

1 Introduction

The titles and objectives of the sections of this chapter are the following:

- 1.1 Introduction; to set the scene and describe the dissertation process
- 1.2 Terminology and nomenclature; to emphasise the importance of the objective
- 1.3 Document structure; to provide a template
- 1.4 Possible subject areas for your dissertation; suggest topic areas and encourage early reading
- 1.5 Professional bodies and the non-technical or technical dissertation or project; to distinguish between these two different types
 - 1.5.1 The difference between non-technical and technical
- 1.6 Qualitative and quantitative analysis; to distinguish between the two analytical schools
- 1.7 The student/supervisor relationship and time management; to provide templates
- 1.8 Ethical compliance and risk assessments; to identify ground rules for compliance with codes of practice
 - 1.8.1 Physical or emotional harm; laboratory risk assessments
 - 1.8.2 Confidentiality and anonymity
 - 1.8.3 Generally
- 1.9 House style or style guide; to promote consistency and provide a template
- 1.10 Writing style; to identify potential pitfalls
- 1.11 Proofreading; to encourage it, as a process, using independent help if necessary
- 1.12 Extra support?; to describe help available from university disability support units
- 1.13 A research proposal; what to do if you are required by your university to do a proposal
- 1.14 Viva or viva voce; to describe what it is and how to prepare

1.1 Introduction

In some universities the dissertation or project may carry as much as one quarter weighting towards the final year degree classification. It is the flagship document of your study. It is the document that external examiners will look at with greatest scrutiny. You may want to take it to your employer and/or prospective employers. You will hopefully be proud to show it to members of your family, and it will sit on your bookshelf so that you can show it to your grandchildren. It is a once-in-a-lifetime journey for most; it is to be enjoyed and remembered. Though it does not happen often, with the help of supervisors, some students may develop

their research into a publication. That may involve condensing the work into about ten pages for delivery at a conference or even for inclusion as a journal paper. It is one thing to get a degree qualification on your CV; quite another for you to be a published author.

One of the key criteria for the research is that it must have some originality. That is, not to discover something new but perhaps to look at an area that has already been investigated, and to take a different perspective on it or to use a different methodology. It is more than an assignment – the research process must seek the information, analyse it and offer conclusions. Modest objectives are adequate. Better dissertations and projects have robust methods of analysing qualitative data or some basic statistical analysis.

Dissertations and projects have assessment criteria. To achieve marks in the upper echelons (70%+), criteria often require that work should demonstrate ‘substantial evidence of originality and creativity’, ‘very effective integration of theory and practice’, ‘excellent grasp of theoretical, conceptual, analytical and practical elements’, and ‘all information/skills deployed’.

There are two separate strands to your research. The first is that you must develop your knowledge in your chosen topic so that you become ‘expert’. One of the reasons you may have chosen your subject is that you may want to learn more about it. Indeed, it is very important that you do this. The second is that you must conduct a piece of research, employing appropriate research methodology. In your document you must explain and substantiate your methodology; it must stand up to scrutiny. The method that you use must include the collection and analysis of data. The two strands go hand in hand. It is not to say that the weighting is 50:50, or any other percentage, but there must be substantial evidence of both in your dissertation. You must demonstrate that you have produced a piece of research in the true meaning of the word ‘research’; it is not adequate that your document is a ‘mere’ report.

1.2 Terminology; nomenclature

Clarity in research is absolutely critical; the plethora of terminology used by academics can be unhelpful, fuzzy and for some misleading. That is just the way it is. It may be useful for you to employ your own rigid definitions of such terminology, or at the very least be consistent in the language you use in your work.

Georg Christoph Lichtenberg (1742–99) a professor of physics at Göttingen University, cited on the Quotations Page (2015), wrote ‘One’s first step in wisdom is to question everything’. Your research should start with a question, from which you will develop an objective in which you will ‘do’ something that will enable you to answer the question. What you will ‘do’ may involve testing a hypothesis. The research question, objective and hypothesis should all match each other, for example:

Research question: How well do UK contractors comply with best practice in health and safety? (note the question mark)

Objective: To determine how well UK contractors comply with best practice in health and safety.

Hypothesis: The compliance of UK contractors with best practice in health and safety is excellent (or in a different context to your research you may write ‘not good enough’).

You need to make it clear in your introduction that you have a research question, objective and hypothesis that match, but when you communicate with people in industry and also when you find the need to repeat yourself in your document it may be best to do so using the term 'objective'. People in industry are likely to be familiar with the word 'objective', but less familiar with research questions and hypotheses. An objective is a statement of what you will 'do' in your research.

