the researcher to illustrate this.

**Table 2.3 Advantages and the convenience of simulations with examples**

| Advantages of simulations | Examples |
|---|---|
| Advantages of simulations as instructional tools | * They enhance safety.<br>* They provide experiences not readily available in reality.<br>* They modify the time frame.<br>* They control the complexity of the learning situation.<br>* They save money. |
| Convenience of simulations | * They cost less than real-life situations.<br>* They are available at any time.<br>* They are repeatable.<br>* They are more controllable than reality.<br>* They are not only imitations of reality, but simplifications of it which are instructionally advantageous.<br>* They facilitate initial learning by simplifying the phenomenon. |

Simulations generally have three major advantages over conventional tutorials, drills, and tests. They enhance motivation, they have better transfer of learning and they are more efficient. Alessi & Trollip (1991:119) classify simulations in two main groups, namely those that teach about something and those that teach how to do something.

■ Simulations that teach *about* something

Physical and process simulations differ from other simulations in that they are **not as interactive.**

- Physical simulations

In computer-based physical simulation, a physical object or phenomenon is

represented on the screen, giving the student the opportunity to learn about it (Alessi & Trollip, 1991:120).

- Process simulations

Process simulation is generally used to inform students about a process or concept which does not manifest itself visibly, e.g. how the economy works. Instead of participating as in situational simulations, or constantly manipulating as in procedural simulations, the student selects values of various parameters at the beginning of the simulation, and then watches the process occur without intervention. Learning, in this case, comes from observing the effect of changing values on the outcome (Alessi & Trollip, 1991:123).

■ Simulations that teach *how to* do something

- Procedural simulations

The purpose of most procedural simulations is to teach a sequence of actions or events that constitute a procedure. They most often contain simulated physical objects because the student's performance must imitate the actual procedures of operating or manipulating some physical entity. Whereas the physical objects in physical simulations are themselves the focus of the instruction, in procedural simulations the simulation of the physical objects is necessary to meet the procedural requirements (Alessi & Trollip, 1991:126). The primary objective of a procedural simulation is to teach the student how to do something, while a physical simulation teaches how something works.

A primary characteristic of procedural simulations is that there is one or more correct or preferred sequences of steps which the student should learn to perform. There are many different ways to reach the same conclusion, however, not all of them are equally efficient. A procedural simulation thus provides the opportunity to explore these different paths and their associated effects.

- Situational simulations

Situational simulations deal with the behaviours and attitudes of people in different situations, rather than with skilled performance (Alessi & Trollip, 1991:127). Unlike procedural simulations, which teach sets of rules, situational simulations usually allow the student to explore the effects of different approaches to a situation, or to play different roles in it.

## 2.3 Delivery systems

This section explores multimedia delivery systems which include the use of computers, CD-ROM, Hypertext Markup Language (HTML), and CD-ROM/WWW hybrids. The future of training in the SA National Defence Force (SANDF) and the constraints thereof on the delivery of multimedia are also discussed.

Multimedia for learning takes many forms and requires large amounts of digital memory when stored in an end-user's library, or large amounts of bandwidth when distributed over a network. It is thus of cardinal importance to find a delivery system which will be best suited for the information transfer regarding the deployment of the field hospital. Schwier & Misanchuk (1993:151) state that the location of the audience is important. If learners are centrally located, many types of training approaches are possible. If the audience is, however, dispersed, located over a wide geographic area, then an individualised approach is necessary which has the potential for power, immediacy, durability, and the flexibility of interactive multimedia becomes more attractive. These authors state that multimedia can provide a cost-effective means of distributing instruction, especially considering the savings realised from travel and lodging expenditures often associated with events offered centrally.

Mudge (1999:12) distinguishes between the advantages and disadvantages of multimedia delivery. Some of these are appropriate to all forms of teaching, some are specific to using multimedia, while some are also specific to delivery through

the Internet. He does, however, recommend that the WWW should be used to supplement rather than replace existing teaching methods. The most important **advantages** of multimedia delivery, as quoted by Mudge (1999:12) are the following:

- Students are able to use computer-based learning when they want to, not just at specified times and can thus choose the best time for them.

- Distance learning may be best for older, mature students who have family considerations and access from home may provide the best solution for their particular needs.

- Material can be accessed as many times as students need, and certain more difficult concepts can be repeated as many times as necessary.

- A range of different media can be used in concert to reinforce the message.

- There is no limit to the number of students who can access the information stored in a computerised teaching module.

The most important **disadvantages** as quoted by Mudge (1999:13) for multimedia delivery are the following:

- The bandwidth could be problematical since text takes up only a small amount of space, while pictures take up more and video can be very demanding.

- Security problems, which include the potential problem of downloading files and/or programs from the Internet that may contain viruses.

- Before anything can be distributed by the WWW, the information needs to be authored into the correct language, usually HTML, which requires

considerable time and skill to create and present the information in the best manner to get a message across.

- Data and information presented needs to be updated as the field expands and progresses.
- Less contact with students.

### 2.3.1 Computers

Computers have been employed to perform a variety of tasks in education and training. They are often used in diagnosing student needs, delivering instruction, drilling students in need of practice, grading student responses, reporting student progress, and simulating expensive equipment or dangerous experiments. The computer, when equipped with well-written software, has several strengths that combine to make it appropriate for instructional use. On the other hand, the computer also has weaknesses which must be considered when attempting to convey a particular message (Hannafin & Peck, 1988:33).

Hannafin & Peck (1988:35) conclude that both teachers and computers have strengths that serve as logical solutions to educational problems. Neither can fully replace the other, nor can either be rejected categorically as ineffective or undesirable. Students are best served when teachers and computers are employed in combination, capitalising on strengths and minimising the effects of weaknesses. Landa (1984) views computers as a "cadre of teaching assistants" performing a variety of tasks, from presenting remedial instruction to introducing new topics to the capable, self-directed learners who are ready to proceed.

To take advantage of the computer's particular capabilities and not waste them, the first rule for correctly using or developing Computer Based Instruction (CBI) material is to do so in a situation where the computer is *likely* to be beneficial. Those situations are where the **cost of instruction by other methods is very**

**high**, **safety is a concern**, it is very difficult to teach the material by other methods, extensive individual student practice is needed, student motivation is typically lacking, or **where there are logistic difficulties** in traditional instruction. While none of these situations guarantees that a computer will be beneficial, the probability is nevertheless increased. High quality and creative instructional design coupled with careful evaluation and revision are also necessary (Alessi & Trollip, 1991:6).

It is very clear that the cost of training nurses with regards to the deployment of the field hospital is very high as a result of the fact that they presently have to be trained on a centralised basis which incurs cost such as housing, daily allowance, rations and a loss of productivity when they are away from their normal places of duty. A number of logistic difficulties are also experienced e.g. the fact that expensive equipment has to be transported and deployed which place a heavy burden on operational, support and maintenance personnel. The movement of expensive equipment poses a further risk to such equipment which invariably incurs cost.

The reduced cost and widespread availability of computer technology means that, in principle, many people can afford to have their own personal computer that is capable of delivering interactive learning resources. The development of computer-based tuition can therefore offer an attractive substitute for 1:1 human tuition. Provided the software is well-designed, it should be able to adapt its behaviour to the specific needs of the individual user and provided that suitable telecommunication facilities or delivery systems are available, this type of tuition can be made totally independent of geographical location. Students can receive it wherever they are located (Barker 1994:6).

### 2.3.2 CD-ROM

CD-ROM (compact disc read-only memory) has emerged during the last few years as one of the most cost-effective distribution media for multimedia projects since it

can contain unique mixes of images, sound, text, video and animations controlled by an authoring system to provide unlimited user interaction. Most personal computers sold include a CD-ROM player, and the software that drive these computers is commonly available on CD-ROM discs.

#### 2.3.2.1 Characteristics of CD-ROM

CD-ROM discs have specific sectors and fields that must contain certain kinds of data in order for them to work properly. According to Schwier & Misanchuk (1993:104-107) CD-ROM has the following attributes:

- Very large amounts of information, up to 660 MB per disc when only digital data are encoded, can be stored on them. Careful planning is, however, required with regards to the arrangement of and the relationships between the various files when large quantities of data are placed on a single disc. They are also able to hold a variety of kinds of information and because of the digital nature of the encoding, they are inherently multimedia.

- CD-ROM discs can be produced at a relatively low unit cost, are very economical for the distribution of software and can be produced relatively quickly.

- CD-ROM discs provide a robust and stable storage medium, inasmuch as they are constructed like videodiscs. They do not deteriorate significantly with age and do not require much care in handling as magnetic media. Their toughness makes them a viable alternative where more delicate media might suffer.

- These discs are a read-only medium, which means that, once pressed, they cannot be altered. Although this feature is an advantage in some cases, not all applications require only reading of files.

- CD-ROM discs offer random access to information stored on them, albeit at a modest seek time. Users will have a tendency to want to move files from the CD-ROM onto a hard disc to increase the speed of access. Many times, however, the files are too large to do this conveniently and for this reason it may be necessary to implement a system of installing and removing files from such a hard disc. CD-ROM is considered a better distribution medium than as a real-time access medium and audio and video will require good real-time compression techniques before CD-ROM is viable for their real-time access.

- They are portable, both in terms of size and weight, and are compatible with all brands of players.

- CD-ROM discs provide a standardised file format which works with a variety of computer operating systems, irrespective of who manufactured the computer or the CD-ROM disc.

From the above, it must be concluded that CD-ROM offers a high-capacity integrated storage medium for the storage and dissemination of learning resources for use in many learning situations. This technology is particularly useful for the support of distance learning, open learning, and use in the office or home.

Since a large number of nurses within the SA Military Health Service have access to a computer, but are located throughout the country, the use of CD-ROM for the delivery of a multimedia project, seems a logical option.

### 2.3.3 Hypertext Markup Language (HTML)

The files which make up web sites on the Internet are structured similar to *Windows*® Help-files. Since the HTML with which web sites are created provides for referencing within and between files (and not for "expanding" text), the problem of bad readability and disorientation is often aggravated (Kussler & van der

Merwe, 1998:324). According to these authors, there are two basic hypertext functions: Internal expansion when activated and external referencing of other files. They furthermore point out that expanding text adds to the length of the files which complicates reading; while referencing, which is activated from long lists, causes users to lose their place within the hypertext. This seems to be the basic problem confronting hypertext developers and hypertext readers.

According to Plewe (1995:634) HTML was envisioned to be a format that would allow scientists using very different computers to share information seamlessly over the network, and several features were necessary for this:

- **Platform independence**, in which a document can be displayed similarly on computers with different capabilities (i.e. fonts, graphics, and colour) was vital to the varied audience.
- **Hypertext**, which allows for any word or phrase in one document to reference another document; would allow for easy navigation between and within the many large documents on the system.
- Rigorously **structured documents** would allow for advanced applications such as converting documents to and from other formats and searching text databases.

Kussler & Van der Merwe (1998:330) conclude that a concise answer to the question as to when good hypertext is found, is when an application

- does have a clear hierarchical structure;
- utilises the unique properties of the visual display screen;
- which, in turn, is enhanced by a sensible and consistent system of external controls and internal links;

- so that it provides users with free and effortless access to every unit of information contained therein.

### 2.3.4 CD-ROM/WWW hybrids

One of the problems regarding the delivery of educational content via the WWW, has been the unreliability and inconsistency of information transfer via Internet connections which is largely caused by bottlenecks at the server level, or because of congestion at any point in the line of transmission. Larger multimedia files require lengthy download times which result in the fact that students have to wait long to view or hear these files. Diaz (1998:90) proposes the use of a CD/Web hybrid, which is essentially a web site on a CD-ROM disc, as a workable solution to these problems.

Pressing a multimedia web site onto a CD-ROM, may prove to be one of the most efficient and effective ways of delivering educational content via the WWW. The creation of a web site that could be played off a CD-ROM drive would enable an instructor to include rich audio and video content since the delivery would not be restricted to the slow transfer speeds of the modem. Hyperlinks on the CD-ROM would take a student from a CD-ROM out to the Internet, and back, seamlessly. The ability to integrate more multimedia resources onto the web site could increase student activity, curiosity, and interest, thereby increasing student motivation (Diaz, 1998:93).

The fact that information that is likely to change in the short term, cannot be included on a CD-ROM/WWW hybrid as well as the fact that updates to a CD-ROM are not as convenient or as immediate as updates to a web site, are disadvantages of this particular delivery system.

### 2.3.5 Constructing a web site

This section explores the main points to be considered in constructing a web site.

#### 2.3.5.1 Layout of a web site

The first step in designing a web site is to ensure that a defined set of goals exists. Without a clear statement of purpose and objectives, the project will either begin to wander off course, or may go on beyond the point of diminishing return. Before beginning to build a web site, the following should be done (Lynch & Horton, 1997):

- Identify the target audience.
- Have a statement of purpose.
- Know the main objectives.
- Have a concise outline of the information the proposed site will contain.

All of the content information and graphic resources to be collected or created in order to achieve the goals of the web site, should also be identified.

Some important guidelines for the layout and style of web sites are the following:

- Consistency in layout. For maximum functionality and legibility the page and site design should be built on a consistent pattern of modular units, all sharing the basic layout grids, graphic themes, and hierarchies of organisation. The goal is to be consistent and predictable (Lynch & Norton, 1997).

- Utilise a consistent format for each page. Jones & Okey (1995) suggests using a metaphor or theme for the program, which should reflect the content of the program. Lynch & Norton (1997) state that the best information designs are the ones most users never notice.

- The main page should be kept short, and the main index should jump to a number of shorter pages. The subject must be presented in manageable segments even though comprehensive in coverage (Willis, 1995).

- Links to internal information should be maximised, while links to external information should be minimised (Willis, 1995).

- Do not use unnecessarily large graphics. Pages which take too long to download frustrate users and may force them to retreat hastily. If the home page requires extensive use of graphics to demonstrate points, the user should be warned. Research has shown that the threshold of frustration is around ten seconds (Lynch & Norton, 1997).

- Do not let the home page become out of date. The home page should be an ongoing part of development, and information should be added or changed as necessary (Willis, 1995).

- Feedback and dialogue. Lynch & Norton (1997) state that well-designed web sites should always provide direct links to the site's editor or the "web master" responsible for the running of the site, which seems vital to the long term success of a program. Web sites should always have a revision date.

- Design stability. If the users are to be convinced that what you have to offer is accurate and reliable, the web site is to be designed with high editorial and design standards. A web site that looks sloppily built, with poor visual design and low editorial standards, will not inspire confidence in the users of such a site. Interactive elements of the site must work reliably (Lynch &

Norton, 1997).

### 2.3.6 Constraints and the future of training in the SA National Defence Force (SANDF)

Whilst exploring the delivery system which will be best suited, certain **constraints** have to be taken into account for the development of this specific multimedia product, for example:

- As a result of certain security restrictions placed on information and documentation of the SANDF, the Internet cannot be utilised. Use of the SANDF's Intranet might, however, be considered.

- The fact that the nurses are located throughout the country and have access to different types of computers with different configurations and capabilities must also be kept in mind.

The downsizing of defence forces, which includes a reduction in personnel and military hardware, is a momentum-gaining trend in many nations today. Modern defence forces are required to fulfil the same roles as before, and in some instances, additional secondary roles have been allocated to them which have to be executed with reduced numbers of personnel, hardware and budgets. The acquisition of new technologies and a decreasing budget have had a great impact on the training systems used by defence forces. This fact necessitated the introduction of alternative delivery approaches into the military training environments which are less manpower intensive and are state of the art in design and function (Weller, 1997:58). This, however, required a paradigm shift from the conventional training methods to an investment in information technology in order to facilitate technology-based training. The budget of the SANDF had been reduced from 4% of the Gross Domestic Product (GDP) to 1,6% of the GDP in recent years, thus forcing it to have a closer look at its training requirements, the availability of funds and possible alternative methods of delivering training.

The SANDF is presently a force operating in a peacetime environment. According to Van der Walt (1997:115) this means, *inter alia*, having a new vision, mission and goals and strategies for operating; having masses of probably outdated course content and material; and maintaining a defensive posture which is stronger than the offensive posture of an external threat, **whilst maintaining an offensive capability**. Van der Walt (1997:115) states that the challenges facing SANDF trainers can be met, amongst others, by:

- Undergoing a paradigm shift in terms of thinking about the learner, viz more individualised and achieving potential. Thinking about training as part of human resource development which culminates in a negotiated strategy between individual needs for development and an organisational need for effective, performing employees. Thinking about training strategies which imply conventional versus alternative strategies, training for impact, training for a specific job, training for portability as well as lifelong learning opportunities.

- Proper instructional design.

- Proper instructional development, including selecting method/s of instruction and selecting media.

- Designing, planning and implementation of a training system, *inter alia,* including provision of technological infrastructure for instruction and learning (hardware and software) and provision of managing technological structure (hardware and software), enablement of instructors, e.g. different roles played in different instructional situations and handling of new instructional technology.

- Employing various and alternative training strategies and **media of instruction**, for example individualised institution centred training; interactive distance training, interactive video, interactive television,

computer-assisted instruction, computer-assisted learning, on-line training and virtual reality. Training incorporating the Internet, Intranet and Extranet. Incorporating facilities such as tele-conferencing, video-conferencing, fax machines and e-mail.

