PREFACE

Prof Carl Klopper graduated in quantity surveying from the University of Pretoria where he also obtained a doctorate. He was awarded a BA degree with majors in Psychology and Economics from UNISA. In 1989 he was appointed Professor in the Department of Quantity Surveying at the University of Pretoria to head the newly introduced MSc (QS)(Management or Project Management) degrees by course work. A master’s degree by course work in Real Estate by the Department of Building Management (under leadership of Prof Chris Cloete) followed the next year. The abovementioned departments merged in 1997 and today the master’s courses offered by the Department of Construction Economics, as the department is now known, are sought after and amongst the most prestigious available in South Africa

Prof Klopper has acted as supervisor and external examiner for several doctoral and master’s students. He has read numerous papers at continuing professional development seminars and international conferences. He has authored and co-authored over twenty prominent publications

Prof Klopper introduced, amongst others, a course in research methodology uniquely suited to the needs of the built environment. His knowledge of the literature on research and his experience and insight in research problems, made him a respected authority on this topic. Numerous postgraduate students and colleagues received guidance and direction from him and they benefited substantially

The need for a departmental research guide was always present in order for MSc by research and PhD students to advance in the right direction and in an orderly way. When it was decided to develop such guidelines, Prof Klopper, who recently retired from the University of Pretoria, was the obvious person to approach. He accepted the assignment with enthusiasm and produced a document that is the culmination of the latest literature available and years of experience. It is stated without doubt that many students, colleagues and researchers will benefit from this clear, concise and handy publication and that it will contribute significantly towards achieving the research objectives of the University of Pretoria

Prof Gerhard Brümmer

HEAD: DEPARTMENT OF CONSTRUCTION ECONOMICS

AUGUST 2003
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SECTION A

ADMISSION REQUIREMENTS, ADMINISTRATIVE PROCEDURES, ETC

A.1 REGULATIONS

Notwithstanding anything to the contrary contained in this publication, the General Regulations pertaining to theses and dissertations published in the applicable Yearbook of the University of Pretoria shall apply. (General Regulations are prefixed with a capital letter G)

Please note that General Regulations are subject to change and may be amended prior to the commencement of the next academic year.

A.2 TERMINOLOGY

A.2.1 Thesis and dissertation

The International Standard (ISO 7144-1986) contains the following definition:

thesis; dissertation: Document which presents the author's research and findings and submitted by him in support of his candidature for a degree or professional qualification

For practical reasons the University of Pretoria distinguishes between the two terms and for purposes of this publication the following definitions apply:

**Thesis:** Document which presents the author's research and findings and submitted by him/her in support of his/her candidature for a doctor's degree

**Dissertation:** Document which presents the author's research and findings and submitted by him/her in support of his/her candidature for a master's degree by research

Where reference is made in this publication to a research report it shall mean a thesis or a dissertation.
A.2.2  **Supervisor and (study) leader**

In terms of General Regulation G.57.2 the dean of the faculty nominates the head of the department, or in consultation with him/her, another lecturer to supervise/lead the candidate in his/her research.

In the case of a thesis such a nominee is called a *supervisor* and in the case of a dissertation a *leader* or *study leader*.

A.3  **ADMISSION REQUIREMENTS**

A.3.1  **Master’s degrees**  MSc (QS); MSc (Construction Management); MSc (Real Estate); MSc (Project Management)

Subject to the stipulations of General Regulations G.1.3, G.30 and G.62, a BSc(Hons) degree or equivalent qualification and practical experience, which is deemed adequate by the head of the department, is required for admission. Supplementary coursework modules may be prescribed during the first year of study.

A.3.2  **Doctoral degrees**  [PhD – in quantity surveying, construction management and real estate]

Subject to the stipulations of General Regulations G.15, G.52 and G.55, an applicable master’s degree is required for admission.

A.3.3  **Research proposal**

In addition to the admission requirements set out in A.3.1 and A.3.2 above, formal approval to register has to be secured through the submission and approval of a document known as a *research proposal* (See Section D hereinafter).

The Head of the Department may, in his discretion, require a prospective candidate to personally attend a meeting of an evaluation committee in order to elucidate his research proposal.
A.4  GRANTING OF STATUS WITH A VIEW TO POSTGRADUATE STUDY

The senate can

A.4.1 admit a graduate from another university (whether in the Republic of South Africa or elsewhere) to a status at the University equal to the status he/she possesses at such other university

A.4.2 admit a person for a postgraduate degree who

A.4.2.1 has passed an examination at another university or institution (whether in the Republic of South Africa or elsewhere) which in the judgement of the senate is equal or higher than the examination which is prescribed for a degree at the University which is a prerequisite for admission to a specific postgraduate study course or for the admission of such a person as a research student; or

A.4.2.2 in some other way has reached a standard of competence which in the judgement of the senate is sufficient for purposes of postgraduate study or research at the University

A.5  PREPARATION AND SUBMITTING OF A RESEARCH REPORT

A.5.1 The leader/supervisor carries full responsibility for the preparation of the research report by the student

A.5.2 A research report is submitted to the Head: Student Administration before the closing date for the various graduation ceremonies as announced annually

A.5.3 When submitting a research report the student must include a written statement by the leader/supervisor and co-leader/co-supervisor, as the case may be, in which the submission of the report is approved; provided that the dean upon request by the student, after consultation with the head of the department and the leader/supervisor, can give consent to submission a case where the leader/supervisor or co-leader/co-supervisor refuses to grant permission

A.5.4 A student for the master's degree/doctoral degree must make the following statement before a Commissioner of Oaths when submitting the research report: “I declare that the dissertation/thesis which I hereby submit to the University of Pretoria for the degree
A.5.5 For examination purposes a student must, in consultation with the leader/supervisor, submit a sufficient number of bound copies of the research report, printed on good quality paper with well formed typed characters, at the Head: Student Administration. Consent may be obtained from the dean to submit the research report in unbound form; provided that the student will have the final approved research report bound and provide same to the examiners.

A.5.6 Apart from the examination copies mentioned in A.5.5 above, each successful student must submit one bound copy and one unbound high-contrast copy for microfilming at the Head: Student Administration one month prior to the date of the graduation ceremony at which the degree is to be conferred, failing which the degree will not be conferred.

A.5.7 In the event of a research report being accepted, but the student still has to effect certain changes in accordance with a decision of the examiners, the changes have to be made in all appropriate copies to the satisfaction of the leader/supervisor, who has to submit a statement to that effect at least one month prior to the graduation ceremony at which the degree is to be conferred.

A.5.8 In the event of the leader/supervisor deeming it necessary, an electronic copy of the research report must be submitted to the Head: Student Administration in the format required. The dean can decide whether the electronic copy must be submitted in lieu of or in addition to the paper copies.

A.5.9 In addition to the copies of the research report referred to in A.5.6 above, the student must submit an electronic copy of the approved research report at the Head: Student Administration in the format required one month prior to the date of the graduation ceremony at which the degree is to be conferred. Failing which the degree will not be conferred.

A.6 INTELLECTUAL GOODS

A.6.1 All rights in connection with intellectual goods which are created by the student during his/her studies or in pursuance of any research project at the University or by utilising the University’s equipment, belongs to the University in accordance with the contract signed by the student and/or his/her parents or guardians at registration. The
arrangement applies inter alia where the student works under study guidance or as a member of a project team of the University. This also applies where the student does contract work for a third party as a member of a research team of the University. The University and the student can, however, come to another arrangement by way of an agreement in writing.

A.6.2 A student and the University can come to an arrangement concerning the publication of a research report or a draft article for publication (as purported in A.10 hereinafter). Where the copyright in the research report and/or draft article for publication is the only exploitable intellectual goods right which results from the research report and/or the draft article for publication, the University will normally transfer the copyright to the student subject to specific conditions. The faculty, in consultation with the Office of the Registrar, can make arrangements which apply to that specific faculty.

A.6.3 In the absence of any agreement as purported in A.6.2 above, the University is entitled to reproduce and/or publish the research report and/or draft article for publication as purported in A.10 hereinafter in a way the University deems fit and to distribute such reproduction.

A.6.4 When publishing the research report or draft article (as purported in A.10 hereinafter), or an adaption thereof, it must be mentioned that it originates from a master’s/doctoral study at the University, stating the name of the leader/supervisor and the department in which the study was completed. Reprints must mention the title and date of the original publication.

A.7 TECHNICAL CARE OF THE RESEARCH REPORT

Except for deviations which must be approved in writing by the dean in consultation with the leader/supervisor, the technical care of the research report must fulfil the following requirements:

A.7.1 Title page

The title page of the copies of the research report which are submitted must contain the following:

(a) (The full title of the research report)
   by
(b) (Full name of student)
(c) Submitted in fulfilment of a part of the requirements for the degree ......................
........................................................................................................................................
or
Submitted in fulfilment of the requirements for the degree .................................
in the Faculty of Engineering, Built Environment and Information Technology,
University of Pretoria
(d) (Year and date of submission)
(See Appendix A for pro forma title pages)

A.7.2 Format and cover

The research report must be submitted in a format which is not larger than A4. The bound copies must have a hard cover on which the title of the report and the name of the student are printed. The name of the student and the year of submission of the report must appear on the spine of each bound copy.

