

CHAPTER 1

BACKGROUND

1.1 Introduction

This project started in May 1994, when work began on designing and developing a set of nine Computer-Assisted Instruction (CAI) tutorials which will ultimately supplement all the topics in the study guide for a first year Statistics module (STA101-H) at the University of South Africa (Unisa), Pretoria, South Africa.

The tutorials were designed, developed and programmed in the TenCore authoring language by the author of this research report. Although there are nine tutorials in the series, this study concentrates on the ongoing formative evaluation of one in particular, namely "Random Variables", which is the sixth in the series.

The tutorial "Random Variables" is provided on diskette together with this research report. Installation instructions are provided in Appendix B.

All the tutorials have undergone review by subject matter experts, as well as an expert review by CAI specialists in the department of Computer Science and Information Systems at Unisa. The tutorial "Random Variables", in particular, has been pilot-tested with staff members and field-tested on a sample group from the target population. The findings and recommendations of this study will be transferred to the other tutorials in the series and will guide further development.

1.2 Research problem

1.2.1 Purpose of the research

This is largely an exploratory study, which evaluates the product, with a view to enhancing and improving the tutorials. It does not attempt to compare the effectiveness of the electronic versus the written medium, and therefore makes no use of control and experimental groups. It does not attempt to measure the amount of learning which takes place, and therefore makes no use of pre-tests and post-tests. These issues will provide the opportunity for further research (see Chapter 6).

1.2.2 Aim of the research

The aim of this research is to design and develop a computer-assisted tutorial “Random Variables” and then to investigate and evaluate the impact of this program on a sample of students from the target population.

1.2.3 Objectives of the research

In order to achieve the above aim, the researcher's objectives were to:

- analyse the target population, the subject matter and appropriate hardware and software;
- design the tutorial “Random Variables” according to an instructional strategy incorporating cognitive learning theories;
- develop and test the tutorial “Random Variables” using the TenCore authoring package;

- modify the prototype after peer review by subject matter and computer-assisted instruction experts;
- implement the six tutorials, which have been developed to date, for students to work through on their own computers or in the Unisa regional microcomputer laboratories;
- evaluate the tutorial “Random Variables” by obtaining peer reviews and student feedback about various aspects of the program;
- assess what changes and modifications are required to improve the tutorial “Random Variables”.

1.2.4 Scope of the project

The project followed an instructional design model, which is described in detail in Chapter 3. The process consisted of various stages and micro-stages. Figure 1.1 gives an indication of the percentage of time spent on the major stages.

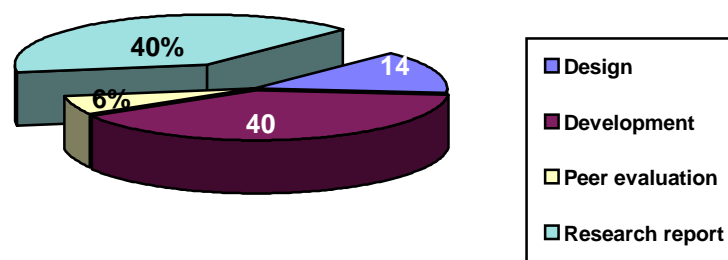


Figure 1.1 Scope of major stages in the instructional design

It can be seen from Figure 1.1 that the compilation of this research report took the same amount of time as did the development of the computer-assisted tutorial.

1.3 Research questions

1.3.1 Research questions

The following main research questions arise:

1. What corrections and modifications to the program are required?
2. What are the cultural and language implications for the heterogeneous student population?
3. Does the teaching approach embodied in the program contribute to perceived learning gains?
4. Is it clear how to use the function keys and icons to navigate through the program?
5. What are the opinions, feelings and emotions of the learners on completion of the program?

1.3.2 Previous related research in South Africa

The Human Sciences Research Council maintains a database (NAVO), which documents details of all Masters and Doctoral theses produced in South Africa. According to a search of this NAVO database conducted in August 1996, eight related studies were identified. These are detailed in Table 1.2.