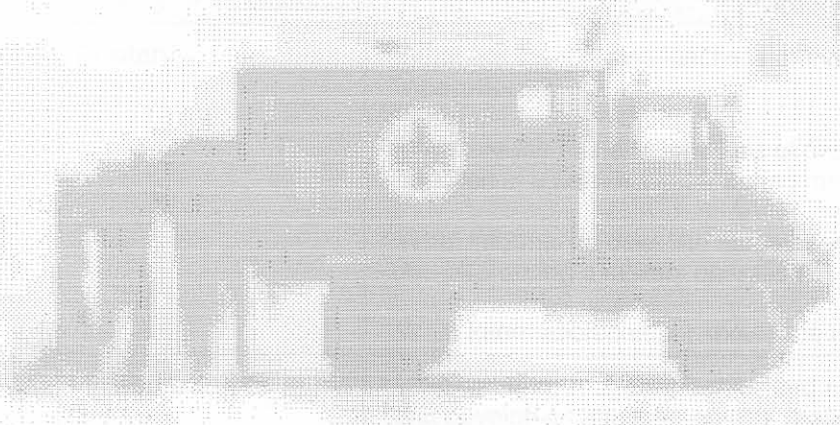
Van der Walt (1997:119) also states that a cost-effective, efficient training system suited to meet the needs of the individual as well as those of the organisation, can be developed by integrating all these principles and technologies.

Recent advances in virtual environment and virtual reality technology make the battlefield available to the individual combatant or teams for special training. This type of technology not only supports the training of a wide range of combat operations, but also non-combatant activities such as evacuations, humanitarian relief operations and search and rescue operations (Weller, 1997:60).

Computers and simulators are presently being used by a large number of defence forces for training purposes (including the SANDF). It has become necessary to take a fresh look at the utilisation of these technological resources in order to make their use more appropriate and generalised. Against the background of the above-mentioned, the SANDF will have to do the trade-off between what training it needs versus what training it can supply in ensuring it does what needs to be done. The SANDF will have to research into new technologies which will reduce the overall cost of training in the long term, without negatively affecting the high standard of training, but improving on it instead.

# Chapter 3

## *Design, development and production*



# CHAPTER 3

# *DESIGN, DEVELOPMENT AND PRODUCTION*

## 3.1 Executive overview

This chapter describes the design, development and the production of the multimedia program. An overview of the stages in the development process is presented in Table 3.2. Each of the stages in the process is described in detail.

The following research questions were addressed:

**Table 3.1 Research questions**

| Topic Addressed | Questions |
|---|---|
| **Content** | * What are the role and functions of the military nurse during **military operations**?<br>* What are the role and functions of the military nurse to be able to function in a **field hospital** during military operations?<br>* What information does the nurse need to be able to function in the field hospital during a military operation?<br>* What information/content should be made available to the nurse? |
| **Presentation of media** | * How can text, images, graphics and animation be combined to create and develop an attention-getting, realistic environment to simulate the deployment of the field hospital and provide information to prepare the military nurse for functioning during military operations? |
| **Delivery of media** | * Which delivery system will be best suited taking into consideration the constraints and restrictions of the SANDF? |
| **Project plan** | * How should this program be designed and developed? |
| **Evaluation** | * How well is this program working? |

## Table 3.2 Stages in the development process of the program

| Stages | Activities | Output | Discussion |
|---|---|---|---|
| **Analysis** | **Conduct analysis:** | | Chapter 3 |
| | * Goal | * Roles and functions of military nurse | |
| | * Target group | * Target group profile<br>* Learning needs | |
| | * Content/information | * Outline of content to be included List of major topics and sub-topics | |
| | * Presentation and delivery of media | * Literature survey report | Chapter 2 |
| | * Project | * Variables which might effect program design<br>* Project plan | Chapter 3 |
| **Designing** | **Design of program:**<br>* Write objectives<br>* Decide on delivery system | * Design for the specific system | Chapter 3 |
| | * Analyse content | * Exact content to be included | |
| | * Sequencing of content | * Navigation map (site map) | |
| | * Design specifications | * Blueprint | |
| | * Design evaluation instrument | * Evaluation instrument | |
| **Development** | * Decide on program editor | * Program editor installed | Chapter 3 |
| | * Story boarding | * Illustrations of screens | |
| | * Develop prototype on computer | * Prototype | |
| | * Conduct **formative** evaluation | * User comments/expert advice<br>* Revise prototype | |
| **Implementation (Programming)** | * Design on computer | * Working product ready for evaluation | Chapter 3 |
| **Evaluation** | * Conduct **summative** evaluation | * Recommendations<br>* Evaluation reports - expert and users | Chapter 4 |
| | * Revise program | * Refinement of program | |
| **Report** | * Report **findings** and compile **recommendations** for further study/program development | * Research report<br>* Delivering of product | Chapter 5<br>Chapter 6 |

## 3.2 Introduction

The researcher adapted the CAI (Computer Assisted Instruction) development model of Alessi and Trollip (1991:245), the process model of making multimedia of Vaughan (1998:430) and the model of Reeves (1994) to use as guides for the development of this program (Table 3.2). Alessi and Trollip (1991:245) recommend a cycle of drafting, evaluation and revision until the product works.

Following is a discussion on each of the stages used in the development process of the multimedia program.

## 3.3 Stage 1: Analysis

The analysis report template of Reeves (1994) was used as guideline to present the results of the analysis activities.

This stage describes the **purpose** of the analysis, **limitations**, the analysis **methods, instruments** used, and the **sample,** followed by the **results** of the analysis.

The outcome of the needs analysis was used to design and develop a multimedia **program** to simulate the deployment of the field hospital and provide information to prepare the military nurse for functioning in the field hospital during military operations.

The multimedia program will in future form part of one of the modules of a degree course for military nurses, presently being developed by a tertiary institution.

### 3.3.1 Purpose

The purpose of the analyses were the following:

#### 3.3.1.1 Goal analysis (performed in two phases)

The aim of the Phase 1 Goal analysis was to clarify and/or confirm the roles and functions of the military nurse to be able to function during **military operations**.

The aim of the Phase 2 Goal analysis was to clarify and/or confirm the roles and functions of the military nurse to be able to function in a **field hospital** during military operations.

#### 3.3.1.2 Target population analysis

The aim of the target population analysis was to confirm the extent of the nurses' training and education needs regarding functioning in a field hospital during military operations, the knowledge and skills they already possessed and needed to acquire, their expectations, and any constraints.

#### 3.3.1.3 Content/information analysis

The aim of the content/information analysis was to clarify the content/information that should be included in the multimedia program in order to make the most essential information available to simulate the field hospital and to prepare the military nurse for functioning in the field hospital during military operations.

#### 3.3.1.4 Media analysis

- Presentation

The aim of this analysis was to find the best combination of text, images, and animation, to create an attention-getting, realistic environment to simulate the deployment of the field hospital and provide information to prepare the military nurse for functioning during military operations.

- Delivery

The aim of the research regarding the delivery of a multimedia product was to find a delivery system which would be best suited, taking into consideration the constraints and restrictions of the SANDF.

#### 3.3.1.5 Project analysis

The aim of the analysis was to collect information regarding the design and development **process** of the multimedia program under development and at the same time set target dates for each stage to be finished.

### 3.3.2 Limitations

#### 3.3.2.1 Content/information of program

The training manuals that existed were not updated and very few local protocols and doctrine regarding peace operations existed. The proposed policy on South African participation in Peace Missions (April 1998) is still in a draft form and could not be quoted until approved by the relevant role players. The researcher therefore had to rely on these limited protocols and people who had been deployed during military operations. New doctrine, emanating from lessons learnt during Exercise Blue Crane conducted during May 1999, was still in the process of being developed and could thus not be utilised as a basis for the development of this product.

A large number of experienced people had left the SANDF through the process of transformation. It was therefore found that the majority of people questioned or interviewed during the analyses, mostly had experience gained during military operational **exercises** and had not gained their knowledge during exposure to real life military **operations**.

#### 3.3.2.2 Inspection of deployed field hospital and interviews

The researcher was only able to spend a limited amount of time with the personnel deployed during Exercise Blue Crane and to observe the activities that were taking place at the field hospital.

## 3.4 Analysis method

Methodological triangulation was used. The research questions and the different quantitative instruments/methods that were applied, are set out in Table 3.3 and are discussed from paragraph 3.4.1.

## Table 3.3 Research questions and analysis methods

| Topic addressed and questions | Lit/ Doc | Ques | Inter | Insp | Focus |
|---|---|---|---|---|---|
| **Information/content:** | | | | | |
| **Phase 1:** | | | | | |
| * What are the role and functions of the military nurse during **military operations**? | ✔ | ✔ | ✔ | ✔ | ✔ |
| **Phase 2:** | | | | | |
| * What are the role and functions of the military nurse to be able to function in a **field hospital** during a military operation? | ✔ | ✔ | ✔ | ✔ | ✔ |
| * What information does the nurse need to be able to function in the field hospital during a military operation? | ✔ | ✔ | ✔ | ✔ | ✔ |
| * What information/content must be made available to the nurse? | ✔ | | ✔ | | |
| **Presentation:** How can text, images, and animation be combined to create an attention-getting, realistic environment to simulate the deployment of the field hospital and provide information for functioning during military operations? | ✔ | | | | |
| **Delivery:** Which delivery system would be best suited? | ✔ | | | | |
| **Project plan:** How should this program be designed and developed? | ✔ | | | | |
| **Evaluation:** How well is this program working? | | ✔ | ✔ | | |

Note : The following abbreviations are used in the table :
Lit/Doc = Literature review/Documentation
Ques = Questionnaire
Insp = Inspection
Inter = Interview,
Focus = Focus group.

### 3.4.1 Analysis methods

The following surveys were used as analysis methods:

#### 3.4.1.1 Interviews

During phase one of the needs analysis, the researcher and the head of the nursing department of a South African university visited the Health Studies Division, Royal Defence Medical College in the United Kingdom. The curriculum of their degree in military nursing, the role of the military nurse during military operations, and the needs analysis that had been done before they developed their course, were discussed in detail.

The researcher interviewed each of eight nurses while they were deployed during a military operation. They were purposefully chosen, i.e. all the nurses that were available at the field hospital during the visit of the researcher. The interview was conducted because it allowed the researcher to in more detail explore the information needs and preferences of the nurses while deployed. A questionnaire with ten open-ended questions was used which was tested for content and construct correctness by a nurse who was not part of the interviews or the deployment. The nurses were allowed to collaborate on aspects if so preferred.

The researcher took notes during the interviews and wrote out longer interpretations of the responses soon after the interviews had been conducted.

Military experts were consulted in order to identify the content that should be included in the multi-media project.

#### 3.4.1.2 Focus group (Phase 1)

Two facilitators (industrial psychologists) were appointed to facilitate the focus group during phase one. The facilitators and the researcher established the

survey goal and the focus group protocol. Sixteen people, military as well as non-military, were purposefully chosen to be part of this focus group. Every person was chosen because of the fact that he/she was a specialist in a certain medical field, e.g. trauma, peace support operations, chemical and biological defensive measures and aviation nursing.

The questions were generated and tested for ease of understanding by a person not part of the focus group.

The facilitators asked the questions and encouraged everybody to give their opinions, and ensured that no single individual dominated the discussion. The researcher took notes and did not take part in the discussion. After each question was asked, the discussion continued until agreement was reached by most of the people on each aspect of the questions.

The data was analysed by the researcher.

An example of the focus group protocol is attached as **Appendix A**.

3.4.1.3 Focus group (Phase 2)

During phase two of the needs analysis, a focus group met at a tertiary training institution to confirm the role and tasks of the military nurse during military operations and specifically in the field hospital.

The head of the nursing faculty established the survey goal and the focus group protocol because the military nursing degree is to be presented at this particular institution.

The following people were purposefully chosen to be part of this focus group:

- Experts in the field of military operations.

- Nurses who have been deployed in military operations.

- A member of the International Committee of the Red Cross.

- A member of the Royal Defence Medical College in the United Kingdom who had developed a degree in military nursing for their students and who had extensive operational experience.

- The head of the nursing faculty asked the questions and encouraged everybody to give their opinions, ensuring that no one dominated the discussion. The researcher took notes and did not take part in the discussion. The discussion continued until most of the people agreed on a certain aspect and until the role and tasks of the military nurse were agreed upon.

The data was analysed by the researcher and the head of the nursing faculty. An example of the focus group protocol is attached as **Appendix B**.

3.4.1.4 Inspection

The deployment site of the field hospital was visited by the researcher during a military operation to inspect the layout of the field hospital, the flow of patients and the flow of traffic and notes and photographs were taken.

3.4.1.5 Questionnaires

Ten questionnaires with 15 open-ended questions were distributed randomly to ten registered nurses stationed at 1 Military Hospital and to ten lecturers at the SAMHS College for Nursing who were willing to complete the questionnaire. The questionnaire used was tested for content and construct correctness by a nurse

who was not part of the research.

The researcher collected all the questionnaires the same day they were completed. The data was analysed by the researcher.

#### 3.4.1.6 Documentation review

The existing and currently used training manuals were studied by the researcher to identify the content that the nurses need to know.

The report of a needs analysis that was done by members of the Royal Defence Medical College in the UK to establish the training needs of their nurses in order to develop a course in military nursing for their students, had been studied to learn from their experience.

#### 3.4.1.7 Literature search

A literature search was done to collect information regarding how the multimedia product to be developed could be utilised to simulate the deployment of the field hospital and which delivery system would be the most suitable for this purpose.

## 3.5 Sample

The people that were included in the analyses are indicated under each of the following headings.

### 3.5.1 Interviews

A **member of the Royal Defence Medical College** in the United Kingdom who had developed a degree in military nursing for their students and who has had extended operational experience had been interviewed to identify and confirm the tasks that a military nurse might perform while functioning in a field hospital during

military operations.

**Registered nurses who had previously deployed** during military operations and military operational exercises were interviewed at the place of deployment during a military exercise to clarify the educational and training needs of the military nurse in order to be prepared to function during military operations. Their computer literacy level was identified and their motivation to use a computer as a supplement for their information needs was established.

**Registered nurses who had never been deployed** were interviewed to identify their educational, training and information needs to prepare themselves for deployment in a military operation. Their computer literacy level was identified and their motivation to use a computer as supplement for their information needs was established.

**Experts in the field of military operations** were interviewed to identify and confirm the content that should be made available to the military nurse.

A **member of the International Committee of the Red Cross** was interviewed to identify and confirm the content that should be made available to the military nurse from the perspective of the Red Cross.

### 3.5.2 Focus group (Phase 1)

A total of **sixteen people, military as well as non-military**, took part in the focus group discussions. These people were chosen because they were specialists in a certain field, e.g. trauma, peace support operations, chemical and biological defensive measures and aviation nursing.

### 3.5.3 Focus group (Phase 2)

The following people were involved in this focus group: Experts in the field of military operations, nurses who had been deployed before, a member of the International Committee of the Red Cross as well as a member of the Royal Defence Medical College in the United Kingdom who had developed a degree in military nursing for their students and who has had extensive operational experience.

## 3.6 Instrumentation

The following instruments and methods were used during the analyses.

### 3.6.1 Questionnaires

#### 3.6.1.1 Questionnaires to registered nurses

Ten questionnaires with 15 open-ended questions were used. See **Appendix C** for an example of the questionnaire.

The aspects that were addressed in the questionnaire are the following:

- The training and applicable courses needed or required to be able to function during military operations.
- The information and educational needs required to be prepared to function during a military operation.
- Their general knowledge regarding the field hospital was tested.
- Their computer literacy level and motivation to receive information or training with computer assistance was established.

#### 3.6.1.2 Interviews with registered nurses

Eight nurses were interviewed while being deployed during a military exercise during which a questionnaire with ten open-ended questions was used. See **Appendix D** for an example of the questionnaire.

The aspects that were addressed in the questionnaire are the following:

- The training and applicable courses needed or required to be able to function during military operations.
- The information and educational needs required to be prepared to function during a military operation.
- The computer literacy level and motivation needed to receive information or training with the assistance of a computer.

## 3.7 Results

The results of the needs analysis are described below.

### 3.7.1 Goal analyses

A graphic representation and a table were used to display the results of the goal analyses during Phase 1 of the analysis. See **Appendices E(1)** and **E(2)** for the results. Only the section indicated in blue in Appendix E(2) was further analysed in Phase 2 for the purpose of developing a multimedia product.

The result of the goal analysis in Phase 2 is displayed in a diagram attached as **Appendix F**. This diagram was used to analyse the content that was made available to the students, taking the educational and information needs indicated by the students into consideration.

### 3.7.2 Target population profile

Since the researcher is a nursing educator and is familiar with military nurses, the military environment, and the training that is available, it allowed her to narrow down the analysis because of her familiarity with and awareness of many of the training and educational needs as well as the constraints that may have an influence on developing a multimedia program.

The target population was male and female registered nurses who are Permanent Force members. They are located throughout the country, working in various sickbays and Military hospitals.