A.8 ABSTRACT OF THE RESEARCH REPORT

Besides the abstract which forms an integral part of the research report and is discussed later hereinafter, a further separate abstract in not exceeding 350 words, together with a title page, is to be prepared in English by the student and submitted with the examination copies of the report.

A list of key terms for the recovery of the source must also be submitted with the examination copies of the report.

The title page of the abstract referred to above must contain the following:

- (The full title of the research report) .................................................................
  by
- (Full name of student) ..............................................................................
- Leader/Supervisor ....................................................................................
- Co-leader/Co-supervisor ..........................................................................
- Department ............................................................................................
- Degree for which the report is submitted ..............................................

The student must submit the abstract of his/her research report to the leader/supervisor for approval prior to handing-in same.
A.9 EVALUATION OF THE RESEARCH REPORT

A.9.1 Examination commission and examination reports

A.9.1.1 The examination commission consists of the leader/supervisor, co-leader/co-supervisor (if any), who act as internal examiner(s) and at least one external examiner in the case of dissertations and at least two in the case of theses.

A.9.1.2 The dean appoints the external examiners from outside the university after consultation with the head of the department.

A.9.1.3 A student must inform the Head: Student Administration in writing at least three months prior to submitting the research report of his intention to do so in order that examiners can be notified accordingly.

A.9.1.4 The members of the examination commission each submit an independent report on the research report to the Head: Student Administration.

A.9.1.5 The Head: Student Administration passes all reports on to the leader/supervisor who in turn prepares a combined report which, in consultation with the head of the department, is submitted to the dean for ratification.

A.9.2 Evaluation of and pass requirements for dissertations

A.9.2.1 Evaluation

The examiners evaluate the dissertation on the basis of the question whether the student has demonstrated that he/she is capable of planning and giving execution to a scientific investigation.

The format and care given to language of a dissertation must be satisfactory and must also satisfy the requirements set by the faculty (See Section F hereinafter).

A.9.2.2 Pass requirements

The average mark of all the members of the examination commission is the final mark; provided that if not more than one external examiner awards a fail mark, the dean may appoint another external examiner. If two external
examiners award a fail mark, the student fails irrespective of the average mark.

Where a dissertation is accepted, but the student is to effect certain changes in accordance with a decision of the examiner, the conferring of the degree is made subject thereto.

The degree is conferred on the basis of a dissertation and examination on the field of study of the dissertation and/or divisions of the field of study as required by the head of the department or leader.

The minimum duration of the course is one year.

The minimum pass mark is 50% for both the dissertation and the examination. The degree is conferred with distinction when a student obtains at least 75% in the examination and the dissertation.

In the event of a student failing only the dissertation, he/she may submit a revised dissertation or another dissertation within two years and in such a case he/she must carry the full cost of the examination.

A.9.3 Evaluation of and pass requirements for theses

A.9.3.1 Evaluation

The examiners evaluate the thesis on the basis of the question whether the student has demonstrated that:

- he/she is capable to plan and execute a scientific investigation independently; and
- he/she is able to perform original work.

The format and care given to language of the thesis must be satisfactory and must also satisfy the requirements set by the faculty (See Section F hereinafter).

A.9.3.2 Pass requirements

A PhD student must submit a thesis which deals with a topic from the list of subject disciplines.
A student passes the thesis if all the members of the examination commission accept it; provided that if not more than one external examiner does not accept the thesis, the dean can appoint an additional external examiner from outside the University, or refer the matter to the faculty board for a decision. If an additional examiner has been appointed and the examiner accepts the thesis, the student passes. Where the majority of the examiners or the additional examiner do(es) not accept the thesis, the student fails.

Where a thesis is accepted, but the student still has to effect certain changes in accordance with a decision of the examiners, the conferring of the degree is made subject thereto.

The degree is conferred on the basis of a thesis and a compulsory doctoral examination, either written or oral, which covers the content of the thesis as well as the sections of the field of study on which the thesis is based.

In the event of a thesis being rejected, the student is allowed to re-submit the thesis in a revised form only once more, and in such a case he/she must carry the full cost of the examination.

A.10 DRAFT ARTICLE FOR PUBLICATION

The student must submit at least one draft article for publication in an accredited journal prior to or simultaneous with the submission of the research report. The draft article must be based on the research undertaken by the student for the research report and must be acceptable to the leader/supervisor. The conferring of the degree can be made subject to the fulfilment of the requirements of this regulation.
SECTION B

A BRIEF INTRODUCTION TO RESEARCH

B.1 WHAT RESEARCH IS NOT

The word *research* is used in everyday speech to cover a broad spectrum of meanings, which makes it a decidedly confusing term for students who must learn to use the word in its specialised denotation.

In order to dispel certain misconceptions about the nature of research, Leedy & Ormrod (2001: 3) highlighted a number of false concepts by making the following statements:

- *Research is not mere information gathering*
- *Research is not mere transportation of facts from one location to the other*
- *Research is not merely rummaging for information*
- *Research is not a catchword used to get attention*

B.2 DEFINITION AND PURPOSE OF RESEARCH

There seems to be no consensus in the literature on how research should be defined. However, from the many different definitions, Hussey & Hussey (1997: 1) identified the following points of agreement:

- research is a process of enquiry and investigation
- it is systematic and methodical
- research increases knowledge

The following are the most common reasons for undertaking research:

- to generate new knowledge
- to explain a phenomenon or occurrence that gives rise to questions on certain aspects
- to provide solutions to practical problems
- to illuminate or confirm an existing theory
- to generate new models and hypotheses that can serve as points of departure in future research
- to construct or create a new procedure or system
- a combination of any of the above
The reasons listed above illustrate that research is purposeful since it is conducted with a view to achieving an outcome. The outcome may be presented in the form of a dissertation, thesis and/or an article for an academic journal. In this manual we focus on the needs of students carrying out a research project for a qualification. Therefore, we concentrate on dissertations and theses.

Leedy & Ormrod (2001: 4 & 5) identified eight distinct characteristics typically found in scientific research. They summarised these characteristics as follows:

- Research originates with a question or problem
- Research requires a clear articulation of a goal
- Research follows a specific plan of procedure
- Research usually divides the principal problem into more manageable subproblems
- Research is guided by a specific problem, question, or hypothesis
- Research accepts certain critical assumptions
- Research requires the collection and interpretation of data in an attempt to resolve the problem that initiated the research
- Research is by its nature, cyclical or, more exactly, helical

B.3 TOOLS OF RESEARCH

A research tool is a specific mechanism or strategy the researcher uses to collect, manipulate, or interpret data. The following are six general tools of research:

B.3.1 The library and its resources

Researchers must be familiar with the library. They must know its layout, the kinds of sources it contains, and the information retrieval systems, so that they can obtain the information that they need as quickly as possible. Researchers can also make their tasks considerably easier by making use of the subject reference service.

B.3.2 The computer and its software

The extensive uses to which computers can be put in research are illustrated by Leedy & Ormrod (2001) by way of computer prompts.

Computer software packages such as Research Toolbox are available to assist and guide the researcher through the generic aspects of the research process.
One use of the computer that a researcher is likely to use throughout a research project is the Internet. The Internet provides many resources such as the World Wide Web, telnet, file transfer protocol, and electronic mail.

B.3.3 Measurement

In research, *measurement* takes on a somewhat different meaning from what it is supposed to cover in everyday speech. Leedy & Ormrod (2001: 24) defines measurement as follows:

> *Measurement is limiting the data of any phenomenon – substantial or insubstantial – so that those data may be interpreted and, ultimately, compared to an acceptable qualitative or quantitative standard.*

Most researchers strive for objectivity. They believe that their observations should be influenced as little as possible – ideally not at all – by their own perceptions, impressions, and biases (Some qualitative researchers are an exception to this rule). And one way of remaining objective is to identify a systematic way of measuring a phenomenon being studied (Leedy & Ormrod, 2001: 34)

B.3.4 Statistics

When data have been collected, the researcher must organise them in meaningful ways so that they can be interpreted. Data uninterpreted by the human mind are worthless. Statistics are tools employed by the researcher to assist in organising data in such meaningful ways. Statistics help condense an overwhelming body of data into an amount of information that the human mind can more readily comprehend. In the process, they can help the researcher to “see” patterns and relationships in the data that might otherwise go unnoticed.

B.3.5 The human mind

Human beings have developed several cognitive tools to help them better understand the unknown. Key among them are *deductive logic, inductive reasoning, the scientific method, and critical thinking*.

- *Deductive logic* begins with one or more premises. These premises are statements or assumptions that are self-evident and widely accepted “truths”. Reasoning then proceeds logically from these premises towards conclusions that must also be true.
• **Inductive reasoning** begins, not with a pre-established truth or assumption, but with an observation. From the observation of a sample they then draw conclusions about the population from which the sample comes.

• **The scientific method** (traditionally) is a means whereby insight into the unknown is sought by (a) identifying a problem that defines a goal of one’s quest, (b) positing a hypothesis that, if confirmed, resolves the problem, (c) gathering data relevant to the hypothesis, and (d) analysing and interpreting the data to see whether they support the hypothesis and resolve the question that initiated the research.