Author	Title	Year	Degree
Burger, J.A.	The use of the computer in distance education and learning in the studying of Biblical Archaeology (in Afrikaans).	1995	M.Ed.
Paynter, J.R.	A strategy for the integration of computers into the curricula of courses within the Accounting departments of South African universities.	1988	M.Com.
Soskolne, C.L.	A computerised statistical census relating to university education - a group of science and engineering students, University of the Witwatersrand.	1974	Non-degree
Theron, H.J.	Use of computers in the teaching of Auditing with special reference to distance education.	1993	M.Com.
Tromp, P.J.	A computerised information system for Economic Statistics (in Afrikaans).	1982	MBA
Young, D.A.	Computer-aided evaluation of television instruction in a tertiary-level introductory Statistics course.	1980	M.Ed.
Van Zyl, J.	Criteria for the evaluation of micro-computer software for the teaching of Mathematics at technical colleges (in Afrikaans).	1983	M.Ed.
Van Zyl, P.H.R.	A didactic model for the use of computer technology in distance education (in Afrikaans).	1992	D.Ed.

**Table 1.1 Summary of related theses in S.A.
(NAVO database)**

As can be seen from Table 1.2, the only two studies which use the computer in the field of Statistics, are those of Tromp and Young. However they do not use the computer in a tutorial or instructional mode, but respectively as a tool to create a database of information or to evaluate television teaching in a Statistics course.

The studies of Burger, Theron and van Zyl, P.H.R. consider the use of computer technology in distance education. Burger and Theron concentrate on the subject areas of Biblical Archaeology and Auditing respectively. Van Zyl presents a didactic model for employing computer technology in distance education so as to move away from a Victorian teaching model and to encourage independent thought and problem solving among students.

The M.Com. theses of Paynter and Theron consider the use of the computer as a tool in the fields of Auditing and Accounting. Soskolne also uses the computer as a computational and record-keeping tool. The study of van Zyl, J. presents criteria for the evaluation of software in the field of Mathematics Teaching.

The present study is thus the only one in South Africa to investigate the design and development of customised computer-assisted tutorials in Statistics, in a Distance Education institution.

1.4 Research methodology

1.4.1 Type of research

This research has elements of both an exploratory and a descriptive study. Mouton and Marais (1993) indicate that an exploratory study is usually a preliminary investigation to gain insight into a particular phenomenon. According to these authors, the spectrum of descriptive studies includes a large variety of types of research. In this particular case, the narrative nature of the research, together with its contextual interest, characterise it as a descriptive study.

1.4.2 Subjects

The subjects who participated in the field test were Unisa students registered for the first year Statistics module, STA101-H in 1996. Due to the difficulties of recruiting a sample of students at a distance education institution, a convenience sample (Cohen & Manion, 1994) was used. There were 339 students registered for the course in 1996, so a figure of 34 would have been a 10% sample (a guideline suggested by Lee & Mamone, 1995). Thirty five students replied to the invitation to participate in the study, with 25 finally taking part.

1.4.3 Research timetable

ACTIVITIES	DATE
1. Design and development of CAI tutorial (270 hours)	Aug-Oct 1994
2. Literature review	Jul-Nov 1995
3. Final proposal	Oct 1995
4. Pilot test	Jan 1996
5. Field test	Mar 1996
6. Data analysis	May 1996
7. Writing research report	June-Oct 1996
8. Final research report	Oct 1996

Table 1.2 Research timetable

1.4.4 Data collection methods

In order to increase the reliability of the study, a number of data collection methods were used to triangulate the findings (Mouton & Marais, 1993). These methods are summarised in Table 1.4, with reference to the research questions.

Method Question	Peer review Focus groups	Survey	Observation	Telephone Interviews
Corrections/ modifications?	SME, CAIE, R	L SME	R	
Cultural / language implications?	SME, CAIE, R	L		
Teaching approach?	SME, CAIE, R	L SME		L
Clear navigation?	SME, CAIE, R	L SME	R	
Opinions, feelings and emotions?		L SME	R	L
Data analysis method	edits to storyboards and prototype	descriptive statistics; binomial test	narrative	discussion

L = Learners

R = Researcher

SME = Subject Matter Experts

CAIE = Computer-Assisted Instruction Experts

Table 1.3 Data collection matrix

1.5 Overview of this research report

This research report is organised as follows:

- Chapter 2 presents a review of the literature in the fields of Statistics Education, Distance Education and CAI and places this particular study in the intersection of these three fields.
- Chapter 3 describes the analysis, design, development, implementation and formative evaluation of the tutorial “Random Variables”, with respect to an accepted instructional design model.
- Chapter 4 presents the research methodology used in this study, in particular the methods and instruments of measurement used.
- Chapter 5 describes the findings of the study.
- Chapter 6 draws conclusions and makes recommendations for further research.