Only eight of the nurses who were interviewed or completed the questionnaire, had been deployed before as part of a military exercise.

Aspects like language preference of the target group were not taken into consideration, because the language most understood in the military environment is English. For this reason the multimedia product was developed in English.

#### 3.7.2.1 Training and applicable courses needed

Although all the nurses (n=28) had done some military courses, they all indicated that the military courses were just enough to give them some background but had not been sufficiently applied to the role and tasks of the military nurse to prepare them for military operations.

**Table 3.4 Military courses completed by target group**

| Officers Formative Training Course | Battle Handling Course | Junior Command and Staff Course |
|---|---|---|
| 28 | 20 | 5 |

Note : Officers' Formative Training must first be completed before the other courses may be attempted, which means that only five nurses had completed all three courses.

Most of the nurses (n=20) felt that their training for nursing was adequate but that they needed more exposure to the field hospital and functioning in adverse conditions. Eight nurses indicated that if they would be called up to be ready for a military operation the following day, they would not be able to function properly since they lacked both nursing and military experience.

The nurses interviewed at the deployment area (n=8), all indicated that they had not been sufficiently prepared for, or briefed about the military exercise and that they had learned through trial and error.

The courses that were indicated as necessary for military nurses to be able to function during military operations are: advanced trauma and life support, clinical diagnosis and treatment, aviation nursing, first aid, theatre technique, and practical experience/ exposure to the field environment and the field hospital.

3.7.2.2 Educational and informational needs

The informational needs of the nurses who had been interviewed that had already been deployed during a military exercise, were slightly different from those of nurses that had not been deployed before. All the nurses (n=8) who had been interviewed at the place of deployment, indicated that they would have preferred to have been more informed about general aspects like the kind of weather to be expected, the kind of diseases to be expected, the specific military operation and

that they would have liked to have been part of the planning process of the deployment of the field hospital and the supplies needed. Two of the nurses indicated that they were not familiar with all the military vehicles and that they would have liked to have been able to distinguish between them. Four of the nurses wanted to learn more about radio-communication procedures and helicopter drills.

The nurses who had never deployed before, indicated that they would like to have been informed about the layout of the field hospital, the components of the field hospital, what would be expected of them, where they would sleep and what kind of facilities would be available to them. Three of the nurses indicated that they would have liked to know what supplies and equipment would be available.

**Table 3.5 Nurses' needs for information, training and education**

| Informational needs | Training/educational needs |
|---|---|
| Equipment and supplies needed | Helicopter drills |
| Kind of patients/diseases that can be expected | Radio-communication procedures |
| Functions of the nurse/what will be expected of the nurse | The different vehicles used during a military operation |
| The layout and components of the field hospital | The layout and components of the field hospital |
| Need to be part of planning cycle - pre-deployment planning appreciation | Type of military operation |
| Ablution facilities and sleeping arrangements | |
| What they must take along | |

### 3.7.2.3 General knowledge regarding the field hospital

The nurses who had been deployed while interviewed, had not been questioned about the field hospital because they had been part of the deployment of the field hospital and were therefore familiar with the layout.

The nurses who had never been deployed before, had either never seen the field hospital deployed or could not remember what they had been told during the military courses. The field hospital is only explained in theory but they had not actually seen it deployed.

#### 3.7.2.4 Computer literacy

Most of the nurses indicated that they were computer literate.

The nurses indicated that real life experience could never be replaced by simulation or a computer, but that through the computer they could gain information that could help them to prepare for a military operation or would serve as a precursor for a military exercise.

#### 3.7.2.5 Motivation

Although not all the nurses indicated that they had access to a computer with a CD-ROM, they were highly motivated people who indicated that if they knew that information was available by means of a computer to prepare them for deployment, that they would spare no pains to get hold of that information. Two of the nurses indicated that they were not interested in getting the information by means of a CD-ROM.

### 3.7.3 Content analysis

The researcher used a diagram (**Appendix F**) to indicate that which was decided upon by the focus group as important aspects to be taken into consideration for teaching the field hospital. Not all the learning needs, as indicated by the students, were included at that stage. The final decision regarding the content that had to be included in the multimedia product, changed after discussion with the military experts and during the development stage.

### 3.7.4 Media analysis

A media analysis was done to determine how text, images and animation could be combined to create an attention-getting, realistic environment to simulate the field hospital, as well as which delivery system would be best suited, taking into consideration the constraints and restrictions of the South African National Defence Force ( SANDF). (See literature review **Chapter 2** for the results).

### 3.7.5 Project analysis

The result of the project analysis was a project plan which was developed using a combination of the steps of the models recommended by Alessi & Trollip (1991:245) Vaughan (1998:430) and Reeves (1994). The development process is set out in table format as well as the target dates for each stage to be finished. (See **Appendix G** for the project plan).

## 3.8 Triangulation

### 3.8.1 Data triangulation

The debriefing reports of the SA Army, SA Air Force and SA Military Health Services after Exercise Blue Crane during the period 6-30 April 1999, confirmed the lack of experience/training/education of military personnel.

Only the aspects that are applicable to the nurses and which they identified as lacking or as needs are listed:

- Lack of operational experience and doctrinal knowledge of peace operations.

- Lack of standard radio-communication procedures.

- Lack of knowledge regarding essential aspects of deployment.
- How to pitch tents.
- How to deploy the field hospital.
- Layout of the field hospital.
- Thorough appreciation (aspects to consider before deployment).
- Lack of knowledge about the Law of Armed Conflict and Humanitarian Law.

## 3.9 Stage 2: The design of the program

According to Hannafin & Peck (1988:58) the purpose of designing is to identify and document the best means of achieving the desired results. Allesi & Trollip (1991:293) state that the design step is critical to the effectiveness of the program. The content is outlined and sequenced and then the plan is reviewed by colleagues and clients. It is much easier to revise things on paper than revise a computer program.

### 3.9.1 Objectives

Objectives that should be met in the program for the main research question to be answered were written and included a description of how the objective will be met. The objectives also guided the researcher to stay on track. The objectives are presented in Table 3.6.

**Table 3.6 Design objectives**

| Objectives | How objectives will be met |
|---|---|
| * Create **attention** | * Graphically attractive Home Page by using an eye-catching photograph scanned in as background. No information given, except a heading that might create curiosity.<br>* Photos - small and enlargements.<br>* Simulation of field hospital - interactivity by user. |
| * **Simulate** the deployment of the field hospital | * Click and drag the "tents and containers" to "deploy" the field hospital - user try him-/herself.<br>* Proposal of a deployment that might work well. |
| * Provide **information** to prepare the military nurse for functioning during **military operations**. | * Content outlined in site map (**Appendix H**) |

### 3.9.2 Delivery system

As a result of the restrictions of the SANDF with regards to the publishing of training material, the use of the WWW for this purpose could not be considered. The use of HTML and a web design format, however, posed a possibility for the delivery of this multimedia program, since use could be made of the Intranet of the SAMHS. A large proportion of the military nurses are located throughout the country, which made the use of a CD-ROM/WWW hybrid as a delivery system, the most feasible option. The information which is likely to change in the short term, could be placed on the SAMHS Intranet.

### 3.9.3 Analysing the content

Subject matter experts were asked to analyse the content that should be included in the program to make sure that the most essential information was made available. It was decided not to include all the learning and educational needs as indicated by the nurses during the analysis phase. The aspects that were

excluded are those aspects that are of a more practical nature as well as those that are subject to change, depending on the type of military operation.

### 3.9.4 Sequencing

The structure of the program must be mapped out, because navigation maps outline the connections or links among various areas of the content and help organise the content. The navigation map (or site map) provides a chart of the logical flow of the interactive interface (Vaughan, 1998:464).

According to Vaughan (1998:468) a familiar landscape must be built to which users may return at any time. A site map for the web site was therefore constructed to which all other documents were linked. The site map would be directly accessed upon exiting any such document. A nonlinear approach was used, i.e. users were given navigational control so that they could wander through the content at will. The site map was, however, arranged in such a way that the user might be enticed to start at the top left and work through the program in a sequential manner. (See **Appendix H** for site map layout).

### 3.9.5 Design specifications

The factors that should be taken into consideration when designing are discussed in detail in **Chapter 2.** The way in which they were implemented in the program are set out in Table 3.7.

## Table 3.7 Design specifications

| Design specifications | Implementation in program |
|---|---|
| **Multimedia organising structure** | Non-linear. |
| | |
| **Multimedia building blocks:** | |
| **Text attributes:** | |
| * Fonts/type faces | Arial. |
| * Print size | Large enough to read comfortably on screen, small enough to print out in few pages per topic. |
| * Type styles | Headings: bold. Italics instead of underlining. |
| * Cases | Combination of upper case and lower case - easier to read. |
| * Serif vs Sans serif | * Sans serif - more legible and attractive when presenting a substantial amount of text on screen as in this program.<br>* Large serif font for headings - deliver message of elegance. |
| * Justification of text | Left justification. |
| * Menus for navigation | Navigation site map (text list of topics) at beginning of site - familiar place for user to go back to. |
| * Buttons for interaction | * Default buttons of Internet used.<br>* Instructions to click on photos to view an enlargement. |
| * Fields for reading | * Text per subject organised to be able to print in no more than two pages.<br>* Lots of white space around text.<br>* Line length limited to maximum of 60 characters. |
| * Symbols and icons | Logo of the SAMHS used on index page.<br>Arrows and helicopter pad - known symbols. |
| * Animating text | Not used. |
| * Layout of text | * Down scrolling limited to 2 screens maximum. Scrolling left and right avoided.<br>* When a combination of text and graphics appear on display, the text is isolated.<br>* Indentations used and blank lines to indicate new paragraphs.<br>* Information organised into manageable segments - users do not get overwhelmed by the amount of information. |

| Design specifications | Implementation in program |
|---|---|
| **Screen design principles:** | |
| * Simplicity | * Simple and straightforward - no "bells and whistles". The best designs are the ones no one ever notices. |
| * Consistency | * Consistent use of colour and screen layout - consistent density and white spaces, background image and familiar site map. Background image used as theme for program - theme reflects program's content. |
| * Clarity | * Bullets used whenever possible. Language level compatible with target group. |
| * Aesthetic consideration:<br>- balance<br>- harmony | * Harmony through consistency of font, colour and background image. Images and text are balanced within the page with lots of white space to create harmony. |
| * Design stability | * Interactive elements work reliably. High design and editorial standards. |
| **Colour combinations** | Only two colours were used for the text, that is black and web safe green for the headings. Green (near the centre of visual spectrum) is easier to perceive than others. The background colour used is white. A photo of a Mfezi ambulance and a helicopter busy with the evacuation of patients was scanned in and used as background image to create a military operations atmosphere. |
| **Images** | Photos scanned in and JPEG saved - permits a greater degree of compression than GIF and faster downloading. Photos do not take more than 15 seconds maximum to download. Four photos at the most on one screen not to clutter the screen. Photos are presented simultaneously with the related text - opportunity to inspect the photos and explanation together. The user controls the length of time for looking at the photos (do not disappear after predetermined time period). Click on a photo to see an enlargement - choice of user. |
| **Graphics** | Vector drawn graphics ("tents and containers") of the field hospital were created by the researcher and GIF saved - background of graphics made transparent. |
| **"Drag-able" screen objects** | "Tents" and "containers" are moved on the screen by clicking and dragging them to construct the layout of the field hospital. |
| **Feedback and dialogue** | Link provided to site's editor through direct link to e-mail address. |

| Design specifications | Implementation in program |
|---|---|
| **Create/keep attention** | Attention attracted initially by the home page background image and the use of the familiar SAMHS logo which create a **formal, professional look - importance of content**.<br>**Curiosity** - what is behind the home page?<br>**User involvement** - dragging around of "tents".<br>**Personal interest** because the content of the program is relevant to the knowledge required to be able to function properly during military operations.<br>**Photos** - capture attention more than text and explain text. Text is balanced with photos and graphics to focus attention.<br>**Consistency** - is more important than varying layout to maintain attention. |
| **Simulation** | Physical simulation combined with procedural simulation. "Deployment" of the field hospital - help user to build a useful mental model. |
| **Delivery systems** | CD-ROM/WWW hybrid which is particularly useful for distance learners. The Intranet for information that might change frequently. |

## 3.10 Stage 3: Development of the program

### 3.10.1 Choice of editor for creating and managing web pages

*Dreamweaver®* was chosen as the editor for creating and managing web pages for the following reasons:

- With *Dreamweaver®*, it is easy to create cross-platform, cross-browser pages.
- HTML documents can be imported without reformatting the code.
- *Dreamweaver®* makes it possible to use HTML features such as animated layers and behaviours without writing a code which was a mandatory feature to allow moving around of the "field hospital" components.

The researcher was unfamiliar with the program and spent considerable time into mastering the program. An informal teaching session was arranged to teach the capabilities and technical aspects of the program.

### 3.10.2 Story boarding

"Story boards are illustrations depicting each change to the computer screen and conveying other important information to the reviewers and programmers" (Hannafin & Peck, 1988:61).

Since the researcher was doing the designing and developing of the program, less-detailed story boards were used. The program was developed for the web which meant that, except for a few pages with photos on and the simulation of the field hospital, all the pages were the same. The story boards were therefore only used as a rough schematic guide for development of the program.

### 3.10.3 Development of the prototype

A small portion of the planned project was selected and developed to get it to work as it would in the final project. At least one of each of the different kind of web pages were developed e.g. a page with photos that link to enlargements, a page with only information and links and a page which creates interactivity through "clicking and dragging" of objects.

### 3.10.4 Conduct formative evaluation and revise the program

Formative evaluation refers to evaluation that takes place while the program is being developed (Hannafin & Peck, 1988:63).

"Test it, then test it again; that's the unavoidable rule" (Vaughan, 1998:544).

#### 3.10.4.1 Testing the program on the web

Testing the program on the web was essential to ensure that the end result appears on screen exactly as planned. The background of the program was not visible on the web, even though it was visible on the researchers' computer on "view on browser" mode. After a long fault finding process it was found that the setting on the *Dreamweaver®* program was incorrect since it was set relevant to site root instead of relevant to document.

#### 3.10.4.2 Potential users

The people who were involved in the formative stage were registered nurses who were previously deployed as part of a military operation and registered nurses who had not been part of military operations before.

The potential users were observed while they were going through the program. Their reactions were analysed and all questions noted. One of the nurses was unfamiliar with the way the program was designed for the web and asked for instructions. Aspects that needed revision were identified and rectified.

#### 3.10.4.3 Graphic design experts

The first design of the program was in the colours of the South African Military Health Service (SAMHS), namely maroon text on a background of cream and web safe green for links and visited links. The SAMHS logo was used on top of each page to create a professional and formal look. The idea was to create an atmosphere that was military and dusty because the deployment of the field hospital is just what the name indicates, in the field. The multimedia design experts recommended, however, that white be used as a background colour and black used for the text. It was also suggested that the SAMHS logo be omitted.

The researcher then scanned in a photo of an Mfezi ambulance and helicopter,

made it transparent and used it as a background image on a white background. The result was a professional look with a "military feel" and without the all white clinical background, which satisfied the graphic design experts.

The researcher worked according to the time schedule as set out in **Appendix G.**

## 3.11 Stage 4: Production

Most users at home and the office have 14 - 15 inches monitor screens which are set to display a 640 x 480 pixel screen. Since the program was developed to be informational, it was of the utmost importance that the program be developed to fit into the confined available space so that it would be easy to print the information without cutting off half of the information on the page. Lynch & Horton (1997) describe the "safe area" dimensions for layouts designed to print well as 535 pixels maximum width and 295 pixels maximum height.

To design and develop for a CD-ROM/WWW hybrid delivery system, certain principles had to be kept in mind. On a 640 x 480 pixel VGA monitor, the working space on the monitor is about 600 pixels wide by 300 tall because browsers include controls and slider bars (Vaughan, 1998:497). He also recommends that eye-catchers that will be first loaded and viewed by visitors without scrolling, be placed in this space (Vaughan, 1998:497).

The design principles which were used for this program are set out in Table 3.6.

## 3.12 Stage 5: Summative evaluation of the program

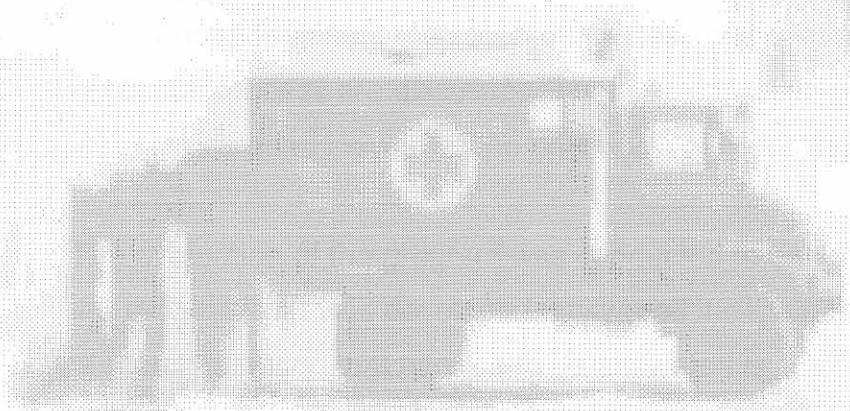
The aim of the summative evaluation was to evaluate if the program met the prescribed objectives. The evaluation process is discussed in **Chapter 4.**

## 3.13 Stage 6: Report

The findings of the summative evaluation and the recommendations for revision of the program and future development are discussed in **Chapters 5 and 6.**

# Chapter 4

## *Evaluation procedure*



# CHAPTER 4

# *EVALUATION PROCEDURE*

## 4.1 Executive overview

This chapter describes the summative evaluation procedure that was used to evaluate the program.