The scientific method serves as a base for research methodology. We should keep in mind, however, that not all research methodologies follow the steps outlined above in exactly that sequence. Approaches such as ethnographic research and grounded theory research involve collecting data and then developing one or more hypotheses about them.

Applications of the scientific method often involves both deductive logic and inductive reasoning. Researchers may develop a hypothesis either from a theory (deductive logic) or from observations of specific events (indicative reasoning). Then, using deductive logic once again, they make predictions about patterns they are likely to see in the data if the hypothesis is supported. And often, using inductive reasoning, they generalise from data taken from a sample to describe the characteristics of a larger population. (Leedy & Ormrod, 2001: 36)

• **Critical thinking** involves evaluating information or arguments in terms of their accuracy and worth. Critical thinking may take a variety of forms, depending on the context. (Leedy & Ormrod, 2001: 33)

**B.3.6 Language**

Proficiency in the language in which the report is eventually communicated is essential. A sound writing style also enhances the extent to which the report is readable.

Knowledge of and reading competence in other languages offer access to a much broader spectrum of research literature.

The potential researcher would do well to make a thorough study of the different research tools in order to make thorough use of them.
B.4 TYPES OF RESEARCH

Hussey & Hussey (1997: 9 & 10) suggests that the many different types of research can be classified according to:

- the **purpose** of the research – the reason why you are conducting it
- the **process** of the research – the way in which you will collect and analyse your data
- the **logic** of the research – whether you are moving from the general to the specific or vice versa
- the **outcome** of the research – whether you are trying to solve a particular problem or make a general contribution to knowledge

Table B.1: Classification of main types of research

<table>
<thead>
<tr>
<th>Type of research</th>
<th>Basis of classification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exploratory, descriptive, analytical or predictive research</td>
<td>Purpose of the research</td>
</tr>
<tr>
<td>Quantitative or qualitative research</td>
<td>Process of the research</td>
</tr>
<tr>
<td>Deductive or inductive research</td>
<td>Logic of the research</td>
</tr>
<tr>
<td>Applied or basic research</td>
<td>Outcome of the research</td>
</tr>
</tbody>
</table>

*Source: Hussey & Hussey (1997: 10)*

B.5 CONCEPTUAL ISSUES

B.5.1 Research paradigms (approaches)

There are two main research paradigms or approaches. Although there is considerable blurring, the two paradigms can be labeled positivist and phenomenological. Some authors prefer to use other terms. The table hereunder summarises some of the more common terms:

Table B.2: Alternative terms for the main research paradigms

<table>
<thead>
<tr>
<th>Positivistic paradigm</th>
<th>Phenomenological paradigm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Qualitative</td>
<td>Subjectivist</td>
</tr>
<tr>
<td>Objectivist</td>
<td>Humanistic</td>
</tr>
<tr>
<td>Scientific</td>
<td>Interpretivist</td>
</tr>
<tr>
<td>Experimentalist</td>
<td></td>
</tr>
<tr>
<td>Traditionalist</td>
<td></td>
</tr>
</tbody>
</table>

*Source: Hussey & Hussey (1997: 47)*
The main features of the two paradigms are shown in the table hereunder.

**Table B.3: Features of the two main paradigms**

<table>
<thead>
<tr>
<th>Positivistic paradigm</th>
<th>Phenomenological paradigm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tends to produce quantitative data</td>
<td>Tends to produce qualitative data</td>
</tr>
<tr>
<td>Uses large samples</td>
<td>Uses small samples</td>
</tr>
<tr>
<td>Concerned with hypothesis testing</td>
<td>Concerned with generating theories</td>
</tr>
<tr>
<td>Data is highly specific and precise</td>
<td>Data is rich and subjective</td>
</tr>
<tr>
<td>The location is artificial</td>
<td>The location is natural</td>
</tr>
<tr>
<td>Reliability is high</td>
<td>Reliability is low</td>
</tr>
<tr>
<td>Validity is low</td>
<td>Validity is high</td>
</tr>
<tr>
<td>Generalises from sample to population</td>
<td>Generalises from one setting to another</td>
</tr>
</tbody>
</table>

*Source:* Hussey & Hussey (1997: 54)

Both approaches involve similar processes. Yet these processes are often combined and carried out in different ways, leading to distinctly different *research methods*. For instance, positivist researchers usually start with a specific hypothesis to be tested. They isolate the variables they want to study, control for extraneous variables, use a standardised procedure to collect some form of numerical data, and use statistical procedure to analyse and draw conclusions from the data. In contrast, phenomenological researchers often start with general research questions rather than specific hypotheses, collect an extensive amount of verbal data from a small number of participants, organise those data into some form that gives them coherence, and use verbal descriptions to portray the situation they have studied. (Leedy & Ormrod, 2001: 101)

Although two main paradigms have been identified, it is best to regard them as two extremes of a continuum. As you move along the continuum, the features and the assumptions of one paradigm are gradually relaxed and replaced by those of the other paradigm. (Hussey & Hussey, 1997: 48)

**B.5.2 Research design versus research methodology**

*Research design* is synonymous with *research planning* and involves the complete strategy of attack on the central research problem. It provides the overall structure for the procedures that the researcher follows. These procedures are fundamentally the same, no matter which academic discipline gives rise to the research endeavour. (Leedy & Ormrod, 2001: 91)
Research methodology or research method, on the other hand, refers to the various means by which data can be collected and/or analysed. Whereas the general approach to planning a research study may be similar across disciplines, the specific methods one uses to collect and analyse data may be specific to a particular academic discipline. (Leedy & Ormrod, 2001: 93)

B.6 THE NATURE AND ROLE OF DATA IN RESEARCH

Hussey & Hussey (1997: 149) describe data as known facts or things used as a basis for inference or reckoning. Some authors draw a distinction between data and information, by defining information as knowledge; data which has been organised into a useful form

There are two main sources of data. Original data are known as primary data, which are data collected at source. Examples include survey data, which are obtained in an uncontrolled situation by asking questions or making observations, and experimental data, which are obtained in a controlled situation by making experiments. Secondary data are data which already exist such as reports, published statistics and internal records kept by organisations

Data can be described as qualitative or quantitative. As the names suggest, qualitative data are concerned with qualities and non-numerical characteristics, whilst quantitative data are all data that are collected in numerical form

Qualitative data can be recorded and described in four measurement scales, viz nominal scale, ordinal scale, interval scale and ratio scale

Data can be collected in various ways such as interviews, questionnaires, observation and protocol analysis

Data and methodology are inextricably interdependent. For this reason, the methodology to be used for a particular research problem must always take into account the nature of the data that will be collected in the resolution of the problem (Leedy & Ormrod, 2001: 100)

B.7 RESEARCH METHODOLOGIES

As already indicated, the nature of the data, to some extent, dictate the research method. The key methodologies can, therefore, be grouped under the two main research paradigms as shown in the table hereunder
### Table B.4: Research methodologies

<table>
<thead>
<tr>
<th>Positivistic Approach to social sciences</th>
<th>Phenomenological</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Associated methodologies</strong></td>
<td><strong>Associated methodologies</strong></td>
</tr>
<tr>
<td>Cross-sectional studies</td>
<td>Action research</td>
</tr>
<tr>
<td>Experimental studies</td>
<td>Case studies</td>
</tr>
<tr>
<td>Longitudinal studies</td>
<td>Ethnography</td>
</tr>
<tr>
<td>Surveys</td>
<td>Content analysis</td>
</tr>
<tr>
<td></td>
<td>Grounded theory</td>
</tr>
<tr>
<td></td>
<td>Hermeneutics</td>
</tr>
<tr>
<td></td>
<td>Participative enquiry</td>
</tr>
</tbody>
</table>

*Source: Adapted from Hussey & Hussey, (1997: 59)*
SECTION C

AN OVERVIEW OF THE RESEARCH PROCESS

C.1 GENERATING A RESEARCH TOPIC

A general subject area which is of interest to the student should be identified as a point of departure for the search of finding a research topic. The student is more likely to have a successful and enjoyable experience if he or she finds the subject matter interesting.

Once the subject area has been established, techniques such as brainstorming, analogy, morphological analysis, construction of mind maps or relevance trees can be employed to generate research topics or to focus interest in a research topic (Hussey & Hussey, 1997: 82 – 85).

C.2 LAUNCHING A PRELIMINARY LITERATURE SEARCH

Having identified the research topic, the focus can move to the literature search. However, before you can commence searching the literature you must determine the key words which are associated with the chosen research topic. These search words are needed to guide you to the most relevant and appropriate literature.

The literature search is the process of exploring the existing literature to ascertain what has been written or otherwise published on the chosen topic, how previous research has been conducted and how this impacts on the proposed research project. (See also Section E hereinafter)

By exploring what others have contributed to the subject area, the student will be able to find out what is already known, identify any gaps, see how his or her ideas compare with what has gone before, and develop existing ideas or create new ones.