When describing what a research project will 'do', students often express this by using words other than 'objective'. Some examples are: 'the focus of the study', 'the reason for the study', 'the study looks into', 'the study tries to', 'the study examines', 'purpose', 'goal', 'direction', 'intention' or 'seeks to'. Perhaps use of these phrases should be discouraged.

It must be recognised that universities and individual academics will have their own preferences, and students must be able to adapt flexibly to work with supervisors, and also to understand the writing of others who use different language. Most supervisors will be comfortable that you 'hang' the whole of your study around objectives; put more clearly, objectives, objectives and objectives.

1.3 Document structure

A suggested structure/template for a dissertation or project is:

No number	Preliminary pages
Chapter 1	Introduction
Chapter 2	Theory and literature review
Chapter 3	Research design and methodology
Chapter 4	Analysis, results and findings
Chapter 5	Discussion
Chapter 6	Conclusions and recommendations
No number	References and bibliography
No number	Appendices

This is not written in tablets of stone, but is merely a framework around which your structure may be designed. It is for individual researchers to design their structure and to agree it with their supervisor. These may be considered as chapter titles, but they should be 'flavoured' by words relevant to your study area, e.g. 'The development of theory and literature about money as a motivator for construction craftspeople'.

The weight of each chapter, or the number of words, does not necessarily lend itself to one sixth in each. There is an argument for saying that the first two chapters, as the opening to the document, could be about one third weight. The middle two chapters comprising the methodology and analytical framework could be about one third weight. Finally the last two chapters, closing off the document, could be about one third weight. Often it is the last part where students lose marks; they simply run out of time after completing the analysis. The consequence is that documents were heading for really good marks only achieve mid-range marks.

Each chapter should open with an introduction – there should even be an introduction to the introduction chapter – and close with a summary. Students often do not like writing either introductions or summaries, and question their value for the reader. The introduction to each chapter need only be a few paragraphs. It is not for readers to embark on a voyage of discovery

as they read each chapter. The ‘introduction to the introduction’ may start with the aim of the study. It may tell the reader that the introduction chapter will provide a background to the topic area and description of the problem, give a historical perspective, give the research goals (including the objectives), describe briefly the methodology, give an outline of the remaining parts of the document and summarise the chapter. But do not write it as mechanically as the above. Ensure that it is flavoured by your topic area, e.g. a historical perspective of PFI as a procurement method. The writing style of a summary is different from the writing style of an introduction. It does exactly what its name implies: it summarises what has gone before. It should not say ‘this chapter has outlined the problem.’ It should summarise in the narrative the key points of the problem in a few lines. You need to say what the problem is. A useful tactic when writing a summary is to read each page and condense it into one or two carefully selected sentences. The reason for a summary is that readers who have taken the journey through your chapter, may need some moments of thought and reflection about what they have just read, before going on. They may indeed have forgotten what they read at the beginning of the chapter by the time they get to the end. Also, readers may not read the whole document in one sitting. When they come to recommence reading, the summary can refresh their minds before continuing.

The whole document should be in report numbering format. Start with the introduction chapter as chapter 1. The introduction to the introduction is 1.1., 1.2 definitions of important phrases, 1.3 background to the topic area etc. Try to avoid too many subsections, but if they are needed they become, e.g. 1.3.1, 1.3.2 etc.

Page number the whole document, except the cover page. By convention, preliminary pages are numbered with Roman numerals, that is (i), (ii) etc. The first page is a declaration, numbered Roman numeral (i). People with dyslexia may find it hard to distinguish between Roman numerals; therefore alternatively consider letters, (a), (b), (c) etc. Pages after the preliminary pages, starting with the cover page to chapter 1, use Arabic numerals 1, 2, 3 etc. The cover page to chapter 1, thus starts at page 1. Page numbering with Arabic numerals continues into the reference section and the appendices. Separate parts of the appendices are labelled by letters not numbers; that is appendix A may be a covering letter to a questionnaire, appendix B may be the questionnaire itself and so on. If appendices are related, perhaps use letters and numbers e.g. A1 and A2 have the same theme, B1, B2, B3 ditto etc., as we have done in this book.