The research sub-question that needed to be answered, was:

| How well is this program working? |
|---|

The target population, the selection process of the samples, and the data collection process are discussed. The data collection process includes the instruments used as well as the procedure of collecting data.

The evaluation of the program was conducted to determine if, and to what extent, the program that was developed, answered the main research question. The main research question that needed to be answered is:

How can multimedia be used to create and develop an attention getting, realistic environment to simulate the field hospital and provide information to prepare military nurses for functioning during military operations?

## 4.2 Introduction

According to Hannafin and Peck (1988:301), summative evaluation is not conducted to identify features for modification or revision. It is an end in itself and does not usually result in subsequent modification of the content of the program or the procedures.

Vaughan (1998:546) adds that the beta testing group should be representative of real users. They must not have any preconceived ideas and must provide comments, suggestions and detailed descriptions of any problems that occurred. If the testers' comments are overlooked or ignored, the testing effort is wasted (Vaughan, 1998:546).

## 4.3 Target population and sample

The target population for the development of this program was registered nurses, male and female, who were Permanent Force members. For the evaluation of this program, the researcher decided to broaden the target group in order to discover if the program would also be suited for groups within the military environment, other than nurses.

The samples for this evaluation were selected as follows:

- A purposive sampling of four registered nurses who had been previously deployed in a SANDF operation and/or exercise.

- A convenience sampling of four other registered nurses and six military personnel other than nurses.

- A convenience sampling of four experts in multimedia design.

## 4.4 Data collection process

### 4.4.1 Instruments used

The following instruments were used:

#### 4.4.1.1 User evaluation questionnaire

The user evaluation questionnaire was used to evaluate if the design objectives as indicated in Table 4.1 were met in the program developed for the main research question to be answered.

A combination of Reeves & Harmon's (1994) "User Interface Rating Tool for Interactive Multimedia", Jones and Okey's (1995) "Interface Design for Computer-based Learning Environments" and the "Interface Design" of Lynch & Horton (1997), were used to develop the evaluation form. (See **Appendix I**).

The questionnaire consisted of 27 questions:

- One question to determine whether the respondents had previously deployed during military operations/exercises.
- One question regarding their familiarity with the Internet.
- The mustering of the respondents was determined in one question.
- The users had to rate 16 aspects pertaining to the program on a five point scale.
- Four different recommendations on improving the program content were listed which could be indicated if found to be applicable.

- Three other questions, relating to improvements to the program, the value of the program and the applicability to other target groups, were asked.

Table 4.1 indicates the relationship between the research questions and the questionnaire.

**Table 4.1** **Design objectives to be met in the program for the main research question to be answered**

| Design objectives | Aspects of user interface dimensions that had to be evaluated by the user | Dimensions of user interface rated by experts |
|---|---|---|
| * Use **multimedia** to create and develop the program, with the application of sound **design specifications** | * The layout of the screen and the overall "look" is pleasing. | * Aesthetics |
| | * The program looks professional with high editorial standards. | * Design stability |
| | * The interactive elements of the program work reliably. | * Design stability |
| | * The content is presented in manageable segments. | * Closure |
| | * I felt overwhelmed by numerous options. | * Closure |
| | * The organisation of the program should be improved. | * Closure |
| | * I knew at all times where in the program I was and how to go to another section of the program. | * Navigation |
| | * I knew at all times how much of the information I had interacted with (visited) and which parts of it I hadn't. | * Mapping |
| | * The screen is not cluttered with too much text. | * Screen design |
| | * The colour of the text provides for good visibility. | * Screen design |
| | * More visual material should be added. | * Screen design |
| | | * Simplicity and consistency<br>* Metaphor or theme<br>* Media integration |

| Design objectives | Aspects of user interface dimensions that had to be evaluated by the user | Dimensions of user interface rated by experts |
|---|---|---|
| * **Simulate** the deployment of the field hospital | * The simulation of the field hospital deployment provides for sufficient user involvement to make experience meaningful.<br>* The opportunity to simulate the deployment of the field hospital gives me sufficient information to be able to apply this information during the planning and deployment phases of military operations. | * Information presentation<br>* Information presentation |
| * Provide **information** to prepare the military nurse for functioning during **military operations**. | * I will be able to use what I learned in this program.<br>* The content is sufficient to prepare me for functioning during military operations.<br>* The content covered in the program should be reduced.<br>* The content covered in the program should be increased.<br>* Make recommendations for improvement.<br>* Indicate most valuable aspect of program. | * Information presentation |
| * Create/keep **attention.** | * This program caught and held my attention.<br>* I enjoyed using this program. | * Ease of use |

#### 4.4.1.2 Interface rating form for experts

Expert multimedia users were asked to rate the program using an user interface rating form. The design specifications as used by the researcher are indicated in Table 3.6 in Chapter 3.

A combination of Reeves & Harmon's (1994) "User Interface Rating Tool for Interactive Multimedia", Jones and Okey's (1995) "Interface Design for Computer-based Learning Environments", and the "Interface Design" of Lynch & Horton (1997), was used to develop the rating form.

The rating form consisted of 12 questions (See **Appendix J**). The experts had to rate the program on a one to five scale by marking the appropriate number under each

indicated dimension. Space was provided for any comments/ suggestions.

### 4.4.2 Collecting data

To be able to evaluate the program, the researcher had to make appointments with users and experts and then had to take her computer to the users and experts because none of the users and only some of the experts had access to the *Dreamweaver®* and/or *Internet Explorer®* programs. As a result of this, it was not possible to access more than a maximum of two users per day to evaluate the program. Four users came to the researcher's house to look at and evaluate the program.

On an average it took the users 75 minutes to work through the program and to complete the questionnaire. Aspects such as the heavy workload of users, made data collection difficult, because appointments were cancelled at short notice and other users had to be found to evaluate the program. It is not known how long it took the experts to evaluate the program or to complete the questionnaire, since the experts executed this task in isolation.

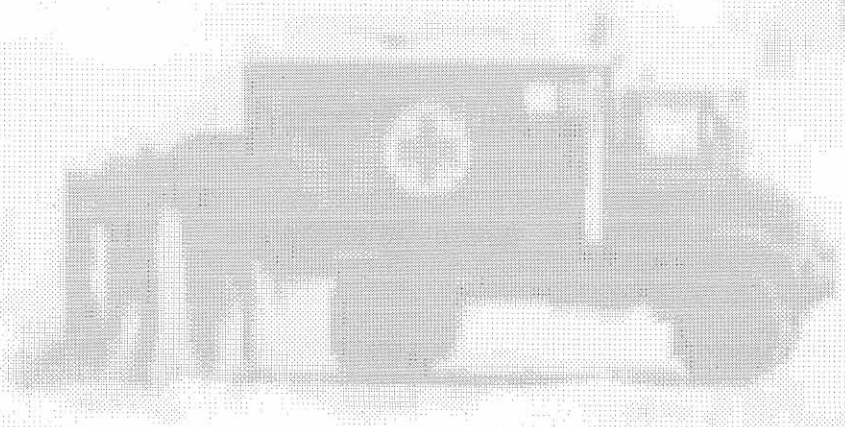
The expert interface rating forms and the user evaluation questionnaires were completed and returned to the researcher, while the users handed the questionnaires back to the researcher on the same day.

### 4.4.3 Analysing the data

An analysis of the data generated by the user evaluation questionnaires, the expert interface rating forms, and the findings of the analyses are discussed in **Chapter 5**.

# Chapter 5

## *Findings*



# CHAPTER 5

# *FINDINGS*

## 5.1 Introduction

This chapter reports the findings of the summative evaluation. Four experts and fourteen users evaluated the program. The findings outlined in this chapter are presented in the same order as the aspects and dimensions that had to be rated. See Table 4.1 (page 82). Where applicable, comments made by the evaluators (users and experts) are included.

## 5.2 Evaluation of the program

Following is a description of the persons who evaluated the program.

### 5.2.1 Target group (users)

#### 5.2.1.1 Registered nurses

The group of registered nurses consisted of two distinct groupings:

- Registered nurses who had previously deployed in a military operation/ exercise and who were purposefully chosen; and

- four nurses who had not deployed in a military operation/exercise, who where available at the time to evaluate the program.

Seven of the eight nurses were not familiar with the Internet.

#### 5.2.1.2 Personnel other than nurses

In order to determine if the program would also be suited for groups other than nurses within the military, six users who were not nurses were asked to evaluate the program and were requested to complete the same user evaluation form as the nurses. These personnel consisted of three medical support officers, a personnel officer, a language practitioner and a pharmacist/logistic officer. Two of these users were not familiar with the Internet.

The researcher had to explain the concept of links to navigate through the program before the users who were not familiar with the Internet could start evaluating the program.

### 5.2.2 Expert evaluators

Four experts evaluated the program:

- The head of media design and development at COLET (SANDF College for Educational Technology).
- A graphic designer employed by COLET.
- A nurse lecturer who is responsible for telematic education of nurses at the University of Pretoria and who is currently busy with the course M.Ed. Computer Assisted Education.
- The Director Language Support, employed by the SAMHS (South African Medical Health Services). He is currently busy with M. Phil. Technology Enhanced Language Instruction.

## 5.3 Findings

Following is an exposition of the findings after analysing the user evaluation questionnaires and the expert interface rating forms.

The users had to evaluate the program according to a five-point scale with the following meanings attached to the numbers; 1 = strongly disagree, 2 = disagree, 3 = neither agree/nor disagree, 4 = agree, 5 = strongly agree. The questionnaire is attached as **Appendix I**.

The experts had to rate the user interface dimensions on a five-point scale with a different meaning for each of the dimensions. This questionnaire is attached as **Appendix J**.

### 5.3.1 Design objective 1

In order to determine if the design objectives, as indicated in Table 4.1 were met in the developed program, the user interface design dimensions had to be rated by the experts and certain aspects of these user interface dimensions by the users.

The first design objective that had to be met by the program in order for the main research question to be answered, is the following:

> Use **multimedia** to create and develop the program, with the application of sound **design specifications**.

To evaluate if this objective had been met, the experts had to evaluate the program according to the following **dimensions of user interface**:

- Aesthetics.
- Design stability.
- Closure.
- Navigation.
- Mapping.
- Screen design.
- Simplicity and consistency.
- Metaphor or theme.
- Media integration.

The users had to rate certain **aspects of the user interface dimensions** as set out in Table 4.1.

Following are the findings relating to the dimensions and the aspects of the dimensions that were rated in order to determine if design objective 1 had been achieved.

5.3.1.1 Dimension of user interface: aesthetics

The aspect of this dimension that had to be rated was:

- ***The layout of the screen and the overall 'look' is pleasing.***

The findings were the following:

- Users

All the nurses and the other personnel found the layout of the screen and overall "look" pleasing. The ratings of this aspect are presented in Table 5.1.

**Table 5.1 Aspects of user interface dimension: aesthetics**

| | Nurses deployed (n=4) | | | | | Nurses not deployed (n=4) | | | | | Personnel other than nurses (n=6) | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Aspect of dimension evaluated** | **1** | **2** | **3** | **4** | **5** | **1** | **2** | **3** | **4** | **5** | **1** | **2** | **3** | **4** | **5** |
| The layout of the screen and overall "look" is pleasing | | | | **1** | **3** | | | | | **4** | | | | **4** | **2** |

■ Experts

All of the experts found the aesthetics of the program design pleasing. The ratings of this aspect are presented in Table 5.2.

**Table 5.2 Expert interface rating: aesthetics dimension**

| **Dimensions of user interface** | **Expert 1** | | | | | **Expert 2** | | | | | **Expert 3** | | | | | **Expert 4** | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **1** | **2** | **3** | **4** | **5** | **1** | **2** | **3** | **4** | **5** | **1** | **2** | **3** | **4** | **5** | **1** | **2** | **3** | **4** | **5** |
| Aesthetics | | | | | X | | | | X | | | | | | X | | | | X | |

Following are some of the comments made by the expert evaluators:

- Maroon and green work well together and in the case of this program the "military feel" that was created with the "military background" is enhanced.

- The background appears disturbing at times, "I wanted to wipe it clean".

- Language rules were applied incorrectly ("field hospital" as a heading was spelled in lowercase).

- The "small, faint font" next to the logo on the index page is just too faint to balance with the heading.
- The aesthetics of the program fits with the military image.
- The overall look is pleasing and fitting for the military user for which it was designed. The use of the transparent background adds to the military character of the program.
- The index page creates a "mood" and sets the scene of what is to be expected.

5.3.1.2 Dimension of user interface: design stability

The following aspects of this dimension were rated:

- ***The program looks professional with high editorial standards.***
- ***The interactive elements of the program work reliably.***

The results of these aspect were the following:

- Users

All the users found the program to be professional with high editorial standards. All the users found the interactive elements of the program to work reliably. The ratings of these aspects are set out in Table 5.3.

**Table 5.3 Aspects of user interface dimension: design stability**

| | Nurses deployed (n=4) | | | | | Nurses not deployed (n=4) | | | | | Personnel other than nurses (n=6) | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Aspect of dimension evaluated** | **1** | **2** | **3** | **4** | **5** | **1** | **2** | **3** | **4** | **5** | **1** | **2** | **3** | **4** | **5** |
| The program looks professional with high editorial standards | | | | **1** | **3** | | | | **1** | **3** | | | | **2** | **4** |
| The interactive elements of the program work reliably | | | | **1** | **3** | | | | **3** | **1** | | | | **2** | **4** |

- Experts

All of the experts found the program design stable.

The ratings of this aspect are presented in Table 5.4.

**Table 5.4 Expert interface rating: design stability**

| **Dimensions of user interface** | **Expert 1** | | | | | **Expert 2** | | | | | **Expert 3** | | | | | **Expert 4** | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 1 | 2 | 3 | 4 | 5 | 1 | 2 | 3 | 4 | 5 | 1 | 2 | 3 | 4 | 5 |
| Design stability | | | | X | | | | | | X | | | | | X | | | | | X |

Following are the comments made by the expert evaluators:

- The high design and editorial standards will inspire confidence in the user that information is accurate and reliable.
- The index page and the other pages' headings are of different size and font which results the eye to "jump between the pages".

5.3.1.3 Dimension of user interface: closure

The following aspects of this dimension were rated:

- ***The content is presented in manageable segments.***
- ***I felt overwhelmed by numerous options.***
- ***The organisation of the program should be improved.***

The results of the analysis of these aspects are set out below:

- Users

Thirteen of the users indicated that the content is presented in manageable segments. One user (other than nursing) was not too sure about it.

Twelve of the users indicated that they were not overwhelmed by numerous options. One of the nurses and one of the other users was unsure.

Thirteen of the users indicated that the organisation of the program does not need improvement. One of the users (other than nurses) indicated that the organisation of the field hospital can be improved by labelling the in tents the same way as the containers.

The ratings of these aspects are presented in Table 5.5.

**Table 5.5 Aspects of user interface dimension: closure**

| | Nurses deployed (n=4) | | | | | Nurses not deployed (n=4) | | | | | Personnel other than nurses (n=6) | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Aspect of dimension evaluated** | **1** | **2** | **3** | **4** | **5** | **1** | **2** | **3** | **4** | **5** | **1** | **2** | **3** | **4** | **5** |
| The content is presented in manageable segments | | | | 3 | 1 | | | | | 4 | | | 1 | 3 | 2 |
| I felt overwhelmed by numerous options | 2 | 2 | | | | 2 | 1 | 1 | | | 4 | 1 | 1 | | |
| The organisation of the program should be improved | **Yes** | | **No** | | | **Yes** | | **No** | | | **Yes** | | **No** | | |
| | 0 | | 4 | | | 0 | | 4 | | | 1 | | 5 | | |

- Experts

All of the experts found the closure dimension manageable.

The ratings of this aspect are presented in Table 5.6.

**Table 5.6 Expert interface rating: closure**

| **Dimensions of user interface** | **Expert 1** | | | | | **Expert 2** | | | | | **Expert 3** | | | | | **Expert 4** | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 1 | 2 | 3 | 4 | 5 | 1 | 2 | 3 | 4 | 5 | 1 | 2 | 3 | 4 | 5 |
| Closure | | | | | X | | | | | X | | | | X | | | | | | X |

The following recommendations were made:

- The two columns on the site map and on the "about" page should be changed into one column. The "about" page reads like a newspaper and

a person has to scroll down and then up again to read the other column. Information on the site map is too much and should be subdivided into more pages.

- Information contained in the program is presented in manageable segments. Users, even inexperienced ones, should be able to manage the information presented easily.