The preliminary literature search should be taken to a point where it will be possible to proceed to the next phase in the research process, i.e. the research design, which culminates in a written research proposal.
C.3 IDENTIFYING AND STATING THE RESEARCH PROBLEM OR QUESTION

The first step of the research design phase is the conversion of a general interest in a topic into a specific research problem which is suitable for a research project. Leedy & Ormrod (2001: 49) see the research problem or question as the axis around which the whole research effort revolves. Their view makes the situation quite clear: no problem, no research

Great care should be exercised in the identification of the problem because some problems are not suitable for research because they lack the interpretation of data requirement; they do not elicit a mental struggle on the part of the researcher to force the data to reveal their meaning. Interpretation of data is a sine qua non for any research project (Leedy & Ormrod, 2001: 49)

Having identified the research problem or question, it should be articulated in such a way that it is carefully phrased and represents the single goal of the total research effort

C.4 DIVIDING THE RESEARCH PROBLEM INTO SUBPROBLEMS

Most research problems are too large or too complex to be solved without subdividing them. The subparts of the main problem are called subproblems. The division must be such that each subproblem constitutes a completely researchable unit and that the subproblems will add up to the totality of the main problem, i.e. the answers to the subproblems in question form resolve the main problem

C.5 FURTHER DELINEATION OF THE RESEARCH PROBLEM

The statement of the research problem establishes the goal for the research effort and the subproblems suggest ways of approaching that goal in a more manageable way. However, to comprehend fully the meaning of the problem, additional information is needed

C.5.1 Stating the hypotheses and/or research questions

Leedy & Ormrod (2001: 60) defines a hypothesis as a logical supposition, a reasonable guess, an educated conjecture. The purpose of positing hypotheses are to direct one’s thinking towards the solution of the problem (or subproblem). Research questions are another means of guiding and directing researchers’ thinking and are more common in phenomenological research studies. Hypotheses and questions provide guidance for the kinds of data the researcher should collect and suggest how the researcher should analyse and interpret those data.
C.5.2 Delimiting the research

What the researcher intends to do should be clearly set out in the problem statement. What needs to be stated in the delimitations is what the researcher is not going to do. Research problems typically emerge from larger contexts and larger problem areas. Information that lies beyond the precincts of the problem under investigation must be firmly ruled out in the statement of delimitations.

C.5.3 Defining terms

Without knowing explicitly what is meant with terms used in the statement of the problem and subproblems, it is impossible to evaluate the research or determine whether the researcher has carried out what was proposed. Each term must therefore be defined operatively. Dictionary definitions are seldom adequate or helpful. In defining the terms the researcher makes the term mean whatever he or she intends it to mean within the context of the problem and its subproblems (Leedy & Ormrod, 2001: 61).

C.5.4 Stating the assumptions

In research we attempt to leave nothing to chance in the hope of preventing any misunderstanding. All assumptions made by the researcher that have a bearing on the problem should be openly and unreservedly set forth. (Leedy & Ormrod, 2001: 62 & 63)

C.5.5 Importance of the study

Setting forth the reasons for undertaking the study could have an influence on funding of the project and therefore warrants inclusion in the research proposal.

C.6 DECIDING ON THE RESEARCH METHODOLOGY

Once the nature, availability and other factors affecting the data required for the study have been established, the decision regarding the choice of methodology can be made.
Hussey & Hussey (1997: 130) describes a research proposal as a written account of the research topic you have chosen and why, a plan of your future research and an explanation of how you will achieve it. The research proposal will be dealt with in the next section (Section D).
SECTION D

THE RESEARCH PROPOSAL

D.1 INTRODUCTION

Guidelines regarding the proposed title and format of a research proposal are given in this section. For typical examples of research proposals reference should be made to the following sources:

- Leedy & Ormrod (2001: Chapter 6);
- Hussey & Hussey (1997: Appendix A); and
- Mouton (2001: Part II, 11)

D.2 PROPOSED TITLE

The proposed title of the research project should be as brief as possible (not exceeding 12 words) and yet the reader should be able to understand what the research is all about from the title.

D.3 FORMAT

Proposals follow a simple, logical form of presentation. The format for the two research paradigms may differ slightly. In general terms, the subjects as indicated in the table hereunder will need to be covered:

<table>
<thead>
<tr>
<th>Chapter/section</th>
</tr>
</thead>
<tbody>
<tr>
<td>What your project is focusing on (the research problem); research purpose and</td>
</tr>
<tr>
<td>research questions or hypotheses; explanation of definition of key terms;</td>
</tr>
<tr>
<td>limitations and delimitations</td>
</tr>
<tr>
<td>Theoretical framework and prior research; explanation of any assumptions and</td>
</tr>
<tr>
<td>theories you are employing; literature review</td>
</tr>
<tr>
<td>Research paradigm and methodology; description of the sources of the data and</td>
</tr>
<tr>
<td>the methods of collection and analysis</td>
</tr>
<tr>
<td>Timetable for the study</td>
</tr>
</tbody>
</table>

Source: Adapted from Hussey & Hussey (1997: 131)
D.4 WEAKNESSES IN RESEARCH PROPOSALS

Leedy & Ormrod (2001: 137) listed some weaknesses frequently found in rejected grant applications as follows:

Weaknesses related to the Research Problem

- The description of the project is so nebulous and unfocused that the purpose of the research is unclear
- The problem is unimportant or unlikely to yield new information
- The hypothesis is ill-defined, doubtful, or unsound, or it rests on insufficient evidence
- The problem is more complex than the investigator realises
- The problem is of interest only to a particular, localised group, or in some other way has limited relevance to the field as a whole

Weaknesses related to the Research Design and Methodology

- The description of the design and/or method is so vague and unfocused as to prevent adequate evaluation of its worth
- The data the investigator wishes to use are either difficult to obtain or inappropriate for the research problem
- The proposed methods, measurement instruments, or procedures are inappropriate for the research problem
- Appropriate controls are either lacking or inadequate
- The equipment to be used is outdated or inappropriate
- The statistical analysis has not received adequate consideration, is too simplistic, or is unlikely to yield accurate and clear-cut results

Weaknesses related to the Investigator

- The investigator does not have sufficient training or experience for the proposed research
- The investigator appears to be unfamiliar with the literature relevant to the research problem
- The investigator has insufficient time to devote to the project
Weaknesses related to Resources

- The institutional setting is unfavourable for the proposed research
- The proposed use of equipment, support staff, or other resources are unrealistic

The authors believe that the above listed weaknesses have relevance to all kinds of research proposals. It is therefore advisable that aspiring researchers take note of their findings in order to avoid making similar errors.
SECTION E

THE EXECUTIONARY PHASE

E.1 CONTINUATION OF THE LITERATURE SEARCH

As indicated in Section C hereinbefore, the literature search commences immediately after having identified the research topic. Although searching the literature is an ongoing process which lasts for almost the entire research endeavour, you must be strong willed and decide to impose a definite cut-off point. The research report will be an account of your research up to a chosen date and you need not be concerned about events after that time.

E.1.1 Main sources of information

Most of the information you need will most probably be obtainable from or through the Academic Information Services on the main campus of the University.

E.1.1.1 Books

Books are a good starting point and usually provide references for further reading. Some of these references will be other books which you can borrow from the library or obtain through interlibrary loans; others will be articles in journals, papers and other published material. Relevant books can be located by means of the library catalogue.

E.1.1.2 Articles and papers

Very recent topics are not likely to be covered by books. Journals and newspapers will be the most relevant places to look for information relating to recent events. Journals generally contain more specialised and specific information than books.

E.1.1.3 Indexes and abstracts

Another good jumping-off point to use is indexes and abstracts. An index lists articles and research reports in certain specified areas and an abstract is a summary of an article or a study. The latter gives the source of the original study, should the reader wish to refer to it.
E.1.1.4  *Research reports and conference papers*

The most up-to-date information on the current state of research in any particular area is provided by *research reports* and *conference papers*.

E.1.1.5  *The Internet*

The internet is not a network on its own, but a term which is used to describe a group of various networks world wide, which are linked in such a way that it functions as one network. It is thus a combination of thousands of computer networks reaching millions of people throughout the world. The use of the Internet to obtain information can be useful for the student since it is always available and more and more information are added daily.

The Internet was originally designed for computer specialists and user-friendliness was not included in the design, and information is not organised like an information system usually is. Advanced retrieval methods (e.g. Archie, Veronica, Gopher, www) are now being developed on the Internet which allow access to the catalogues of the most important libraries and archives. (Botha & du Toit, 1999: 12)

E.1.2  *Computerised databases*

Databases available cover most areas of knowledge and can comprise either bibliographic details, full text or factual information.

Computerised databases may be *on-line* or *off-line*. Many on-line databases are accessible from anywhere in the world. The database is made publicly available by one or more *hosts*. Access is via computer terminal connected by modem to the telecommunications network. A CD-ROM is an example of an off-line database. A CD-ROM contains permanent, digitally encoded information on a huge scale.

E.1.3  *Recording references*

Keeping record of any relevant and useful books, articles, quotations, etc is essential throughout the research process. Records may be kept on index cards which are inexpensive and easy to use. Alternatively records may be stored on computer.
E.2 COLLECTING THE DATA

The figure hereunder shows an overview of the data collection process.

Table E.1: Overview of the data collection process

| Identify variables or phenomena |
| Select sample                   |
| Select type of data required    |
| Choose appropriate collection method(s) |
| Conduct pilot study or exploratory research |
| Modify collection method(s)    |
| Collect data                   |

Source: Hussey & Hussey (1997: 141)

The selection of a sample and some of the data collection methods are discussed hereinafter.