The preliminary pages to a research document should include the following separate parts:

- (a) unnumbered: a cover page with the document title, name of author, name of university, year and degree title.
- (b) declaration using words prescribed by the university such as ‘I declare that this research has not been submitted to any other university or institution of learning, and the work included is entirely my own except where explicitly cited in the text.’ You will be using and citing the work of others, as described in chapter 3.
- (c) an acknowledgements page: it is usual to thank people who have contributed to the research through their time or sponsorship, employers, friends or members of your family and supervisors. Only a short statement is usual.
- (d) abstract: the abstract is a very concise summary and should be written very carefully.

Readers may be initially attracted to documents by titles, but these can be misleading, and more information is required. So the purpose of the abstract is to allow readers to make a quick decision about whether they wish to read further sections of the document, or alternatively they may be able to make a sensible judgement that the document

is not relevant to their needs. Often readers who are browsing previous research will read abstracts and decide not to read on; that is fine. They have been able to quickly make an informed decision based upon a full and concise summary of the document. Since you have a limited number of words, and you may wish to entice people into the document, each part must be measured carefully. External examiners will read some, but cannot read all documents. Given a choice of which to read, they may be attracted by research with a well-articulated abstract. In academic publications abstracts are often 200–250 words in length, but in dissertations perhaps a larger word count is acceptable. An abstract confined neatly to one A4 page of text, single line space, 12 size font, perhaps three or four paragraphs with a line space between, would be about 500 words. Try to avoid going onto a second page, even for one line. This is your opportunity to sell your work. In research terms, it would be a serious failing if subsequent researchers picked up your document with the idea to further their knowledge in your field, but because of a lack of clarity in the abstract, were led to think that your work was not relevant. If a sentence, or indeed a single word, is not necessary to convey the message required, it should be taken out. The abstract is an art in writing concisely and with precision.

It should: give the topic, state the aim, outline the problem, give the main objectives or hypotheses, summarise the methodology (including population description, sample size if appropriate, method of data collection and analyses) and state the main findings, conclusions and recommendations. It can be written as work proceeds but can only be completed at the end. Students often adopt a writing style for an abstract similar to the following: ‘the study will give an objective, and describe the methodology...’ etc. This is not an abstract, since it would leave readers without the information required. The abstract must actually state what the objective is, and state the methodology. Some students submit their documents without an abstract; deduct 5 marks!

An example abstract is included in appendix C.

- (e) contents page: this should list the main titles of each chapter. It is not usually necessary to list all subsections of chapters on the main contents page. Subsequently, each chapter should have its own cover page that details the titles of subsections within the chapter.
- (f) list of abbreviations: in your narrative, convention is that at the first point of using each abbreviation in your document it should be spelt out in full, with its abbreviation in brackets, thus: ‘The Health and Safety Executive (HSE) is responsible for ...’. At any subsequent need to refer to the HSE you can then just use the abbreviation. If readers later ‘forget’ what HSE stands for, they can refer to your list of abbreviations at the front of the document. Do not overdo the use of abbreviations; however, the construction industry does use them frequently, and you may reasonably have a list of abbreviations that is about a page long.
- (g) glossary of symbols (if statistical tests are executed): letters of the Greek or Roman alphabet are often used to distinguish between different tests. See sections 8.1 and 9.1 for examples of statistical symbols.
- (h) glossary of terms: this ensures a common understanding even for quite well known terms as well as terms that have a particular meaning in the subject topic of the research. It will include a brief definition of their meaning in the context of the study. Ensure that such definitions are authoritative; that is, from the literature. For example, there may be a need to refer to ‘sustainable development in construction’ in your document. That may mean different things to different readers, so give an authoritative

meaning: ‘development that meets the needs of the present without compromising the ability of future generations to meet their own needs’ (Brundtland, 1987). You may need to define many phrases in your document.

- (i) lists of appendices, figures and tables: similar to the format at the beginning of this textbook.

Figures may be pie charts, histograms, graphs, or diagrams. Tables may contain results of experiments, or summarise data. Do not overdo pictorial representation of data just to get some colour into your document. A small table, for example, may better show the age profile of people, rather than a brightly coloured pie chart using half a page of space. Figures and tables should be numbered, and prefixed by the number of the chapter in which they appear, e.g. figure 2.3 will be the third figure in chapter 2. The title and content of figures or tables should be such that they can be understood on a stand-alone basis. The reader should not have to browse other sections of text to gain an understanding of a figure or table. Do not refer in your text to ‘the figure above’ or ‘the table below’. Figures and tables should be introduced in your text, and then inserted in your document in the first subsequent convenient position, perhaps at the end of that paragraph or on the next page if that position is close to the bottom of a page. By convention, the titles of figures appears under the figure, and the titles of tables above the table; in both cases the figures/tables themselves and the text for titles can be centred on the page.