- Information is managed very well into easily understandable sections. The bullets help with this organisation and provides for easy reading.

5.3.1.4 Dimension of user interface: navigation

The following aspect of this dimension was evaluated:

- ***I knew at all times where in the program I was and how to go to another section of the program.***

The findings were the following:

- Users

Thirteen of the users indicated that they knew at all times where in the program they were and how to go to another section of the program. One of the users stated that she felt lost.

The ratings of this aspect are presented in Table 5.7.

**Table 5.7 Aspects of user interface dimension: navigation**

| | Nurses deployed (n=4) | | | | | Nurses not deployed (n=4) | | | | | Personnel other than nurses (n=6) | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Aspect of dimension evaluated** | 1 | 2 | 3 | 4 | 5 | 1 | 2 | 3 | 4 | 5 | 1 | 2 | 3 | 4 | 5 |
| I knew at all times where in the program I was and how to go to another section of the program | | | 1 | 1 | 2 | | | | 1 | 3 | | | | 1 | 5 |

■ Experts

Three of the four experts found the program easy to navigate. One of the experts indicated that it was a bit difficult. The ratings of this aspect are presented in Table 5.8.

**Table 5.8 Expert interface rating: navigation**

| **Dimensions of user interface** | **Expert 1** | | | | | **Expert 2** | | | | | **Expert 3** | | | | | **Expert 4** | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 1 | 2 | 3 | 4 | 5 | 1 | 2 | 3 | 4 | 5 | 1 | 2 | 3 | 4 | 5 |
| Closure | | | | | X | | | X | | | | | | X | | | | | | X |

The expert evaluators made the following suggestions:

- Link to the site map from every page.
- It is not necessary to work through the program sequentially, but going through it in sequential order is possible and probably an easier option for the inexperienced user.
- Navigation through this program is very easy.

5.3.1.5 Dimension of user interface: mapping

The aspect of this dimension that had to be evaluated was:

- ***I knew at all times how much of the information I had interacted with (visited) and which parts of it I had not.***

The results of this evaluation are as follows:

- Users

Eleven of the users indicated that they knew at all times how much of the information they had interacted with and which parts of the program they had not.
Three of the users indicated that they experienced problems with the navigation. (The users that experienced problems worked on the researcher's computer and the program was not "refreshed" and therefore the links did not change colour.)

The ratings of this aspect is presented in Table 5.9.

**Table 5.9 Aspects of user interface dimension: mapping**

| | Nurses deployed (n=4) | | | | | Nurses not deployed (n=4) | | | | | Personnel other than nurses (n=6) | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Aspect of dimension evaluated** | **1** | **2** | **3** | **4** | **5** | **1** | **2** | **3** | **4** | **5** | **1** | **2** | **3** | **4** | **5** |
| I knew at all times how much of the information I had interacted with (visited) and which parts of it I hadn't | | | 1 | 1 | 2 | | | | 2 | 2 | | 1 | 1 | 1 | 3 |

- Experts

Two of the experts indicated that the mapping of the program is powerful while two of the experts experienced some trouble with the mapping.

The ratings of this dimension are presented in Table 5.10.

**Table 5.10 Expert interface rating: mapping**

| Dimensions of user interface | Expert 1 | | | | | Expert 2 | | | | | Expert 3 | | | | | Expert 4 | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 1 | 2 | 3 | 4 | 5 | 1 | 2 | 3 | 4 | 5 | 1 | 2 | 3 | 4 | 5 |
| Mapping | | | | | X | | | X | | | | | X | | | | | | X | |

The experts made the following comments:

- The presence of a site map and the "about" page being accessed from the home page makes mapping extremely easy. The use of hypertext to access information referred to in the text, makes the way finding to other information very manageable.

- Too much information on the site map makes way finding difficult. Divide the information between more pages.

- Way finding between the different pages and back to the site map is easy. At the site map however, I was not sure which of the sections I already visited.

5.3.1.6 Dimension of user interface: screen design

The aspects of this dimension that had to be evaluated were:

- ***The screen is not cluttered with too much text.***

- ***The colour of the text provides for good visibility.***

- ***More visual material should be added.***

The results of this evaluation are as follows:

- Users

  - Thirteen of the users indicated that the screen is not cluttered with too much text and one user found it cluttered.

  - Fourteen of the users indicated that the colour of the text provides for good visibility.

  - Nine of the thirteen users wanted more visual material to be added.

The ratings of these aspects are presented in Table 5.11.

**Table 5.11 Aspects of user interface dimension: screen design**

| | Nurses deployed (n=4) | | | | | Nurses not deployed (n=4) | | | | | Personnel other than nurses (n=6) | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Aspect of dimension evaluated** | 1 | 2 | 3 | 4 | 5 | 1 | 2 | 3 | 4 | 5 | 1 | 2 | 3 | 4 | 5 |
| The screen is not cluttered with too much text | | | | 1 | 3 | | | | | 4 | | | 1 | 2 | 3 |
| The colour of the text provides for good visibility | | 1 | | | 3 | | | | | 4 | | | | 3 | 3 |
| More visual material should be added | Yes | | | No | | Yes | | | No | | Yes | | | No | |
| | 3 | | | 1 | | 3 | | | 1 | | 3 | | | 3 | |

■ Experts

All four the expert evaluators indicated that the general principles of screen design were adhered to. The ratings of this dimension are presented in Table 5.12.

**Table 5.12 Expert interface rating: screen design**

| **Dimensions of user interface** | **Expert 1** | | | | | **Expert 2** | | | | | **Expert 3** | | | | | **Expert 4** | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 1 | 2 | 3 | 4 | 5 | 1 | 2 | 3 | 4 | 5 | 1 | 2 | 3 | 4 | 5 |
| Screen design | | | | X | | | | | X | | | | | X | | | | | X | |

The experts commented on the following:

- The principles of screen design are generally adhered to and no major violations thereof could be found. The use of an appropriate background adds to the impact on the user. The background illustrates that elements of art and invention are present. Appropriate use is made

of text, visual material and colour.

- One of the experts indicated that the background appeared disturbing at times and that green was not a good choice of colour for the headings.
- The program is in general visually very stimulating, especially the transparent background, the choice of font and colour. The text on the index page next to the "Field hospital" heading is just too faint to be balanced with the rest of the text.

The following aspects were not evaluated by the users.

5.3.1.7 Dimension of user interface: simplicity and consistency

Four experts evaluated the program. Three of the experts rated the program as consistent and predictable. One of the experts rated the program as somewhat inconsistent and unpredictable.

The findings, after analysing the expert rating forms, are presented in Table 5.13.

**Table 5.13 Dimension of user interface: simplicity and consistency**

| Dimensions of user interface | Expert 1 | | | | | Expert 2 | | | | | Expert 3 | | | | | Expert 4 | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 1 | 2 | 3 | 4 | 5 | 1 | 2 | 3 | 4 | 5 | 1 | 2 | 3 | 4 | 5 |
| Simplicity and consistency | | | X | | | | | | | X | | | | | X | | | | | X |

The following comments were made:

- Photos are not consistent. Most of the photos can be "clicked" on to enlarge except four photos which are "roll over" images. This confuses and frustrates the user because the photos could not be enlarged.

- Information regarding the photos on how to enlarge them is not repeated on the enlarged photos to let the user know how to get them to the original size.

#### 5.3.1.8 Dimension of user interface: metaphor or theme for the program

Three of the four experts who evaluated the program found the theme of the program appropriate. One of the expert evaluators found the metaphor/theme somewhat inappropriate. The findings of the expert ratings are presented in Table 5.14.

**Table 5.14 Expert interface rating: metaphor or theme for the program**

| Dimensions of user interface | Expert 1 | | | | | Expert 2 | | | | | Expert 3 | | | | | Expert 4 | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 1 | 2 | 3 | 4 | 5 | 1 | 2 | 3 | 4 | 5 | 1 | 2 | 3 | 4 | 5 |
| Metaphor or theme for the program | | | | | X | | | X | | | | | | | X | | | | X | |

Following are the comments of the expert evaluators:

- The theme provided with the background is very applicable to the program's content.

- The logo of the SAMHS could be used as a metaphor.

#### 5.3.1.9 Dimension of user interface: media integration

All four experts who evaluated the program found the media integration dimension coordinated.

The findings of the expert ratings are presented in Table 5.15.

**Table 5.15 Expert interface rating: media integration**

| Dimensions of user interface | Expert 1 | | | | | Expert 2 | | | | | Expert 3 | | | | | Expert 4 | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 1 | 2 | 3 | 4 | 5 | 1 | 2 | 3 | 4 | 5 | 1 | 2 | 3 | 4 | 5 |
| Media integration | | | | | X | | | | X | | | | | | X | | | | | X |

The following comment was made:

- The media integration is coordinated. At a later stage when the program is extended, other types of media (sound, video) could be included to enhance the program. The photographs were absolutely necessary to make the information relevant to the target group. The program would not be able to function equally without them.

### 5.3.2 Design objective 2

The second design objective that had to be met by the program in order for the main research question to be answered, is the following:

> **Simulate** the deployment of the field hospital.

To determine if this objective had been met, the experts had to evaluate the program according to the **information presentation** dimension of user interface, while the users had to rate certain **aspects** of the user interface dimensions as set out in Table 4.1.

Following are the results of this dimension and the aspects of the dimension that had to be rated in order to determine if design objective 2 had been achieved.

5.3.2.1 Dimension of user interface: information presentation (simulation)

The aspects of this dimension that had to be rated were:

- ***The simulation of the field hospital deployment provides for sufficient user involvement to make experience meaningful.***

- ***The opportunity to simulate the deployment of the field hospital gives me sufficient information to be able to apply this information during the planning and deployment phases of military operations.***

- Users

Twelve of the users indicated that the simulation of the field hospital deployment provided for sufficient user involvement to make the experience meaningful.

Twelve of the fourteen users indicated that the opportunity to simulate the deployment of the field hospital gave them sufficient information to be able to apply this information during the planning and deployment phases of military operations.

The ratings of these aspects are presented in Table 5.16.

## Table 5.16 Aspects of user interface dimension: information presentation (simulation)

| | Nurses deployed (n=4) | | | | | Nurses not deployed (n=4) | | | | | Personnel other than nurses (n=6) | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Aspect of dimension evaluated** | 1 | 2 | 3 | 4 | 5 | 1 | 2 | 3 | 4 | 5 | 1 | 2 | 3 | 4 | 5 |
| The simulation of the field hospital deployment provides for sufficient user involvement to make the experience meaningful. | | | | 2 | 2 | | | 1 | 2 | 1 | | | 1 | 2 | 3 |
| The opportunity to simulate the deployment of the field hospital gives me sufficient information to be able to apply this information during the planning and deployment phases of military operations. | | | 3 | 1 | | | | | 2 | 2 | | | 2 | 3 | 1 |

Comments regarding the simulation of the field hospital were (when requested to make suggestions on how to improve the program) were:

- Develop the simulation section further to incorporate different scenarios and the other military health team's functions.
- Label tents the same as the containers are labelled.

The comments made by the experts are set out on page 107.

### 5.3.3 Design objective 3

The third design objective that had to be met by the program in order for the main research question to be answered, is the following:

> Provide **information** to prepare the military nurse for functioning during **military operations**.

To evaluate if this objective had been met, the experts had to evaluate the program according to the **information presentation** dimension of user interface, while the users had to rate certain **aspects** of the user interface dimensions as set out in Table 4.1.

Following are the results of this dimension and the aspects of the dimension that had to be rated in order to determine if design objective 3 had been achieved.

#### 5.3.3.1 Dimension of user interface: information presentation

The aspects of this dimension that had to be rated were:

- ***I will be able to use what I learned in this program.***
- ***The content is sufficient to prepare me for functioning during military operations.***
- ***The content covered in the program should be reduced.***
- ***The content covered in the program should be increased.***

The users were also asked to recommend:

- ***Improvements to the program***;

and

- ***indicate the most valuable aspect of this program***.

The findings are the following:

- Users

  - Thirteen users indicated that they will be able to use what they learned in this program. One of the users (other than nurses) was not sure if he would be able to use the information.

  - Only two of the four nurses that had been deployed indicated that the content was sufficient to prepare them for functioning during military operations. Four of the nurses that had never deployed before indicated that the content was sufficient. Three of the users (other than nurses) indicated that the information was sufficient.

  - None of the fourteen users wanted the content covered in the program to be reduced.

  - All of the users wanted the content covered in the program to be increased.

The ratings of these aspects are presented in Table 5.17.

## Table 5.17 Aspects of user interface dimension: information presentation

| | Nurses deployed (n=4) | | | | | Nurses not deployed (n=4) | | | | | Personnel other than nurses (n=6) | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Aspect of dimension evaluated** | 1 | 2 | 3 | 4 | 5 | 1 | 2 | 3 | 4 | 5 | 1 | 2 | 3 | 4 | 5 |
| I will be able to use what I learned in this program | | | | 1 | 3 | | | | 2 | 2 | | | 1 | 3 | 2 |
| The content is sufficient to prepare me for functioning during military operations | | 1 | 1 | 2 | | | | | 3 | 1 | | | 3 | 3 | |
| The content covered in the program should be reduced | **Yes** | | **No** | | | **Yes** | | **No** | | | **Yes** | | **No** | | |
| | **0** | | **4** | | | **0** | | **4** | | | **0** | | **4** | | |
| The content covered in the program should be increased | **Yes** | | **No** | | | **Yes** | | **No** | | | **Yes** | | **No** | | |
| | **4** | | **0** | | | **4** | | **0** | | | **4** | | **0** | | |

- Experts

All four the expert evaluators indicated that the information presentation is very clear.

The ratings of this dimension are presented in Table 5.18.

**Table 5.18 Expert interface rating: information presentation**

| Dimensions of user interface | Expert 1 | | | | | Expert 2 | | | | | Expert 3 | | | | | Expert 4 | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 1 | 2 | 3 | 4 | 5 | 1 | 2 | 3 | 4 | 5 | 1 | 2 | 3 | 4 | 5 |
| Information presentation | | | | | X | | | | | X | | | | | X | | | | | X |

The experts commented on the following:

- The information presentation is very clear and easily understood - even to a novice.

- The information presented in the program is comprehensible and clear. Users would be able to learn from this program. The inclusion of the SOFAS (Status of Forces Agreement) and the ROE (Rules of Engagement) is critical information because this is not presently generally accessible.

- The information made available is easy to comprehend (user-friendly language).

- The simulation of the field hospital provides valuable information that will orientate the nurse in preparation for a military operation.

## ■ Suggested improvements to the program

The question on how to improve the program resulted in the following responses:

- Four of the nurses that had deployed previously wanted more content to be added and two nurses wanted more visual material to be added.

- All four of the nurses that had not deployed previously wanted more content and more photographs to be added.

- Four of the six other users wanted more content and three wanted more visual material to be added. Only three of the users that recommended more content, explained what the content should be and only one made recommendations about the visual material. They recommended the content to be added according their own fields of interest.

Only one of the above mentioned users who wanted more visual material to be added made any recommendations. The additional content they recommended to be included, is presented in Table 5.19.

**Table 5.19 Recommendations regarding content to be included in the program**

| Nurses deployed previously (N=4) | Nurses not deployed previously (N=4) | Other users (N=6) |
|---|---|---|
| More visual material. | More visual material. | Map to indicate the location of the SADC countries. |
| Personal requirements. | Personal requirements. | Interaction between medical post and field hospital |
| Checklists for the equipment and supplies needed. | | Content of scales, equipment and supplies required by different sections |
| Guidelines on how to do an appreciation of the expected number of casualties/patients and the planning of equipment and supplies accordingly. | Control and command during military operations. | |
| Guidelines for the utilisation of other facilities (infrastructure needed) instead of tents. | Functions of each nurse (standing operational procedures). | Simulation section developed further - different scenarios. Label tents. |
| Exact (fine) details on how to deploy each containerised unit plus checklists of each. | | |

## ■ The most valuable about the program

The users were asked to list the most valuable aspects of the program. Following is a summary of these comments made by evaluators of the different groups.

- <u>Nurses deployed</u>
  - The information that is compiled in one document with photographs that enables a person to see what is discussed. Currently no such document exists.

- Layout of the field hospital.

- The program's suitability to orientate nurses that have never deployed before.

- The program provides essential information as preparation for a military exercise which can then be put into practice.

- Nurses not deployed

  - Information that can be put into practice on how to deploy a field hospital.

  - Everything.

  - Few people get the opportunity to see the field hospital deployed before being called up for a military operation and know the different vehicles involved. This program provides information that can be used to prepare the nurse for the operation. At least, the nurse will be able to recognise the vehicles and familiarise herself with the layout and units of the field hospital.

  - The information about the field hospital and the simulation thereof.

- Other military personnel

  - The simulation section.

  - The layout of the field hospital and the corresponding information.

- Everything.
- The explanation of the field hospital concept.
- The photographs of the different components of the field hospital.
- This program can be extensively used to orientate especially nurses and to familiarise them with the organisation and layout of the field hospital on a decentralised base. Cost and time away from work can therefore be reduced for the SAMHS.

- Experts

All four the expert evaluators indicated that the information presentation is very clear.