E.2.1 Selecting a sample

Selecting a sample is a fundamental element of a positivistic study. A sample is made up of some of the members of a population. A population may refer to a body of people or to any other collection of items under consideration for research purposes. (Hussey & Hussey, 1997: 144)

Depending on the size of the study and the size of the population under consideration, it is sometimes possible to use the entire population. However, in most positivistic studies the size of the population is such that a sample has to be selected from the population.

A representative sample is one in which the results obtained for the sample can be taken to be true for the whole population. To achieve this criterion, the sample must be:

- chosen at random (every member of the population must have a chance of being chosen)
- large enough to satisfy the needs of the investigation being undertaken
- unbiased

(Hussey & Hussey, 1997: 144)
E.2.2 Data collection methods

Hussey & Hussey (1997: 140) list the following as the main data collection methods:

- Critical incident technique
- Diaries
- Focus groups
- Interviews
- Observations
- Protocol analysis
- Questionnaires

Some of the methods listed above are discussed briefly hereunder

- **Interviews.** This method of collecting data is associated with both positivist and phenomenological studies. An interview is a method of data collection in which selected participants (the sample) are asked questions in order to find out what they do, think or feel. Interviews make it easy to compare answers and may be face-to-face, voice-to-voice or screen-to-screen; conducted with individuals or a group of individuals (Hussey & Hussey, 1997: 156)

  Interviews may be either *structured* (questions prepared beforehand) or *unstructured* and questions asked may be *closed* or *open-ended* depending on the type of study undertaken. It must be borne in mind that unstructured interviews are likely to be time consuming and there may be problems with recording the questions and answers, controlling the range of topics and, later analysing the data

- **Observation** is also associated with both positivistic and phenomenological methodology. Observation can take place in a laboratory setting or a natural setting. There are two ways in which observation can be conducted: *non-participant* and *participant*. The purpose of non-participant observation is to observe and record what people do in terms of their actions and their behaviour without the researcher being involved. Examples of this method is using a video or still cameras or making audio recordings if the focus is dialogue. Participant observation, on the other hand, implies that the researcher is fully involved with the participants and the phenomena being researched. The aim is to provide the means of obtaining a detailed understanding of values, motives and practices of those being observed. (Hussey & Hussey, 1997: 159)
Questionnaires are a popular method of collecting data and are associated with both positivistic and phenomenological studies. A questionnaire is a list of carefully structured questions, chosen after considerable testing, with a view to eliciting reliable responses from a chosen sample. The aim is to find what a selected group of participants do, think or feel.

Under a positivistic paradigm questionnaires can be used for large-scale surveys. A positivistic approach suggests that closed questions should be used, whereas a phenomenological approach suggests open-ended questions.

As with structured interviews, you need to be sure that each respondent will understand the question in the same way and that every respondent is asked the questions in exactly the same way as the others. This is no problem with a postal questionnaire, but may become an issue if the questions are asked face-to-face or by telephone.

It is essential that you pilot or test your questionnaire as fully as possible before distributing it. It may take several drafts, with tests at every stage, before the questionnaire is ready for distribution.

Besides answers to factual questions, you will also be seeking opinions. One way to do this is a simple question requiring a Yes or No response. However, it is often possible to allow participants to give more discriminating responses, and to state if they have no opinion, by providing them with some form of rating scale. This allows a numerical value to be given to an opinion. One of the more frequently used types of scale is the Lickert scale. This turns the question into a statement and asks the respondent to indicate their level of agreement with the statement by ticking a box or circling a response. Another way of obtaining numerical values from qualitative data is to pose questions where there are semantic differences. Two words or phrases are selected to represent two ends of a continuum and respondents are asked to indicate their choice on a five or seven-point scale. Figure E.2 hereunder shows an example (Hussey & Hussey, 1997: 171)
Figure E.1: Rating scale using a continuum

| Q19. Rate your manager’s communication skills on the following scale by circling the appropriate number |
|---|---|
| Very open | Secretive |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |

*Source: Hussey & Hussey (1997: 171)*

Having collected and recorded the data for your research project, you are now in a position to start analysing it

E.3 **ANALYSING QUANTITATIVE DATA**

In analysing quantitative data drawn from a sample to draw conclusions about a complete population Hussey & Hussey (1997: 187) draw a distinction between *exploratory data analysis (descriptive statistics)* and *confirmatory data analysis (inferential statistics)* which will become evident in the discussion hereunder

E.3.1 **Exploratory data analysis**

Exploratory data analysis implies techniques that are used to present frequencies and to measure location (central tendency), dispersion (spread) and change. In this way the data are described and summarised and then presented in tables, charts, graphs and other diagrammatic forms, which enables patterns and relationships to be discerned which are not apparent in the raw data (Hussey & Hussey, 1997: 189)

E.3.2 **Confirmatory data analysis**

This type of analysis involves using quantitative data collected from a sample to draw conclusions about a complete population and includes four main groups of inferential statistics:

- estimating from samples
- measuring association (Pearson’s product moment correlation coefficient; Spearman’s rank correlation coefficient)
- measuring difference (Chi squared test; student t-test)
- forecasting
It is important to note that there is a wide selection of techniques and procedures available to conduct a confirmatory data analysis. If you are not a statistician, it will be advisable to seek the help of someone with a good knowledge of the range of techniques available.

E.4 ANALYSING QUALITATIVE DATA

The two main approaches used to analyse qualitative data are quantifying methods and non-quantifying methods.

E.4.1 Quantifying methods

The process of quantifying qualitative data can occur either informally or formally. Examples of the former are:

- a procedure which is dependent on the frequency of something occurring
- a form of scaling to determine which data should be included

Examples of the latter are:

- content analysis which can be described as a way of systematically converting text to numerical variables for quantitative data analysis
- repertory grid techniques which allows the interviewer to get a mental map of how the interviewee views the world, and to write this map with the minimum of observer bias (Hussey & Hussey, 1997: 253)

E.4.2 Non-quantifying methods

There exist a number of non-quantifying procedures which can be adopted such as general analytical procedures, cognitive mapping, data displays, grounded theory and the quasi-judicial method. These methods are fully described by Hussey & Hussey (1997: 256 – 270)

E.5 PREPARING THE RESEARCH REPORT

By the time you get to the final writing-up stage in your research, you should have collected and generated a significant amount of data and material. During the course of conducting your
research, you should have been writing draft sections of your report, discussing them with your leader/supervisor and making amendments. Therefore, you should now be ready to start writing the first complete draft of your final report. (Hussey & Hussey, 1997: 276)

The next section deals with the research report in more detail
SECTION F

THE RESEARCH REPORT

F.1 INTRODUCTION

The research report brings the whole research effort to its destined conclusion. Leedy & Ormrod (2001: 285) defines the research report as a straight forward document that sets forth clearly and precisely what the researcher has done to resolve the research problem.

In general terms the research report should achieve four objectives:

- It should give a clear understanding of the research problem and why it merited an in-depth investigation.
- It should describe exactly how data were collected in an attempt to resolve the problem.
- It should present the data completely and precisely. The data should substantiate all interpretations and conclusions that the report contains.
- It should interpret the data and demonstrate exactly how the data resolve the research problem (Leedy & Ormrod, 2001: 288).

It is important to remember that you do not have to write the report in any particular order. Many researchers start by writing up the literature review, as in many cases it forms part of the research proposal. (Hussey & Hussey, 1997: 278)

F.2 REPORT DESIGN

Perhaps the best way to understand and appreciate the nature of research reports (and to prepare yourself for writing one) is to look at some existing reports. The Merensky library and any other university library for that matter, has a collection of dissertations and theses on its shelves. (Leedy & Ormrod, 2001: 286)

Hussey & Hussey (1997: 279) give some general guidelines regarding the structure of the report as follows:

- The information should be presented in a logical sequence. Each section should have a logical progression and support a central message. Each item should lead to the next
• A standard hierarchy of headings and subheadings should be adopted to structure the report (See Appendix B for a scheme of formatting headings and subheadings)

• The chapters, main sections and subsections should be numbered sequentially. Thus Section 3.5.5 refers to the fifth subsection in Section 5 of Chapter 3. Three is normally considered to be the maximum number of subdivisions. Therefore it is usual to divide the report into chapters which contain a number of main sections and, in turn, these are divided into subsections. As a general rule paragraphs should not be numbered

• Titles and headings used for tables, graphs and other illustrations should also be standardised and numbered sequentially. The first digit should refer to the chapter number and the second digit to the table/chart number. Thus, Table 3.5 refers to the fifth table in Chapter 3

When planning the research report, it is of the utmost importance to bear in mind the concept of synergy: the research report should be greater than the sum of its parts. In order to achieve this, it should be born in mind that, in addition to the requirements set out in the first bullet above, the chapters do not exist in isolation from each other; they are interrelated and need to be integrated to form a cohesive whole (Hussey & Hussey, 1997: 278)

Although individual research reports differ in structure according to the problem being investigated and the methodology being employed, there are some common features. Table F.1 shows a typical structure of a research report