If figures or tables are produced in Excel or other software, they can be imported into Word using the ‘snipping tool’ available in the ‘search all programmes and files’ box of the start menu, as illustrated in figure 1.1. Alternatively use the print screen, paste, format and crop functions in Word.

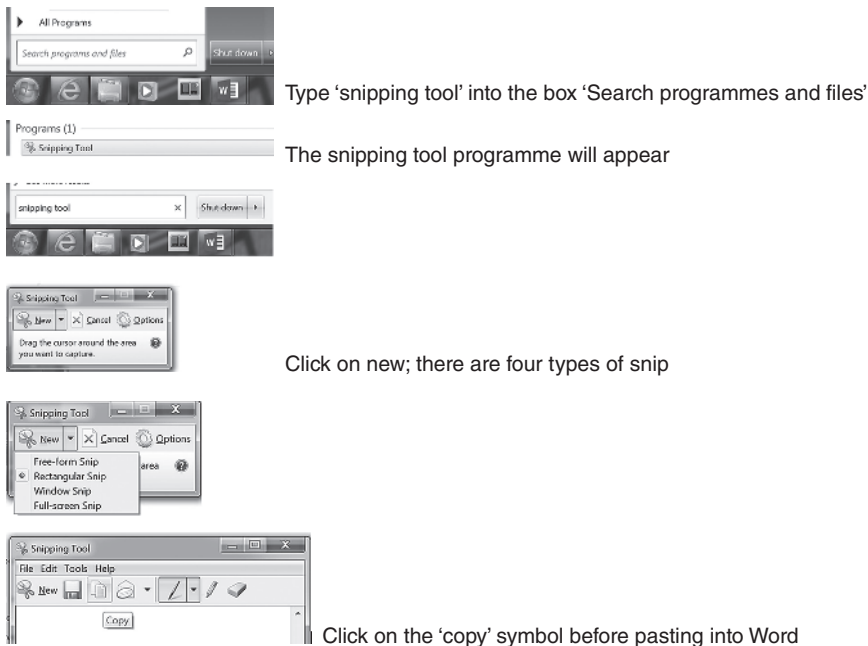


Figure 1.1 Using the ‘snipping tool’ to cut and paste figures, tables or images in Word.

1.4 Possible subject areas for your research

The topic area that you choose for your work should ideally be related to the specialism that you are studying within construction. You should consider all parts of the construction process from and including inception (clients with ideas that require projects) through to construction, maintenance, refurbishment, demolition and recycle. Most disciplines are interested to use their skills to improve the service provided to clients at all stages of the process. In practice, modern methods of procurement integrate the supply chain, and therefore all professionals are now involved both earlier and later in the process than has traditionally been the case. You may consider issues from the perspective of any party in the supply chain, e.g. clients, end users, consultants, contractors, subcontract specialists, suppliers, manufacturers or indeed other stakeholders such as investors or the public. If you are a civil engineer, you may need to do a 'technical' piece of research, as described in section 1.5.1.

Non-technical topic areas often include soft people issues, such as human resource management, job satisfaction, grievances, employee turnover or quality of life measures. Resources such as subcontractors, plant, material and capital (money) are also popular. You may want to specialise in finance, planning, legal issues or contracts, procurement methods, health and safety, quality, design aesthetics, planning, building information modelling, maintenance, business ethics or use of information technology and software. In the context that you may wish to consider variables in your study, popular dependent variables align with key performance indicators promoted by Constructing Excellence in the Built Environment (Constructing Excellence, 2015), such as client satisfaction, cost predictability, time predictability, quality or safety. Sustainability issues driven by the climate change agenda are often researched. There is great potential for studies in many areas related to sustainability, such as the UK's Building Research Establishment Environmental Assessment Method (BREEAM, 2015) or renewable energy. Defining and measuring best practice in a given field may be the basis of a useful study. The definition of best practice could be an objective of your study met by the literature review. You may find investigating best practice useful to you personally, since it is a valuable way to enhance your own knowledge in the field. The measurement of compliance with best practice by organisations or individuals may then be the basis for another objective, to be met by the main data collection process in the middle part of your study. When Paul Morrell came to the newly created post of UK government chief construction advisor in November 2009, he stated 'we're going to need to start counting carbon as rigorously as we count money, and accepting that a building is not of value if the pound signs look okay, but the carbon count does not' (Richardson, 2009) – lots of opportunities, therefore to measure carbon. The outcome of your research should not be a 'project' of a descriptive kind or a report or the design of a structure. The emphasis is on data collection and analysis, around objectives. It may be management, technology or science based. In July 2013, the UK government launched its publication 'Construction 2025: industrial strategy for construction – government and industry in partnership' (BIS, 2013). It provides many potential subjects for research, for example its vision for 2025 around people, the digital economy (Building Information Modelling et al.), low carbon, industry growth and leadership.