### 5.3.4 Design objective 4

The fourth objective that had to be met by the program in order for the main research question to be answered, is the following:

| |
|---|
| Create/keep **attention.** |

To evaluate if this object had been met, the users had to rate the following aspects:

- ***This program caught and held my attention.***
- ***I enjoyed using this program.***

The findings were the following:

- Users

Thirteen of the fourteen users indicated that the program caught and held their attention. One user (other than a nurse) indicated that he was a little bored.

All fourteen of the users indicated that they enjoyed the program (even the bored one).

The ratings of these aspects are presented in Table 5.20.

**Table 5.20 Create/keep attention**

| | Nurses deployed (n=4) | | | | | Nurses not deployed (n=4) | | | | | Personnel other than nurses (n=6) | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Aspect of dimension evaluated** | **1** | **2** | **3** | **4** | **5** | **1** | **2** | **3** | **4** | **5** | **1** | **2** | **3** | **4** | **5** |
| **This program caught and held my attention** | | | | **1** | **3** | | | | | **4** | | | **1** | **1** | **4** |
| **I enjoyed using this program** | | | | **1** | **3** | | | | | **4** | | | | **2** | **4** |

5.3.4.1 Dimension of user interface: ease of use

According to Reeves & Harmon (1994), this dimension may be highly correlated with how well users enjoy using a specific program. Not liking an interactive program that is intended to be highly motivating is a major problem. All four experts who evaluated the program found the program very easy to use.

The findings after analysing the expert rating forms is presented in Table 5.21.

**Table 5.21 Expert interface rating: ease of use**

| Dimensions of user interface | Expert 1 | | | | | Expert 2 | | | | | Expert 3 | | | | | Expert 4 | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 1 | 2 | 3 | 4 | 5 | 1 | 2 | 3 | 4 | 5 | 1 | 2 | 3 | 4 | 5 |
| Ease of use | | | | | X | | | | X | | | | | X | | | | | | X |

The experts commented on the following:

- The program designer succeeded to make the program very easy to use.
- To 'double click' on the enlarged photographs to take it back to the original size would make it easier than using the 'back' button.
- "A 'site map' button on every page to take the user immediately back to the site map would make the use of the program easier. To 'double click' on the enlarged photographs to take it back to the original size would make it easier than using the 'back' button".
- The program is extremely easy to use especially for experienced users of the Internet. With the limited instructions, even inexperienced users should have no difficulty in using the program.

### 5.3.5 Overall functionality of the program

In order to determine if the program would also be suited for groups other than nurses within the military, the users had to indicate on the questionnaire if the program would be applicable to target groups other than nurses. They were requested to motivate their answers. The responses are set out below.

#### 5.3.5.1 Nurses deployed

All four nurses indicated that the program might be applicable to target groups other than nurses. Only two of them motivated their answers:

- Not all personnel get the opportunity to be part of a military operation. The program can be used to at least show the personnel what they can expect and to prepare them.
- The information presented in the program is not exclusively for nurses. Every person in the Military Health Service should be familiar with the field hospital and the main medical equipment.

#### 5.3.5.2 Nurses never deployed

All four nurses indicated that the program might be applicable to other target groups as well as to nurses. Their motivation were:

- Nurses function as part of a multi-professional team and the program might therefore be applicable to the other team members as well.
- The program gives insight into the sections (main medical equipment) where other professionals than nurses function. This provides for the completion of the whole picture.
- "Everybody that is part of a military operation".

#### 5.3.5.3 Other military personnel

All six users indicated that the program will be suitable for other target groups. Each made the suggestions according to his/her own interest field.

- The medical support officer (operational interest) indicated that if the simulation section is further developed to accommodate different scenarios, it will be more applicable to operational personnel.

- Medical support officer (instructor): "No other information is available in one document or presentation to train personnel than this program".

- The personnel officer (operational Interest) suggested that to make it more applicable, the complete Medical Battalion Group and Medical Health Task Group concept must be included to incorporate other interest groups and not only the certain areas where nurses might be utilised.

- The language practitioner indicated that the program might be applicable for every person in the health environment that might be called up to take part in military operations.

- Pharmacist/logistic officer - "This program can be used by members of all musterings within the SAMHS who are not familiar with the field hospital - either during conventional or peace operations. It is a very good effort to try and bridge the gap that presently exists with regards to training in the SAMHS".

5.3.5.4 Experts

All four expert evaluators rated the program as functional.

The ratings of these aspects are presented in Table 5.22.

## Table 5.22 Expert interface rating: overall functionality

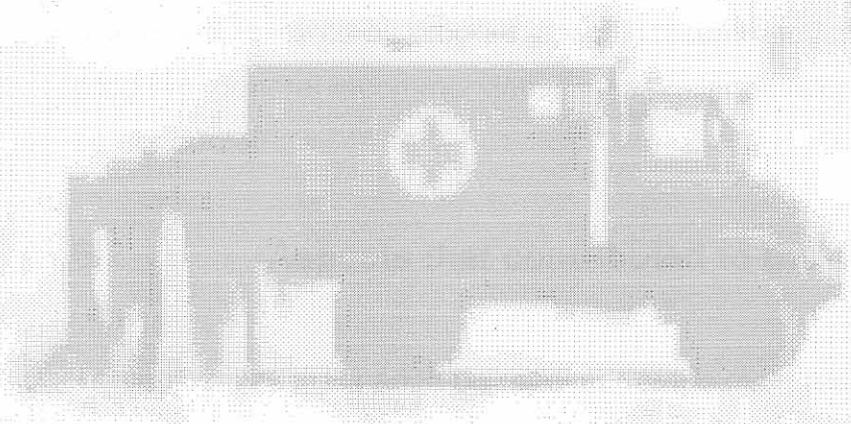
| Dimensions of user interface | Expert 1 | | | | | Expert 2 | | | | | Expert 3 | | | | | Expert 4 | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 1 | 2 | 3 | 4 | 5 | 1 | 2 | 3 | 4 | 5 | 1 | 2 | 3 | 4 | 5 |
| Overall functionality | | | | | X | | | | X | | | | | X | | | | | | X |

The expert evaluators comments are summarised as follows:

- The program is highly functional for the intended use of the program and can be used for other target groups as well.

# Chapter 6

## *Conclusions and recommendations*



# CHAPTER 6

# *CONCLUSIONS AND RECOMMENDATIONS*

## 6.1 Introduction

The findings in Chapter 5 indicate that the program that was developed succeeded in creating an attention-getting, realistic environment wherein the field hospital could be simulated and whereby information was provided to prepare military nurses for functioning during military operations.

This chapter focuses on those aspects that contributed to the success of the program and outlines the aspects where differences of opinion occurred.

The overall functionality of the program and the limitations of the research are discussed, followed by program specific recommendations for improvement of the program, general recommendations for similar development and further research to be conducted.

## 6.2 Aspects that contributed to the success of the program

The objectives that had to be reached for the main research question to be answered, and that were evaluated by means of how successful the dimensions of user interface were applied, are discussed. The objectives are:

- Use multimedia to design and develop the program with the application of sound design specifications.
- Simulate the deployment of the field hospital.

- Provide information to prepare military nurses for functioning during military operations.
- Create/keep attention.

The dimensions of user interface that were evaluated in order to conclude whether the objectives had been reached, are discussed and are presented in Table 4.1.

### 6.2.1 Use multimedia to design and develop the program with the application of sound design specifications

According to the findings of this research, sound design principles were applied in the design and development of the program. The design specifications that were implemented in the program are presented in Table 3.7.

The opinions of the users and experts are discussed below.

#### 6.2.1.1 Dimension of user interface: Aesthetics

Reeves & Harmon (1994) state that aesthetics are highly unique and one person's sense of beauty may seem grotesque to another. This statement was confirmed, since most of the users and experts found the layout of the screen and the overall appearance of the program pleasing, except for two expert evaluators. It was indicated that the application of maroon and green text worked well together and enhanced the "military feel" that was created with the "military background". However, one of the expert evaluators complained about the incorrect use of language rules ("field hospital" as a heading was spelt in lowercase) and the disturbing background that he wanted to "wipe clean". The fact that this evaluator is a linguist, may explain his concern. Another expert evaluator did not like the "small faint" font used simultaneously with the large headings on the index page. According to Reeves & Harmon (1994) creative designers may sometimes intentionally violate screen design principles for effect, or to focus the users' attention.

Most of the users and experts rated the aesthetics dimension (which refers to the artistic aspects of interactive programs in the sense of possessing beauty or elegance) very highly. The researcher therefore did not change anything on the index page and did not change the headings to initial capital letters.

#### 6.2.1.2 Dimension of user interface: Design stability

The findings of this study indicated that the program appeared professional and high editorial standards were present. A professional appearance and high editorial standards inspire confidence in the user that the presented information is accurate and reliable. A web site that appears to be sloppily built, with poor visual design and low editorial standards, will not inspire confidence in the users of such a site (Lynch & Norton 1997). One of the expert evaluators complained about the heading of the index page which differed in size and font from the rest of the pages. This evaluator commented that the use of a different font and font size resulted in the eye "to jump" between the pages. The researcher adapted the headings of the remainder of the pages to be the same as those of the index page.

#### 6.2.1.3 Dimension of user interface: Closure

Reeves (1994) states that program information must be organised into manageable segments in order to allow users the ability to access information in a controllable way. Most of the users (nurses and others) indicated that the information contained in the program was presented in manageable segments and that the organisation of the program did not need improvement. The expert evaluators confirmed the standard of closure by rating this dimension as manageable.

One of the users (other than nurses) mentioned that the organisation of the field hospital section could be improved by labelling the tents in the same way as the containers had been labelled. This was done.

One of the experts recommended that the layout of the "about" page be changed.

Originally the page was constructed like a newspaper with two columns, which resulted in the fact that a user had to scroll down the left-hand column and then up again to read the right-hand column. This matter was corrected by the researcher.

#### 6.2.1.4 Dimension of user interface: Navigation

The findings indicated that navigation within the program was easy. One of the expert evaluators complained about the use of non-standard link colours. The researcher deliberately used "earthy" colours (terra cotta and web safe green) for the links and visited links respectively, to enhance the "military feel" and to complement the background.

According to the literature, standard links to pages that had not been opened are blue and links to previously opened pages are purple or red (Kussler & Van der Merwe, 1998:327). These colours are standard in most web browsers and should therefore be used consistently (Nielsen 1999). However, Reeves & Harmon (1994) state that screen design principles have not kept up with the rapidly changing nature of interactive technology and furthermore, creative designers may intentionally violate screen design principles for effect or to focus the users' attention.

Since none of the other evaluators negatively reported on the colours of the links and because of the fact that navigation within the program was reported as being very easy, the colours of the links were not changed.

One of the users suggested that the "site map" should link from every page. Willis (1995) states that links to internal information should be maximised. This suggestion, therefore, was implemented.

Three of the users and one of the experts indicated that they had experienced problems with certain navigational aspects. One of the comments was: "Way finding between the different pages and back to the site map is easy. At the site map, however, I was not sure which of the sections I already visited". The users and

experts who experienced these problems, evaluated the program on the researcher's computer. It was found that the program had not been "refreshed" and therefore the links did not change colour after they had been visited.

During the needs assessment, most of the nurses indicated that they were computer literate. Not knowing at that stage which delivery system would be best suited, the researcher wrongly assumed that the target group would be familiar with the Internet if they were computer literate. As a result of this, the researcher had to give initial instruction to users who evaluated the program who were not familiar with the Internet. The evaluators found navigation within the program very easy and the site map provided a familiar place to return to from where the users could further explore the content presented in the program. The way in which they navigated through the program indicated that even a novice could use the program with ease.

#### 6.2.1.5 Dimension of user interface: Mapping

According to Vaughan (1998:468) a familiar landscape must be built to which users may return at any time. For this purpose a site map was constructed which linked to all other pages. The mapping system presented users with an aid in understanding which parts and how much of the information space they had interacted with and which parts and how much of them they had not.

Although one of the evaluators described way finding between the different pages easy, the following comment was made: "At the site map, however, I was not sure which of the sections I already visited". The reason for experiencing this problem is discussed in paragraph 6.2.1.3 (Navigation).

#### 6.2.1.6 Dimension of user interface: Screen design

Treuhaft (1995:2) states that text lines longer than 60 characters are difficult to read and that the number of lines of text should be limited. Vaughan (1998:198) suggests that, unless the purpose of the multimedia program is to display large blocks of text,

the user should be presented only with a few paragraphs of text per page. Since the program was developed to be informational, it was of the utmost importance that the program had to be developed to fit into the confined space so that it would facilitate the printing of the information, without cutting off half of the information on the page.

The general opinion of the evaluators was that the screen was not cluttered with too much text and that the colour of the text provided for good visibility. One of the experts did not like the green coloured headings and recommended that these be changed. According to Alessi & Trollip (1991:42), some colours, especially those near the centre of the visual spectrum such as yellow and green, are easier to perceive than others. Colours at the extremes of the visible colour spectrum (reds and blues) are the most difficult perceptual colours and should be avoided for text and detailed pictures.

Sneiderman (1987), as cited by Reeves & Harmon (1994), maintains that although certain design principles have been established, "screen design will always have elements of art and require invention". The researcher, therefore, did not change the green coloured headings as suggested.

#### 6.2.1.7 Dimension of user interface: Simplicity and consistency

The goal is to be consistent and predictable with web sites. A site should be built on a consistent pattern of modular units, all sharing the same basic layout grids, graphic themes and hierarchies of organisation for maximum functionality and legibility (Lynch & Norton, 1997).

All the evaluators, except one of the experts, rated the program as being very consistent and predictable. This specific evaluator perceived the use of photos as inconsistent, because all of the photographs, with the exception of four, could be "enlarged" when "clicked" on. These four photographs were "roll over" images which confused and frustrated the user, because these images could not be enlarged like the other photographs. The "roll over" images were deleted as a result of this

feedback.

### 6.2.1.8 Dimension of user interface: Metaphor or theme for the program

Jones & Okey (1995) suggest the use of a metaphor or theme for a program which should reflect the content of the program. These authors suggest that the metaphor be made obvious to the users. The metaphor must be made applicable to the content of the program, but they also state clearly that not all programs support a metaphor. No metaphor was used for this program, but a military theme was created by means of a photograph that was made transparent and displayed as a background.

The expert evaluators rated the theme as appropriate for the program and very applicable to the content of the program. One of the evaluators recommended that the SAMHS-logo be repeated on all pages. Since he was the only person who made this recommendation, it was not implemented.

### 6.2.1.9 Dimension of user interface: Media integration

Reeves & Harmon (1994) state that the various media used must work together to form a cohesive program and they pose the question as to whether the various media components are necessary functions of the program, or whether the program would function equally well without them. Alessi & Trollip (1991:40) state that pictures should be presented simultaneously with the related text so as to afford the user the opportunity to inspect the photographs/pictures and the explanations thereof, simultaneously.

Integration of the media was found to be coordinated and the evaluators indicated that the photographs were absolutely necessary to make the information relevant to the target group. One evaluator suggested that, when the program is extended in a next phase, other types of media, like sound and video, should be included to enhance the program.

### 6.2.2 Simulate the deployment of the field hospital

#### 6.2.2.1 Dimension of user interface: Information presentation (simulation)

The advantages of simulations are discussed in the literature review and listed in Table 2.3. An important reason for including a field hospital simulation in the program, was that the deployment of the field hospital is extremely expensive and time consuming. When equipment is transported to the deployment area, wear and tear occur. The non-availability of realistic scenarios and inadequate training opportunities result in unprepared nurses being sent to military operations/exercises. Only a limited number of nurses get any actual experience at such military operations/exercises.

Alessi & Trollip (1991:119) refer to physical simulations (simulations that teach *about* something) and procedural simulations (simulations that teach a sequence of actions), both of which were used in the program. When physical simulations are used, a physical object is represented on the screen, while a primary characteristic of procedural simulations is, that there is one or more correct or preferred sequences which should be learned to perform. Schwier & Misanchuk (1993:250) regard the dragging of screen objects as reasonable to use since it provides variety to keyboard response, while Alessi & Trollip (1991:119) see the dragging of screen objects as a useful type of interaction.

Almost all the users indicated that the simulation of the deployment of the field hospital had been a very valuable contribution to familiarise especially the nurses with the aspects that should be taken into consideration during the planning and deployment phases of military operations. More detail and different scenarios were recommended. It was also suggested that the simulation section be developed further and be extended to incorporate more of the other military health services' functions.

The simulation and layout of the field hospital were listed by a number of the evaluators as the most valuable aspect of the program.

### 6.2.3 Provide information to prepare the military nurse for functioning during military operations

#### 6.2.3.1 Dimension of user interface: Information presentation

The most elegantly designed user interface for an interactive program is useless if the information it is intended to present is incomprehensible to the user. This dimension is concerned with whether the information contained in the knowledge space is presented in an understandable format (Reeves, 1994).

Prior to developing the program, the researcher performed a content/information analysis to clarify and confirm the content that should be included in the program. The reason for this was to make the most essential information available to prepare military nurses to function in the field hospital during military operations.