**Table F.1: Typical structure of a research report**

<table>
<thead>
<tr>
<th>Chapter/section</th>
<th>Descriptions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Introduction</td>
<td>A precise explanation of what research is about and why it is important and interesting, the research questions or hypotheses should also be stated</td>
</tr>
<tr>
<td>Literature review</td>
<td>A critical analysis of what other researchers have said on the subject and where your project fits in</td>
</tr>
<tr>
<td>Methodology</td>
<td>An explanation of why you collected certain data, what data you collected, from where you collected it, when you collected it, how you collected it and how you analysed it</td>
</tr>
<tr>
<td>Results</td>
<td>A presentation of your research results</td>
</tr>
</tbody>
</table>
### Analysis and discussion

An analysis of your results showing the contribution to knowledge and pointing out any weaknesses/limitations

### Conclusions

A description of the main lessons to be learnt from your study and what future research should be conducted

### References

A detailed, alphabetical or numerical list of the sources from which information has been obtained and which have been cited in the text

### Appendices

Detailed data referred to but not shown elsewhere

*Source:* Adapted from Hussey & Hussey (1997: 281)

The length of the different types of reports will vary. However, a general indication of the desired word length (excluding the appendices) is as follows:

- **Dissertation** ................................................................. 40 000 words
- **Thesis** ........................................................................ 80 000 words

(Hussey & Hussey, 1997: 280)

### F.3 WRITING STYLE

As already stated, the research report is a *straight forward* document with no pretense at being a work of fine literature. The emphasis should be on clarity of meaning. It is therefore recommended that sentences be kept relatively short (preferably no longer than 20 words) and that a new paragraph be started for each new idea

The report should be presented in such a way that it invites the reader to start reading and is easy to follow through. Besides implementing the layout, margins, etc prescribed hereinafter, certain techniques, such as dividing the text up into *digestible chunks*, interspersing it with graphical and other illustrations, using headings, subheadings, different fonts and typefaces, etc, can be used to achieve this aim. Careful choice of words to create a lucid, flowing style which will both attract and maintain the interest of the reader. For this reason the meaning of words and phrases should be checked for correct usage

Because the research is reporting upon what has already happened, the report should be written in the *past tense*, except for interpreting the results and presenting the conclusion where using the *present tense* is appropriate. The report will also be restricted by another convention of document writing; namely, that – except for the title page or the by-line – the researcher, *qua* researcher, should be anonymous. The use of the first personal pronoun in any of its forms or
reference to the researcher in any way is taboo. In the interest of keeping the person of the researcher subdued upon the face of the report, the more impersonal passive voice style of writing must be employed.

F.4  ABBREVIATIONS AND SYMBOLS

F.4.1 Abbreviations and symbols shall be in conformity with those specified in the appropriate International Standard. If the symbols required are not covered by the relevant International Standard, reference may be made to national standards or to publications issued by scientific bodies competent in the field.

If the report contains signs, symbols, units, abbreviations or acronyms that may not be immediately understood by the reader they should be explained in one or more lists.

F.4.2 Abbreviations and symbols shall be defined when they first occur in the text. If there are numerous abbreviations and symbols, they shall be listed and defined separately from the text. This list shall be placed after the table of contents or after the list(s) of figures and/or tables if these are included.

F.5 QUOTATIONS

Quotations not integrated in the text of the clauses shall be clearly distinguished from the main text; sources shall also be indicated.

F.6 CITING PUBLICATIONS

F.6.1 A citation is an acknowledgement within the text of the source from which information was obtained (Hussey & Hussey, 1997: 103)

F.6.2 Citations in the text shall be distinguished by the author’s name and year of publication (See Appendix C)

F.7 NOTES

Notes shall be kept to a minimum
F.8 EQUATIONS AND FORMULAE

F.8.1 Equations and formulae shall be indented from the margin and separated from the surrounding text by an extra space

If the formulae are very short, they may be placed in the text, preceded and followed by an extra space

F.8.2 If there are several equations and formulae, they shall be identified by consecutive numbers placed in parentheses at the extreme right of the line

*Example*

\[ w = \frac{u_{11} - u_{12}}{u_{21}} \]

F.8.3 Reference signs in the text to equations or formulae shall be in the form

e.g. (1), form. (2), or equivalent in other languages

F.8.4 If the equations or formulae have to be broken owing to lack of space in the line, they shall be broken before an equals sign or after a plus, minus, multiplication or division sign

F.8.5 The numerator shall be separated from the denominator by a line equal in length to the longer of the two

F.8.6 Where it is necessary to include fractions in solid text, they shall, where possible, be reduced to a single level by using a solidus (/) or, where applicable, the negative index

*Example*

In stead of \( \frac{1}{\sqrt{2}} \) write \( 1 / \sqrt{2} \) or \( 2^{-\frac{1}{2}} \)

F.9 VERSES

F.9.1 Verses shall be distinguished from the main text
F.9.2 If there are verses of more than 15 lines each group of, for example, five lines shall be numbered

F.9.3 Verses shall be indented from the left-hand margin and separated from the surrounding text by extra space

F.9.4 In the case of facing page translations, the verses shall be arranged in such a manner that they correspond

F.9.5 If a line extends beyond the margin, the excess shall be indented and aligned on the right-hand margin

F.9.6 The source from which a poem has been quoted shall be given at the end of the quotation, preferably in the form of a full bibliographic reference (see ISO 690)

F.10 ILLUSTRATIONS AND TABLES: LAYOUT AND REPRODUCTION

F.10.1 Location

Illustrations, for example drawings, charts, photographs, maps and tables should be included near the first reference made to them in the text

They shall, however, be placed in numerical sequence after the text, when a research report contains only a few pages of text and numerous illustrations and/or tables, or when there are several references to the same table and illustration

F.10.2 Presentation

Copies of illustrations and tables shall be legible even when reduced. Coloured lines shall be replaced by various dashed lines. Illustrations, which for technical reasons (for example colour reproductions) require separate duplication or printing, shall be presented as plates (hors-texte)

F.10.3 Captions and legends

- A short caption or legend, horizontal and unboxed, shall be given with each illustration or table

- The caption of a table shall appear above the table and after the Arabic numeral assigned to it
• The legend of an illustration shall be placed below the illustration. If the illustration occupies a full page, the legend shall be placed at the bottom of the facing page.

• The legend of an illustration shall be placed after the Arabic numeral assigned to it.

• When referred to in the text, the illustration or table numbers shall be preceded or followed by the words “figure” or “table”, or their equivalent (or their abbreviations); the source of any non-original data in an illustration or a table shall be given.

F.10.4 Numbering

• Illustrations shall be numbered consecutively in Arabic numerals, generally without distinguishing between maps, drawings, graphs, diagrams, plates, etc. A separate system of numbering may, however, be desirable for maps.

• Illustrations and tables should be numbered separately and consecutively.

• Illustrations and tables in appendices shall be designated by the letter of the appendix as well as by their own number.

F.11 LIST OF BIBLIOGRAPHIC REFERENCES

F.11.1 A reference is the detailed description of the source from which the information was obtained (Hussey & Hussey, 1997: 103).

F.11.2 Entries in the reference list shall comply with ISO 690.

F.11.3 All documents cited in the body of the text shall be listed under References (See Appendix C).

F.11.4 The list of bibliographic references shall be placed on a new page immediately after the main text, and preceding illustrations and tables if these are grouped together (See F.10.1 hereinbefore).
F.11.5 Documents not cited in the body of the text but given as supplementary information shall be listed in an appendix with the title “Bibliography”

F.12 APPENDICES

F.12.1 Appendices may include more detailed information, more extensive explanation of methods and techniques that are summarised in the text, suggested reading (bibliography), and other information that is not essential to the understanding of the main text.

F.12.2 The pagination of the appendices shall be consecutive and continue the pagination of the main text.

F.12.3 A capital letter of the alphabet, beginning with A, preceded by the word Appendix shall be given for identification of each appendix.

F.12.4 The division into clauses and subclauses in the appendices shall be consistent with that of the main text. The numbering of these items shall start afresh with each appendix, with each number being prefixed by the appendix letter.

F.12.5 Each appendix shall start on a new page.

F.13 INDEX

The presentation of the index shall comply with ISO 999.

F.13.1 Arabic numerals shall be used for all page references with the exception of page references from appendices. These page numbers shall be prefixed by the appendix letter.

When there is more than one volume, the page number shall be preceded by and separated from the volume number, which shall be given in Arabic numerals.

F.13.2 Each index shall start on a new page.

F.13.3 The type of index shall be clearly indicated in the title of the index, i.e. general or specialised (by subjects, geographical names, etc).
F.14 CONTENT OF THE REPORT

F.14.1 Preliminary pages

The preliminary pages are the introductory pages which precede the first chapter. The page numbers for these pages are normally small Roman numerals (i, ii, iii, etc). The preliminary pages usually comprise in the following order:

- a title page (see Appendix A for prescribed format)
- a list of contents with page numbers
- a list of figures and tables
- any acknowledgements (optional)
- an abstract

Your research project will have been registered with a particular title, but it may be necessary to revise this to ensure that it reflects the research actually conducted. The title should be kept as short as possible.

The inclusion of acknowledgements is optional. It could consist of a few short sentences thanking those who have rendered assistance with the research project in some special way, e.g. institutions or firms who gave access to data required, individuals, such as the supervisor or study leader, colleagues and family. The guild mark of education is to say thank you to those who have given their time and assistance to support the research project. The acknowledgement page is the proper place for the gracious expressions of such indebtedness. These people may include those who introduced the researcher to data sources that aided in completing the research or those who guided the study and gave counsel – perhaps a faithful typist and proofreader, and family members who encouraged and assisted the research effort (Leedy & Ormrod, 2001: 294).