A graphic overview of the flow of the discussion is given in Figure 1.5 overleaf.

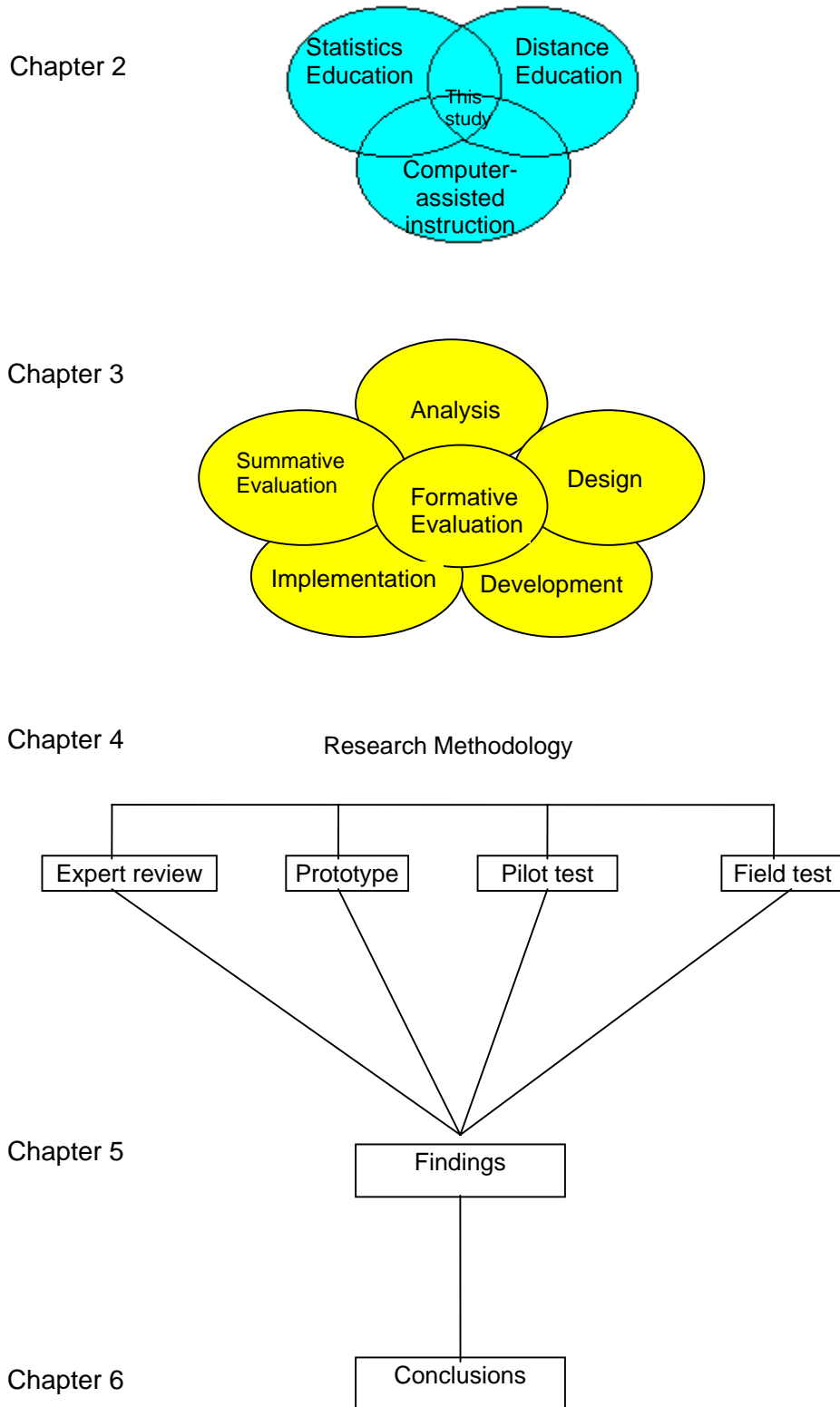


Figure 1.2 Overview of the research report