Most of the users, and especially the nurses, indicated that they would be able to use what they learned in the program. All the evaluators stated that they wanted more content to be included in the program. Two of the four nurses who had been deployed, indicated that the content was not sufficient to prepare them for functioning during military operations. The reason for this was that they knew how important the excluded information was for the pre-deployment planning and functioning during military operations. It is meaningful that the nurses and other users who had been deployed, could indicate what information was lacking. Almost all the users who had not been deployed, indicated that they wanted more visual material and more information to be included. They could, however, not indicate what the information was that they needed. From this it is clear that they wanted as much information as possible, but that they did not know what they wanted to know.

All of the four experts who evaluated the program rated the information provision dimension as very high. They commented that the information presentation was comprehensible and clear and that users would be able to learn from this program. Recommendations regarding the content to be included in the program are presented

in Table 5.20.

### 6.2.4 Create/keep attention

The attention of the student must not only be initially attracted, but also maintained throughout the lesson. Various factors for gaining and holding attention play a role, e.g. challenge, curiosity, control, relevance and consistency (Alessi & Trollip 1991:11). The application of the design specifications in the program on how to create and keep attention, are presented in Table 3.6.

Attention was initially attracted by the home page background image and the use of the familiar SAMHS-logo which created a formal, professional appearance. All the users had personal interest in this program because the content of the program is relevant to the knowledge required to be able to function during military operations. Photographs and graphics (drag-able tents and main medical units) were used to capture and focus the attention of the users. Photographs were presented simultaneously with the related text, which created the opportunity to inspect the photos at the same time. Most of the users and all of the nurses who had never been deployed requested more visual material. When asked to list the most valuable aspect of the program one of the nurses who had not been deployed yet, wrote: "Few people get the opportunity to see the field hospital deployed before being called up for a military operation. The program provides information that can be used to prepare the nurse for military operations. At the least, the nurse will be able to recognise the vehicles and familiarise herself with the layout and units of the field hospital".

The user-involvement created through the dragging around of the "tents" and the "deployment of the field hospital", held the attention of the users. Almost all of the users listed the simulation of the field hospital and the corresponding information as one of the most valuable aspects of the program.

#### 6.2.4.1 Dimension of user interface: Ease of use

The ease of using of a program may be highly correlated with how much users enjoy using a specific program. Not liking an interactive program that is intended to be highly motivating, is a major problem (Reeves & Harmon, 1994).

This program succeeded in creating and keeping the users' attention, because almost all evaluators rated this aspect very highly and indicated that they had enjoyed using the program very much. The experts confirmed this when they rated the "ease of use" dimension as very effective.

## 6.3 Overall functionality of this program

The target population for the development of this program was registered nurses who are Permanent Force members. The researcher decided, however, to broaden the target group that was to evaluate the program in order to determine whether the program would also be suited for other groups within the military health environment.

All of the fourteen users indicated that the program might be applicable to target groups other than nurses and all of the four experts rated the program as highly functional for the target group. They also recommended the use of the program for target groups other than nurses. Some of the most significant comments were: "Nurses function as part of a multi-professional team. This program might be applicable to the other team members as well". "The concept of the complete Medical Battalion Group and Medical Health Task Group concept must be included to incorporate other groups and not only the certain areas where nurses might be utilised". "This program can be used by members of all mustering within the SAMHS who are not familiar with the field hospital. It is a very good effort to bridge the gap that presently exists with regards to training in the SAMHS".

## 6.4 Limitations of the research

The limitations experienced by the researcher are highlighted.

### 6.4.1 Target group

The web pages for this program were developed with *Dreamweaver*© which was not readily available on the users' computers. Most of the users do not make use of the Internet. Therefore, the users had to use the researcher's computer for the evaluation of the program. Only a limited number of users/experts could evaluate the program per day. The findings of this study could thus be derived from only a small sample of the target group.

A large number of experienced members had left the SANDF as a result of transformation. It was, therefore, found that the majority of people questioned or interviewed during the analyses, as well as the people who evaluated the program, had mostly gained experience during military operational **exercises** and had not gained their knowledge during actual exposure to real life military **operations**.

### 6.4.2 Content/information of the program

The training manuals that existed were not updated and very few local protocols and little doctrine regarding peace operations, existed. The proposed policy on South African participation in Peace Missions (April 1998) was still in a draft form and could not be quoted until approved by the relevant authorities. The researcher, therefore, had to rely on these limited protocols. A new doctrine, which emanated from lessons learnt during Exercise Blue Crane conducted during May 1999, was still in the process of being developed and could thus not be utilised as a basis for the development of this product.

## 6.5 Recommendations

The recommendations are discussed as follows:

- Program-specific recommendations that recommend improvements and/or extensions of the developed program.

- General recommendations for the development of similar programs as well as research that can be done.

### 6.5.1 Program specific recommendations

The need for more information was expressed by almost all users, nurses as well as other military personnel.

The following were not intended to be included in the developed program, but are essential aspects that must be included during the next phases of program development. These are also some of the aspects that were listed by the users in the questionnaires as imperative aspects to be included, viz;

- the equipment and supplies needed for every section, e.g. theatre and casualties;

- checklists for the equipment and supplies in preparation for different types of operations;

- exact (fine) details on how to physically deploy each containerised unit, as well as the checklists for each;

- the functions of nurses in the different sections; and

- guidelines on how to do an appreciation for the expected number of casualties/patients and the respective planning of equipment and supplies.

Almost all users, nurses as well as other military personnel, requested further development of the program, with specific reference to the simulation section of the field hospital in order to incorporate different scenarios and a larger number of the military health service's functions than only nursing.

Appendix E(2) indicates in italics how little of the possible content that may be incorporated in the future, had been used in the developed program.

### 6.5.2 General recommendations for similar development

Exercise Blue Crane took place during the period 6 to 30 April 1999. The debriefings of the SA Army, SA Air Force and SA Military Health Service that took place after the exercise, confirmed the lack of experience with regards to training and education of military personnel for military operations.

Multimedia is presently enjoying widespread use in education and training programs and will provoke radical changes in the teaching process of the future, since teachers will become more like guides and mentors, instead of the primary providers of information and understanding.

Further research into computer delivery technologies that can be used to enrich the learning experience for the student in the SANDF, is imperative. The following are some of the technologies that can be further explored for their applicability and possible application in the SANDF:

- Virtual reality and virtual environment. How can they support, for example, training in the deployment of the field hospital and the evacuation of patients?

- How can multimedia be used for training nurses, medical officers and operational medical care orderlies in the triage, resuscitation and evacuation of wounded under pressure of time and under operational circumstances?

- The feasibility of providing access for all military personnel to the Internet, or at least the Intranet, for training and educational purposes. Through the Intranet, current training and support materials can be delivered to a large dispersed audience, more cost and time-effectively than traditional training material. The field hospital program was developed as a CD-ROM/WWW hybrid, which is essentially a web site on a CD-ROM disc that could be played off a CD-ROM drive. Hyperlinks on the CD-ROM would take a student effortlessly from a CD-ROM to the Internet and back. Information that is likely to change in the short time, cannot be included on a CD-ROM, but updates to a web site can be done easily and immediately. The information on the CD-ROM includes aspects of a permanent nature. The emphasis of future development of this program should therefore be on the aspects that were excluded from the program because of their temporary nature, or aspects that might change according to circumstances. Equipment and supplies for the field hospital are examples of aspects that might change according to the type of military operation for which is to be prepared. This type of information would be best suited for availability on the Internet/Intranet. The researcher could, however, not develop for the Intranet of the SAMHS, because it is currently not utilised effectively and is still a novice idea to use as training/education method within the SANDF.

- Displaying photographs to explain related text, has proved to be very useful and popular in the developed multimedia program. When developing similar programs for the future, or improving on the current one, use can be made of digital videos and/or photographs with specific techniques for obtaining special effects. “Panaview” photos, for example the inside of the theatre, are taken very close to each other. The photos are then “stitched” together to create the impression that the viewer is situated inside the theatre and can see the inside

of the room through a 360º view. The user will then be able to see the complete interior of the theatre by "clicking" and moving the mouse over the photograph. Such a program can be developed even further by showing an enlarged photograph of a specific section of the interior of the theatre, on which the users can "click" with the mouse. In this way, equipment can be explained and supplies can be listed whenever a user exercises that choice.

An overview of the recommendations and the limitations is presented in Table 6.1.

## Table 6.1 Overview of recommendations

| Objectives | Recommendations | Limitations |
|---|---|---|
| Use **multimedia** to design the program, with the application of sound **design specifications.** | * Research into technologies like<br>- virtual reality and virtual environment. How can they support for example, training in the deployment of the field hospital and the evacuation of patients?<br>- multimedia to train nurses, medical officers and operational medical care orderlies in the triage, resuscitation and evacuation of wounded under pressure of time.<br><br>* Access for all military personnel to the Internet or at least the Intranet. Through the Intranet current training and support materials (programs like this one) can be delivered to a large dispersed audience more cost and time effective than traditional training methods. | * Access to a computer at home or work is not equally possible for all users.<br><br>* To develop a multimedia program with sound and video, the users must have access to computers that have sound and video capabilities. This is also not possible for all users. |
| **Simulate** the deployment of the field hospital. | * Develop the simulation section further to incorporate different scenarios and more of the military health team than just nurses. | |

| Objectives | Recommendations | Limitations |
|---|---|---|
| Provide **information** to prepare the military nurse for functioning during **military operations** | The following were not planned to be included in this program but it is essential aspects that must be included during the next phases of program development. They were also some of the aspects that were requested by the users in the questionnaires to be included:<br>* The equipment and supplies needed for every section, e.g. theatre, casualties.<br>* Checklists for the equipment and supplies.<br>* Exact (fine) details on how to deploy each containerised unit plus checklists of each.<br>* Functions of nurses in the different sections.<br>* Guidelines on how to do an appreciation for the expected number of casualties/patients and the planning of equipment and supplies accordingly. | * Equipment and supplies are examples of the aspects that might change according to the type of military operation for which is to be prepared. This type of information would be best suited to be on the Internet/Intranet and not on CD-ROM, as the currently developed program. Internet is not available to every user and the Intranet is currently not used effectively. |

## 6.6 The way forward

Being part of the information age means, amongst others, adapting to the ever changing technological environment and coping with the rate at which information becomes outdated.

The SANDF is going to have to research into new technologies that will reduce the overall cost of training in the long term, without negatively affecting the high standard of training, but improving on it instead. The advantages of using multimedia in training and education, are virtually inexhaustible. If funds are not available for immediate application, the development of such multimedia products can be implemented in stages for more advanced utilisation at a later stage.

This developed multimedia program on CD-ROM, is but a small beginning and creates a most exciting challenge for exploring and developing various and alternative training strategies and media of instruction in the SANDF and specifically the SAMHS.

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# Appendix A: Focus Group Protocol

## Goal analysis: Phase 1

### GOAL

To clarify the role and tasks of the military nurse and the information needed to be able to function during military operations in order to develop a course to prepare the military nurse to function during **military operations.**

- What is the role of the military nurse during military operations?
- What are the tasks of the military nurse during military operations?
- What is the information that must be made available to the nurse to enable her to function during military operations?
- What is the prior knowledge that the nurse needs?

# Appendix B: Focus Group Protocol

## Goal analysis: Phase 2

**GOAL**

To clarify the role and tasks of the military nurse and the information needed to be able to function during military operations in order to develop a course to prepare the military nurse to function in the **field hospital**.

- What is the role of the military nurse during military operations?
- What are the tasks of the military nurse during military operations?
- What is the information that must be made available to the nurse to enable her to function during military operations?
- What is the prior knowledge that the nurse needs?

# Appendix C: Questionnaire for target population analysis

As you probably know, a new training program is being developed to prepare the military nurse to be able to function during military operations. You are requested to complete this questionnaire to help us learn more about your training and information needs and preferences.

Your answers will be handled in confidence and will be incorporated with those of others to determine the training and content requirements to provide better training and education.

Thank you for your time and assistance. Since you are not required to identify yourself anywhere on this questionnaire, you will remain anonymous.

Please answer the questionnaire in either Afrikaans or English and as honest as possible. Don't be concerned if you don't know the answers, it might confirm that there is a need for training regarding the specific aspects.

## GENERAL INFORMATION

1. Which military courses have you already completed ? If you didn't complete any, state reasons.

_____

_____

_____

2. How many times have you been deployed in a military operation. When, where and for how long?

_____

_____

_____

## ABOUT THE CLINICAL WING (FIELD HOSPITAL)

3. List five components of the clinical wing.

_____

_____

_____

4. What do you think are the biggest differences (if any) between a field hospital and a base hospital?

_____

_____

5. List five factors to be taken into consideration for the layout of the field hospital for the best utilisation of the medical equipment and treatment of the patients.

6. Please make suggestions about how the layout of the field hospital can be taught to Registered Nurses.

## TRAINING NEEDED TO BE ABLE TO TAKE PART IN MILITARY OPERATIONS

7. Do you think it is necessary for a Registered Nurse to be trained for military operations?

8. Do you think you have undergone sufficient training to be able to take part in military operations? Give reasons for your answer.

9. What kind of training and/or courses do you think a Registered Nurse should have undergone before taking part in a military operation? (Military and Nursing)

| Military | Nursing |
|---|---|
| | |
| | |
| | |
| | |

10. Taking into consideration your qualifications and experience, **if you get called up tomorrow**, where do you think you would function optimally during a military operation, e.g. theatre, person in charge, etc.?

## INFORMATION REQUIRED BY YOURSELF BEFORE BEING DEPLOYED OPERATIONALLY

11. You are tasked to take part in a military operation. Make a list of not more than ten aspects which you would like to be informed about before you mobilise.

## COMPUTER LITERACY

12. Are you computer literate? _____

13. What is your opinion on the worth of computer based training where various graphic, print, audio, video and computer technologies can be integrated to prepare the military nurse to be able to function during military operations?

14. Do you have access to a computer with a CD-ROM drive?

15. If you don't have access to a computer with a CD-ROM and you know that information to prepare you for a military operation is available on a CD, would you go through some trouble to be able to get the information from the CD?

**THANK YOU FOR YOUR TIME**

# Appendix D: Interview questionnaire for target population analysis

As you probably know, a new training program is being developed to prepare the military nurse to be able to function during military operations. You are requested to complete this questionnaire to help us learn more about your training and information needs and preferences.

Your answers will be handled in confidence and will be incorporated with those of others to determine the training and content requirements to provide better training and education.

Thank you for your time and assistance. Since you are not required to identify yourself anywhere on this questionnaire, you will remain anonymous.

Please answer the questionnaire in either Afrikaans or English and as honest as possible. Don't be concerned if you don't know the answers, it might confirm that there is a need for training regarding the specific aspects.

## GENERAL INFORMATION

1. Which military courses have you already completed ? If you didn't complete any, state reasons.

2. How many times have you been deployed in a military operation. When, where and for how long?

## TRAINING NEEDED TO BE ABLE TO TAKE PART IN MILITARY OPERATIONS.

3. Do you think it is necessary for a Registered Nurse to be trained for military operations?

4. Do you think that you have undergone sufficient training to be able to take part in military operations? Give reasons for your answer.

5. What kind of training and/or courses do you think a Registered Nurse should have undergone before taking part in a military operation? (Military and Nursing).

| Military | Nursing |
|---|---|
| | |
| | |
| | |
| | |

## INFORMATION REQUIRED BY YOURSELF BEFORE BEING DEPLOYED OPERATIONALLY

6. Make a list of not more than ten aspects which you would liked to have been informed about before mobilisation.

_____

_____

_____

_____

_____

## COMPUTER LITERACY

7. Are you computer literate? _____

8. What is your opinion on the worth of computer based training where various graphic, print, audio, video and computer technologies can be integrated to prepare the military nurse to be able to function during military operations?