The abstract is a summary of the entire research report in not exceeding 500 words. The purpose of an abstract is:

- to introduce the topic
- to describe how the research was carried out
- to discuss the results of what was done
Having described the preliminary pages, the focus can now be put on the main text of the research report

F.14.2 Introduction

The introductory chapter of the report is a more detailed version of the first section of the research proposal, and introduces the reader to the study undertaken and the fundamental principles on which it is based.

After a few introductory comments that provide the background and the rationale for the study, the document should set forth clearly and unmistakably the problem that has been researched. If the problem has been divided into subproblems, these should be presented following the statement of the problem and announced with proper subheadings. By presenting the problem and its subproblems, the writer gives the reader a clear and complete understanding of the principal thrust of the research project. With this thrust in mind, the reader will then be in a better position to understand the interpretation of the data and to judge the merits of the research (Leedy & Ormrod, 2001: 289)

If the research procedure includes the testing of hypotheses, these should be clearly and explicitly stated as well as the assumptions the researcher made in testing them.

Any delimitations should also be clearly set forth in terms that may be ambiguous or are used in a specialised sense must be defined.

Lastly, the importance and relevance of the research have to be demonstrated.

Hussey & Hussey (1997: 286) points out that the first two parts (chapters) of the research report which an examiner will read are the introduction and the conclusions, so these two chapters are important and are closely related. It is therefore advisable not to write the introductory chapter until the conclusions have been written.

F.14.3 Literature review

Chapter 2 usually deals with an overview of the literature.
Hussey & Hussey (1997: 288) offer the following guidance on writing this chapter:

- **Select relevant material only**
- **Group the material into categories and comment on the most important features**
- **Compare the results of different studies, picking out those which have the most bearing on your research**
- **Set the context for your own study**
- **Be critical. You are not recording or describing other people’s work, you are providing a critique by pointing out the strengths and weaknesses of other research and evaluating other studies, theories, etc with reference to your own study**

**F.14.4 Methodology**

The *methodology* chapter is a critical part of the report in both a positivistic and a phenomenological study and will vary according to which of the two paradigms has been adopted. However, in general terms both approaches require an exact explanation of how the problem was investigated to a point where another researcher could replicate the study and presumably get similar results, and why particular techniques were used.

**F.14.5 Presentation and interpretation of data**

In a positivistic study the *presentation and interpretation* of data are usually found in separate successive chapters. In the *presentation of data* chapter(s) you would typically give a description of the sample and address the research questions or hypotheses in the sequence which seems most appropriate. Most of the data will be given in the form of tables and graphs.

In the phenomenological study it is often impossible to disentangle the data and analysis whether one or two chapters are required to do this will depend on the amount of data collected and the depth of the analysis. As with positivistic (quantitative) data, the aim in a phenomenological study is to make sense of the data collected. The use of diagrams and other illustrations can be very effective, but care should be exercised not to let them overshadow the text. (Hussey & Hussey, 1997: 291)
At an early stage in the analysis and interpretation chapter (if this is given as a separate chapter), the purpose of the research and the research questions should be restated since these should underpin and direct the analysis and interpretation. The researcher should demonstrate that he or she can be self-critical by discussing any weaknesses or faults in the research design (Hussey & Hussey, 1997: 292)

If the data is mainly qualitative, it is essential to intersperse the text with quotations. This will give the text authenticity and vibrancy. However, care has to be taken that any illustrations or quotations given are relevant and part of the fabric of the study (Hussey & Hussey, 1997: 294)

F.14.6 Summary, conclusions and recommendations

The purpose of the research should be restated and the main parts of the study should be summarised. This should be followed by a widening of the discussion to explain how it is important for any further research in the same area; why it is of general interest and importance; and finally offering suggestions for future research

It will be worthwhile spending some time in choosing appropriate wording to conclude the main text on a high note. Aim for a convincing ending

The main text is followed by the end matter comprising of the list of references and the appendices

F.14.7 References

All documents cited in the main text shall be listed under References and formatted as required (see F.11 hereinbefore)

F.14.8 Appendices

The appendix or appendices will contain information which was either too detailed or not sufficiently relevant to be included in the main text

Documents not cited in the main text but given as supplementary information shall be listed in an appendix labeled Bibliography

The various items making up the appendices must be properly structured and clearly labeled
F.15  METHOD OF PRODUCTION

F.15.1  Typescript

Research reports shall be presented in typescript of size A4 with one and a half line spacing and printed only on the recto. A reasonable size font, say 10, 11 or 12 pitch, shall be used to ensure legibility. The left-hand margin shall be 30mm wide to facilitate binding and the right-hand margin shall be 25mm wide to allow examiners to write their comments.

F.15.2  Paper

Paper shall be white, of an opacity and quality that allows printing, reading and micro-reproduction.

F.15.3  Pagination

The numbering of the preliminary pages (except the title-leaf which remains unnumbered) shall be small Roman numerals (i, ii, iii, etc).

The pagination of the main text and end matter shall run consecutively, including blank pages, in Arabic numerals.

F.16  MARKING CRITERIA

Arangies & du Plessis (1990: 96 & 97) determined guidelines for the evaluation of dissertations and theses for the Faculties of Economics and Management Sciences from replies received from sixteen universities in the Republic of South Africa. They found that comparative agreement exists on the essential aspects which are to be evaluated. However, it was also clear that great dissension exists as to the relative importance attached to these aspects.

Table F.2 hereunder lists the essential aspects identified and also reflects the weights allocated to each.
Table F.2: Weights of core aspects in the examination of dissertations and theses (out of 100)

<table>
<thead>
<tr>
<th>Core aspects</th>
<th>Dissertation</th>
<th>Thesis</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Average</td>
<td>Recommended</td>
</tr>
<tr>
<td>a) Topic, purpose, hypothesis and problem statement</td>
<td>12</td>
<td>10</td>
</tr>
<tr>
<td>b) Research methodology, scientific processing and justification of statements</td>
<td>17</td>
<td>15</td>
</tr>
<tr>
<td>c) Source study</td>
<td>15</td>
<td>15</td>
</tr>
<tr>
<td>d) Content</td>
<td>27</td>
<td>35</td>
</tr>
<tr>
<td>e) Summary, conclusions and recommendations</td>
<td>12</td>
<td>15</td>
</tr>
<tr>
<td>f) Contribution to science</td>
<td>8</td>
<td>0</td>
</tr>
<tr>
<td>g) Language, style; technical composition, care and rounding off</td>
<td>9</td>
<td>10</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td>100</td>
<td>100</td>
</tr>
</tbody>
</table>

Source: Adapted and translated from Arangies & du Plessis (1990: 98)
REFERENCES


APPENDIX A

PRO FORMAS OF TITLE PAGE

MANAGEMENT OF DELAYS ON BUILDING PROJECTS
IN THE REPUBLIC OF SOUTH AFRICA

BY

DIEDERICK GERHARDUS BRÜMMER

submitted in fulfilment of a part of the requirements for the degree

PHILOSOPHIAE DOCTOR
(QUANTITY SURVEYING)

in the Faculty of Engineering, Built Environment and Information Technology,
University of Pretoria

September 1998
BESTUUR VAN VERTRAGINGS OP BOUPROJEKTE
IN DIE REPUBLIEK VAN SUID-AFRIKA

DEUR

DIEDERICK GERHARDUS BRüMMER

voorgelê ter vervulling van 'n deel van die vereistes vir die graad

PHILOSOPHIAE DOCTOR
(BOUREKENKUNDE)

in die Fakulteit Ingenieurswese, Bou-omgewing en Inligtingstegnologie,
Universiteit van Pretoria

September 1998
APPENDIX B

FORMATTING HEADINGS AND SUBHEADINGS

- **Level 1 heads**, the most important ones, are in **ALL CAPITAL LETTERS in bold typescript** and centred on the page. These are headings of the largest units of writing; for instance, they may be the titles of the various chapters in a proposal or research report. They correspond with Arabic numerals 1, 2, 3, and so on, in an outline.

- **Level 2 heads** are also in **ALL CAPITAL LETTERS in bold typescript** and indented. They correspond with Arabic numerals 1.1, 2.1, 3.1 and so on, in an outline.

- **Level 3 heads** have a **Single capital letter followed by lowercase letters in bold typescript** and indented. They correspond with Arabic numerals 1.1.1, 2.1.1, 3.1.1 and so on, in an outline.

- **Level 4 heads** have a **Single capital letter followed by lowercase letters in italics** and are indented. They correspond with Arabic numerals 1.1.1.1, 2.1.1.1, 3.1.1.1 and so on, in an outline.

- **Level 5 heads** have a **Single capital letter followed by lowercase letters in italics**, indented and are followed on the same line by the first paragraph in the section. They correspond with lowercase letters in brackets (a), (b), (c) and so on, or **bullets**, in an outline.

If you use this format, your various headings would look like this on the page:

1.0 FIRST LEVEL HEAD

1.1 SECOND LEVEL HEAD

1.1.1 Third level head

1.1.1.1 Fourth level head

- **Fifth level head**. The next paragraph begins here . . . . .

  OR

  (a) **Fifth level head**. The next paragraph begins here . . . . .

**NB**

The format suggested here is not the only one you might use. However, approval must be obtained from the leader/supervisor for utilising other schemes.
APPENDIX C
CITATIONS AND REFERENCES

This appendix is based on an internal publication by the Academic Information Services of the University of Pretoria titled *Guidelines for the preparation of written assignments* (Revised 1999) authored by WM Botha & PH du Toit

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1.0 INTRODUCTION

Any document containing information from other documents or information sources, or mention of these, must acknowledge or describe these sources in detail. This acknowledgement or reference can take different forms. Over the years, the search for uniformity has been impeded by various study fields, publishers and periodicals, all of whom developed different traditions, conventions, and styles of reference. Individuals too, often have strong preferences. For a long time, no international standard existed against which literature consulted in the compilation of scientific documents should be referenced (Botha, 1980). The International Standards Organisation (ISO) has now finalised such a standard: *ISO 690: Documentation Bibliographic references - Content, form and structure*. (The Republic of South Africa is represented on the world body by South African Bureau of Standards (SABS) - now Standards South Africa (STANSA) - who also liaise with various interested organisations through the country in this regard.)

The scope and field of implementation of this standard is formulated as follows:

*This International Standard specifies the elements which must be included in bibliographical references to published monographs and supplementary publications, and to chapters, articles, etc in such publications. It provides a prescribed sequence for reference elements and lays down conventions for the transcription and presentation of information “borrowed” from the source publication. The standard is intended for use by authors and editors in compiling bibliographic references as addenda to texts, and also in the wording of textual references to a bibliography. The standard is designed to serve as a comprehensive specification for bibliographic description such as can be expected from libraries, analytical bibliographers, indexers, etcetera.*

The standard encompasses published sources in both printed and unprinted form. It prescribes the two most current referencing methods, one of which is also known as the Harvard method.

The International Standard shall apply to citations in the text and lists of references in research reports and the specific referencing method must be based on the Harvard method. Examples of citations in the text and examples of how publications and other information sources referred to in the text should be presented in the list of references are given hereinafter.
2.0 CITATIONS IN TEXT

2.1 Two basic methods are used as indicated in the example hereunder

Maltha (1997: 3) asserts that a half century ago, all the researchers within a specific area were known to each other

OR

A half century ago, all researchers within a specific area were known to each other (Maltha, 1997: 3)

In the example above a specific part of a source is cited and the relevant page number is therefore given after the year of publication and separated by a colon. Where the citation is more general, the colon and page number falls away

Further examples of citing in the text in specific cases are given hereunder

2.2 An author who published more than once in the same year

Brown (1976a) found that . . . . . but later changed his viewpoint (1976b) through . . . .

2.3 An author who published in different years

Shear stressed repeatedly (1960, 1961a, 1961b, 1965) that . . . .

2.4 Authors with the same surname

E van Wyk (1972: 14) independently reached the same viewpoint as T van Wyk (1970: 3)

2.5 An author’s contribution published in a work edited by someone else

Technical reports are not normally printed (Rowlands, 1975: 383) but . . . .

(Note that Rowland is the author – the editor’s name is not mentioned in the citation)

2.6 More than one author in a specific place in the text

This is in agreement with various other authors (Blake, 1965; Doyle, 1965; Smith, 1966; Zuary, 1967) and one can . . .

52
2.7 A source whose first descriptive element is not an author

In a critical bibliography *Modern Historians*, p.22 it is assumed . . . .

2.8 Works whose authors are not mentioned

When a work has no author (the author is not known), cite the first two or three words of the reference list entry followed by the year, e.g.

. . . . in the book Language Use (1991)
. . . . on language use (“World languages”, 1991)

2.9 Personal communications

Letters, memos, telephone conversations, class handouts, etc are cited in the text only and are not included in the reference list. Include the initials as well as the surname of the author and provide as exact a date as possible, e.g.

. . . . according to W Claassen (personal communication, May 2, 1999)

2.10 Citation of a secondary source

Weisenmiller (as cited in Borst, 1997) recommends . . . .

Please note that only the primary source, in this example Borst (1997), is listed in the reference section

3.0 ENTRIES IN THE REFERENCE LIST

3.1 Books

3.1.1 The particulars of every entry for a book in the list of sources must be stated in the following order:

- author (surname and initials, in capitals, separated by a comma)
- year of publication
- title (in italics, bold type or underlined)
- edition (except the first)
- place of publication
• publishers

(The language the work is written in must be maintained in the references thereto)

3.1.2 Single author books


3.1.3 Books by two authors


3.1.4 Books by more than two authors

BOSMAN, DB, VAN DER MERWE, IW & HIEMSTRA, LW. 1975.

Instead of using all three or more names, the first author’s name can be used, together with *et al*

BOSMAN, DB et al. 1975

3.1.5 Books whose authors are not mentioned


3.1.6 Books authored by institutions, organisations, associations, or the like

Medical Research Council . . . .

British Museum . . . .
Council for Scientific and Industrial Research . . . .

The Association of South African Quantity Surveyors . . . .

A “subordinate” body is placed after a full stop:

- University of Pretoria. Faculty of Law . . . .
- Imperial Chemical Industries. Paint Division . . . .

3.1.7 A Government or official publication


3.1.8 Proceedings of conferences, and the like


3.1.9 A compiled or edited book

The reference appears under the title of the work, with the name of the compiler/editor mentioned after the title

3.1.10 A book translated by some one other than the original author


3.1.11 A book whose original author is not mentioned, and which has been translated


3.1.12 A book forming part of a named series or publication comprising books appearing under individual titles


a. Part of series


3.1.13 An author’s contribution in a book edited by someone else


3.1.14 **Academic dissertations and theses**

These publications are normally *not published* in the strict sense of the word. The Standard gives no specific examples or instructions in this respect. The Standard’s principles, together with other existing conventions, are applied here.

**BRADLEY, JE. 1970.** *Die Mandlakazi: ’n ondersoek na enkele kultuuraspekte.* Ongepubliseerde MA-verhandeling. Potchefstroomse Universiteit vir Christelike Hoër Onderwys


3.2 **Encyclopaedia articles**

3.2.1 Details of an encyclopaedia article description are given in the following sequence:

- author(s) (capital letters)
- year
- title of the article
- name of the encyclopaedia (in italics, bold, or underlined)
- edition (except the first)
- page(s) on which the article appears

3.2.2 *An article by one author*

**HASSELHOFF, A. 1975.** Illuminated manuscripts. *Encyclopaedia Brittanica*, vol. 12, p. 95 – 100

3.2.3 *Article by two authors*

**VARLEY, DH & IMMELMAN, RFM. 1972.** Libraries. *Standard Encyclopaedia of Southern Africa*, vol. 6, p. 618

3.2.4 *An article by more than two authors*

Use can also be made of *et al* here, as described in 3.1.4
3.2.5 *An article whose author is not mentioned*

Phoenicia. 1958. *The Encyclopaedia Americana*, vol. 6, p. 28

3.3 **Journal articles**

3.3.1 Descriptive details of journal articles are set out in the following sequence:

- author(s) (capital letters)
- year of publication
- title of the article
- the journal’s name (italics, bold, or underlined; it may be abbreviated in line with ISO-standard ISO 4)
- month/season, date
- volume
- number
- page(s) on which the article appears

3.3.2 *An article by one author*


3.3.3 *An article by two authors*


3.3.4 *An article by more than two authors*


3.3.5 *An article whose author is anonymous*

3.4 **Newspaper reports/articles**

3.4.1 Newspapers items should be treated in the same manner as journal articles. Details should be set out in the following sequence:

- author(s)/heading of the report (capital letters for a heading)
- year
- title of the article
- title of the newspaper
- edition date
- page(s)

3.4.2 *An article/report where the author is named*


3.4.3 *An anonymous report*


3.5 **Other sources**

3.5.1 The norms as stated do not cover manuscripts and other unpublished material and in these instances the normative principles are adapted in accordance with other existing conventions

3.5.2 A Reproduction

3.5.3 *Letters*


3.5.4 *Microforms*


3.5.5 *Sound recordings*

MANDELA, N. 1996. *Interview with Max du Preez*, SABC, 14 April 1996

3.6 *The Internet*

3.6.1 Information retrieved from the Internet must also be referred to according to certain rules. The following elements must be considered:

- author
- title of article
- title of journal or monograph type of medium
- date of publication
- volume number/pages availability
- date consulted

3.6.2 *World Wide Web Sites*


3.6.3 *Gopher sites*

Quittner, J. *Far Out: Welcome to Their World Build of MUD*. Published in Newsday, 7 Nov. 1993. gopher/University of Koeln/About MUDs, MOOs and MUSEs in Education/Selected Papers/newsday (Access: 5 Dec. 1994)
APPENDIX D

BIBLIOGRAPHY


HOLT, GD. *A guide to successful dissertation study for students of the built environment*. 2nd ed


Newport University: *Thesis and dissertation handbook.* Newport Beach: Newport University


Rand Afrikaans University. Department of Psychology. 2002. *General rules of writing in psychology.* Johannesburg: Rand Afrikaans University, Department of Psychology