_____

_____

_____

9. Do you have access to a computer with a CD-ROM?

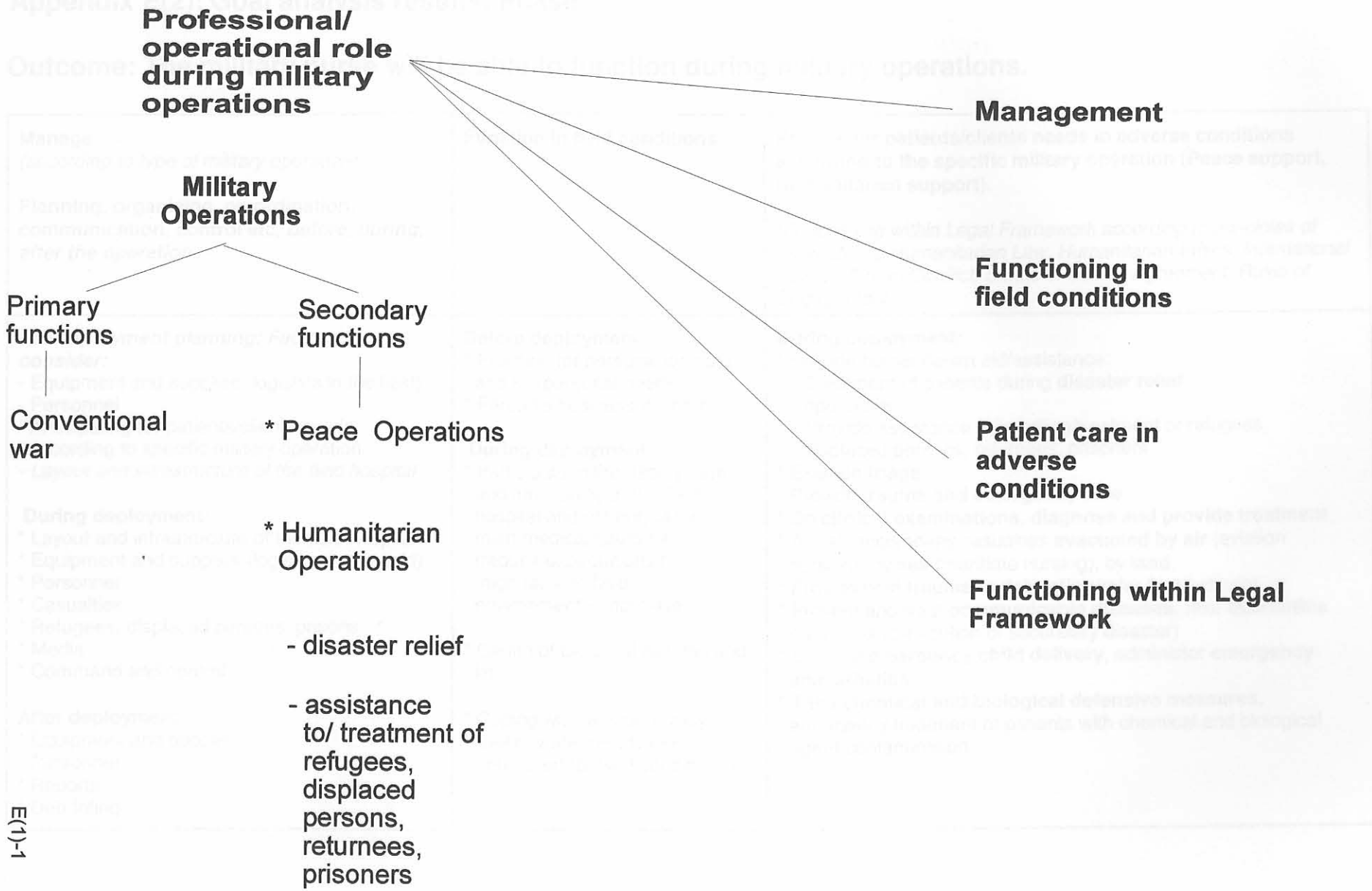
_____

10. If you don't have access to a computer with a CD-ROM and you know that information to prepare you for a military operation is available on a CD, would you go through some trouble to be able to get the information from the CD?

_____

**THANK YOU FOR YOUR TIME**

# Appendix E(1): Goal analysis results: Phase 1



# Appendix E(2): Goal analysis results: Phase 1

## Outcome: The military nurse will be able to function during military operations.

| **Manage**<br>*(according to type of military operation)*<br><br>**Planning, organising, co-ordination, communication, control etc, *before, during, after the operation.*** | **Function in field conditions** | **Provide for patients/clients needs in adverse conditions according to the specific military operation (Peace support, Humanitarian support).**<br><br>*(Functioning within Legal Framework according to principles of International Humanitarian Law, Humanitarian Ethics, International Law on Armed Conflict, Status of Forces Agreement, Rules of Engagement).* |
|---|---|---|
| ***Pre-deployment planning: Factors to consider:***<br>- Equipment and supplies (logistics in the field)<br>- Personnel<br>- Anticipating for patients/clients needs according to specific military operation<br>- *Layout and infrastructure of the field hospital*<br><br>**During deployment:**<br>* Layout and infrastructure of the field hospital<br>* Equipment and supplies (logistics in the field)<br>* Personnel<br>* Casualties<br>* Refugees, displaced persons, prisons<br>* Media<br>* Command and control<br><br>**After deployment**<br>* Equipment and supplies<br>* Personnel<br>* Reports<br>* Debriefing | **Before deployment:**<br>* Planning for personal clothing and kit (personal needs)<br>* Personal business in order<br><br>**During deployment:**<br>* Participate in the deployment and functioning in the field hospital and utilizing of the main medical equipment (reduce expectations from "high tech" to field environment - improvise)<br><br>* Caring of personal clothing and kit<br><br>* Coping with lack of privacy, sleep, water restrictions (prepared for field conditions) | **During deployment:**<br>* Provide humanitarian aid/assistance:<br>- Treatment of patients during **disaster relief** operations<br>- Provide assistance to/handling/treatment of refugees, displaced persons, returnees, prisoners<br>* Execute **triage**<br>* Provide t**rauma and emergency care**<br>* Do **clinical examinations, diagnose and provide treatment**<br>* Assist/ accompany casualties **evacuated by air** (aviation nursing), by **sea** (maritime nursing), by **land**.<br>* Provide post **traumatic debriefing**/refer for treatment<br>* Prevent and treat **communicable diseases**, take **quarantine** measures (prevention of secondary disaster)<br>* Execute **emergency child delivery**, administer **emergency anaesthetics**<br>* Take **chemical and biological defensive measures**, emergency treatment of patients with chemical and biological agent contamination |

## Appendix F: Goal Analysis results: Phase 2

Aspects to take into consideration for teaching the field hospital

**Military Health Task Force Organisation:**

**Medical Post** **Field Hospital**

Factors to be taken into consideration:
* main medical equipment
* kind of operation
* area of deployment
* layout, for the best utilisation of the medical equipment and treatment of casualties
* personnel
* logistics

* Conventional war
* Peace support
* Humanitarian support

Legal framework

Factors to consider

Position of treatment areas and main medical equipment in relation to each other

Flow of patients:
Admin
Triage
Treatment area
Evacuation
- Air
- Road

Functions

Equipment and supplies
- Theatre
- Casualties
- Wards

# Appendix G: Project Plan

| ACTIVITY | OUTPUT | START DATE | END DATE | AVAILABLE DAYS |
|---|---|---|---|---|
| **Conduct analysis:**<br>* Goal<br>* Target group<br>* Content/information<br>* Project<br>* Presentation and delivery of media | * Roles and functions of military nurse<br>* Target group profile<br>* Learning needs<br>* Outline of content to be included - list of major topics and sub-topics<br>* Variables which might effect program design<br>* Project plan<br>* Literature survey report | 16/4/99 | 21/5/99 | 28 |
| **Design of product:**<br>* Write objectives<br>* Decide on delivery system<br>* Analyse content<br>* Sequencing of content<br>* Design specifications<br>* Design evaluation instrument | * Design for the specific system<br>* Exact content to be included<br>* Navigation map (site map)<br>* Blueprint<br>* Evaluation instrument | 25/5/99 | 23/6/99 | 12<br>(Winter school) |
| **Develop:**<br>* Decide on program editor<br>* Story boarding<br>* Develop prototype on computer<br>* Conduct formative evaluation | * Program editor installed<br>* Illustrations of screens<br>* Prototype<br>* User comments/expert advice<br>* Revise prototype | 24/6/99 | 3/8/99 | 34 |
| **Production** | * Working product | 4/8/99 | | |
| **Evaluation** | * Summative evaluation | | 27/9/99 | 43 |
| **Report** | * Report findings and compile recommendations for further study/program development | 28/9/99 | 24/10/99 | 27 |

# Appendix H: Site map

South African Military Health Service

field hospital SiteMap

Suid Afrikaanse Militêre Gesondheidsdiens

Home

About

Clarification of concepts

Military Operations:

- Peace Operations
  - Involvement conditions:
- Humanitarian Support

Legal Framework:

International Law on Armed Conflict

Humanitarian Law

Status of Forces Agreement

Rules of Engagement

Military Health Task Force:

- Medical Post
- Field Hospital
- Field hospital operational capabilities:

Pre-deployment planning:

- Surgical Theatre
- Sterilisation Unit
- Pathology Laboratory
- X-Ray Unit
- Laundry
- Casualties
- Patient wards
- Patient evacuation
- Air evacuation
- Field accommodation
- Transporting containers

Deployment Simulation

Instructions: deployment simulation

References


e-mail

# Appendix I: User evaluation questionnaire

Your evaluation of this program and the input/comments/suggestions will help the developer to improve the program and make it more user friendly.

## INSTRUCTIONS

Please circle your response to the items. Rate aspects of the program on a 1 to 5 scale.

1= strongly disagree, 2 = disagree, 3 = neither agree/nor disagree, 4 = agree, 5 = strongly agree.

Where choices between different options are required, please tick the appropriate block.

Your feedback is sincerely appreciated. Thank you.

## GENERAL

1. Have you deployed before during military operations/exercises?

| Yes | No |
|---|---|

2. My mustering is: _____

3. My gender is:

| Male | Female |
|---|---|

4. I am familiar with the Internet. 1 2 3 4 5

5. I regularly make use of the Internet. 1 2 3 4 5

## PROGRAM CONTENT

(Please circle your response to each item)

6. The content is presented in manageable segments. 1 2 3 4 5

7. The content is applicable to me. 1 2 3 4 5

8. The content is sufficient to prepare me for functioning during military operations. 1 2 3 4 5

9. The opportunity to simulate the deployment of the field hospital

gives me sufficient information to be able to apply this information during the planning and deployment phases of military operations. 1 2 3 4 5

10. The simulation of the field hospital deployment provides for sufficient user involvement to make the experience meaningful. 1 2 3 4 5

11. I will be able to use what I learned in this program. 1 2 3 4 5

**PROGRAM DESIGN**
(Circle your response)

12. The layout of the screen and the overall "look" is pleasing. 1 2 3 4 5

13. This program provides sufficient interaction between me, the computer and the program. 1 2 3 4 5

14. The screen is not cluttered with too much text. 1 2 3 4 5

15. The colour of the text provides for good visibility. 1 2 3 4 5

16. The interactive elements of the program work reliably. 1 2 3 4 5

17. The program looks professional with high editorial standards. 1 2 3 4 5

18. This program caught and held my attention. 1 2 3 4 5

**NAVIGATION**
(Please circle your response to each item)

19. I knew at all times where in the program I was and how to go to another section of the program. 1 2 3 4 5

20. I felt overwhelmed by numerous options. 1 2 3 4 5

21. I knew at all times how much of the information I had interacted with (visited) and which parts of it I hadn't. 1 2 3 4 5

**HOW WOULD YOU IMPROVE THIS PROGRAM?**
(Check all that apply)

22. Reduce content covered in the program. _____

23. Increase content covered in the program. _____

24. Improve program organisation. _____

25. Add more visual material. _____

26. **What other improvements would you recommend to this program?**

27. **What is the least valuable about this program?**

28. **What is the most valuable about this program?**

29. **Do you think this program might be applicable to target groups other than nursing? Please motivate your answer.**

30. **I enjoyed using this program.** 1 2 3 4 5

**THANK YOU FOR YOUR TIME**

# Appendix J: Expert interface rating form

**Instructions for completing this form**:

For each of the user interface dimensions illustrated below, please rate the programme you have reviewed on a one to five scale by circling the appropriate number under each dimension.

Described under each dimension is a definition for each of the user interface dimensions. You are requested to read these definitions before rating a specific dimension.

Please add any comments that may help to clarify or explain your rating. If a specific dimension does not seem appropriate for the programme that you are rating, do not circle any number on the scale for that dimension and add a brief comment to explain your response.

## Dimension 1: Navigation

"Navigation" is concerned with the perceived ability to move through the contents of an interactive programme in an intentional manner. This dimension of interactive multimedia ranges from the perception that a programme is difficult to navigate to one that is perceived as being easy to navigate. An important aspect of navigation is orientation, i.e. the degree to which a user feels that they know where they are in a programme and how to go to another part of it. This is a critical variable because users frequently complain of being lost in interactive programs.

| Difficult | | | | Easy |
|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 |

Comments:

## Dimension 2: Closure

This concept deals with the organisation of programme information into manageable segments so that users are not overwhelmed by the amount of information contained in the programme. Organising information requires that methods be used to allow users the ability to access information in a controllable fashion.

| Uncontrolled | | | | Manageable |
|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 |

Comments:

## Dimension 3: Mapping (Way Finding)

Way finding is considered a method of letting users know where they are, what they can do when they are there, and where they need to go next. In complex, nonlinear programs, user-disorientation can be alleviated if users can see what parts of the system they have already accessed. User disorientation is described, among other things, as the user not knowing "the boundaries of the information space". Having a detailed mapping system gives users an aid in understanding which parts and how much of the information space they have interacted with, and conversely, which parts and how much of it they haven't. Icons, graphics, backgrounds, borders, and screen titles can help users find their way through a complex learning environment. Interactive programs fall in a continuum of containing no mapping function to an appropriately powerful mapping function.

Just as it is important to possess a map of the most usable scale when taking a road trip, it is important for interactive programs to provide enough, but not too much, detail in showing user paths. A map that shows every piece of a programme's knowledge space might prove to be so tedious or unwieldy as to be of as little value as an interactive programme with no map.

| None | | | | Powerful |
|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 |

Comments:

## Dimension 4: Screen design

"Screen design" is a particularly complex dimension of interactive programs that can easily be broken down into many sub-dimensions related to text, icons, graphics, colour and other visual aspects in interactive programs. It is maintained that although certain design principles have been established, "screen design will always have elements of art and require invention". A separate dimension has been defined to deal with the artistic aspects of interactive programs (see Aesthetics below). Screen design is defined as the dimension ranging from substantial violations of the principles of screen design to general adherence to the principles of screen design.

| Violates principles | | | | Adheres to principles |
|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 |

Comments:

## Dimension 5: Aesthetics

"Aesthetics" refers to the artistic aspects of interactive programs in the sense of possessing beauty or elegance. In the aggregate sense, many people may praise the aesthetics of an automobile design or the elegance of a bridal gown. However, in an individual sense, aesthetics are highly unique and one person's sense of the beautiful may seem grotesque to others. The aesthetics dimension of the user interface of an interactive multimedia programme is defined as ranging from displeasing to pleasing.

| Displeasing | | | | Pleasing |
|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 |

Comments:

## Dimension 6: Simplicity and consistency

Users are not impressed with complexity that seems gratuitous, especially users who may be depending on the site for timely and accurate work-related information. For maximum functionality and legibility the page and site design should be built on a consistent pattern of modular units, all sharing the same basic layout grids, graphic themes, editorial conventions and hierarchies of organization. The goal should be to be consistent and predictable so that the users will feel comfortable exploring the site and confident that they know how to find what they are looking for.

Inconsistent/unpredictable Consistent/predictable

| 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|

Comments:

## Dimension 7: Design stability

To convince the users that the information is accurate and reliable the Web site should be designed with high editorial and design standards. A site that looks sloppily built, with poor visual design and low editorial standards will not inspire confidence in the users. Functional stability means keeping the interactive elements of the site working reliably.

Unstable Stable

| 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|

Comments:

## Dimension 8: Metaphor or theme for the programme

Not every programme needs a metaphor. Not all programs can support a metaphor. Providing users with a theme can be more helpful than a forced or inappropriate metaphor. The theme must be applicable to the programme's content and an indication what the programme is intended to do.

| Inappropriate | | | | Appropriate |
|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 |

Comments:

## Dimension 9: Information presentation

The "Information presentation" dimension is concerned with whether the information contained in the knowledge space of an interactive programme is presented in an understandable form. The most elegantly designed user interface for an interactive programme is useless if the information it is intended to present is incomprehensible to the user. Certainly the user might be able to find all of the information about a subject, but whether the user could comprehend, understand, or learn from that information is another matter. Information presentation is defined as a dimension ranging from obtuse to clear.

| Obtuse | | | | Clear |
|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 |

Comments:

## Dimension 10: Media integration

The most important aspect of the media integration dimension refers to how well an interactive programme combines different media to produce an effective whole. Do the various media (text, graphics, photos, animation) work together to form one cohesive programme, or is the programme a hodgepodge of gratuitous media segments? Are the various media components necessary to the function of the programme or would the programme function equally well without them? The media integration dimension is defined as ranging from uncoordinated to coordinated.

| Uncoordinated | | | | Coordinated |
|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 |

**Comments:**

## Dimension 11: Overall functionality

"Overall functionality" is an aspect of interactive multimedia programs related to the perceived utility of the programme. The perceived functionality of an interactive programme is obviously closely related to the intended use of the programme. A given programme may have multiple uses. Its overall functionality must be judged in relation to the specific intended use that exists in the mind of the users. Overall functionality ranges from dysfunctional too highly functional.

| Dysfunctional | | | | Functional |
|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 |

Comments:

## Dimension 12: Ease of use

"Ease of use" is concerned with the perceived facility with which a user interacts with an interactive multimedia programme. This can range from the perception that the programme is very difficult to use to a perception that the programme is very easy to use. Some people may perceive the interface to be easier to use because of their own unique experiences and attributes.

Nonetheless, in the long run, improving the user interface dimensions of multimedia, such as "ease of use", is a highly desirable goal, regardless of content.

Difficult Easy

| 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|

Comments:

**THANK YOU FOR YOUR TIME**