Most often, part-time students select a problem from their workplace; talk to your colleagues at work. Alternatively, you may select something that is current in industry or academia. Full-time students may seek out a mentor from industry – very often practitioners will

be delighted to 'put something back' into the education system they have gone through themselves. You should have been reading about current issues throughout your study, so as you are selecting the topic area for your research, you should speed that reading up. The lead sources to look for current issues are websites and conferences of your professional bodies, other academic conferences such as ARCOM, the weekly construction press and construction academic journals. You should be reading each week at least one of *Construction News*, *New Civil Engineer* or *Building*. Download the apps or log on to the websites of *The Construction Index* or *Construction Enquirer*. Find all these sources through a web search engine. To ensure that your study has academic credibility, if you start from a practical perspective, you will need to take it back to its theoretical roots. Alternatively, you may start with a theory and take it forward to its practical application; for example, flagship theories in management, such as leadership and motivation.

1.5 Professional bodies and the non-technical or technical dissertation or project

Undergraduate degree programmes are often accredited by professional bodies. Accreditation is very important to universities, and also very important to you as students. Accreditation means that degree programmes are approved by the relevant professional body, and depending on the level of accreditation, successful students are deemed to have achieved the minimum educational requirements of that professional body. Attaining your degree does not mean you immediately become a full member; there is usually a requirement for a period of practice in industry or research. You will then need to demonstrate your competence against a range of criteria.

It is important for you to become a member of a professional body. Passing your degree demonstrates you are good at academic work, but in your later career you need to demonstrate to employers your competence in practice or, as required by the Construction Design and Management Regulations (HSE, 2015), that you have appropriate skills, knowledge and experience. Your membership of a professional body indicates a commitment to keep yourself up to date with current developments in construction through your continuing professional development (CPD). Also, you will be signed up to a code of professional conduct and comply with the highest ethical standards. The best employers and construction clients need evidence that they are dealing with people who are up to date, professional and ethical. Professional body membership is that evidence, a passport to employment.

The key professional bodies in the built environment, in alphabetical order and split between the loose classifications of building and civil engineering, are as follows:

Building

Chartered Association of Building Engineers (CABE)
Chartered Institute of Architectural Technologists (CIAT)
Chartered Institute of Building (CIOB)
Royal Institution of Chartered Surveyors (RICS)
Royal Institute of British Architects (RIBA)

Civil engineering

Institution of Civil Engineers (ICE)
Institute of Highway Incorporated Engineers (IHIE)

The Institution of Highways and Transportation (IHT)
The Institution of Structural Engineers (IStructE)

You should join at least one professional body while you are studying, as a student member; if appropriate, more than one. Many have free membership for students. You should use their libraries and attend CPD events during your study period. After you have completed your degree, you should aspire to become a full member. Depending on the institution, that may be possible within say three years, but some institutions require a masters degree level qualification. Full membership of most of the above professional bodies brings with it 'chartered' status, a prestigious title.

As an entire year of students leave their course of study with their degree, there are 'x' number of students in the job market competing for available jobs. The question to students then will be: 'What will differentiate your application from the next person?' CPD attendance displays to employers, a commitment to being involved in their chosen career pathway. That can make the difference between employment or not! There are other criteria beyond CPD attendance, but if you have already networked you may perform much better in a job interview because of CPD attendance.

When professional bodies accredit programmes, they stipulate generically, the content of degrees. The building professional bodies may be happy with either non-technical or technical research. The civil engineering professional bodies are likely to favour only technical research. Civil engineers often call the final research document a project, not a dissertation. Some universities have a BSc (Hons) degree in civil engineering, others a BEng (Hons) civil engineering. It may be possible for BSc (Hons) programmes to undertake non-technical work, but BEng programmes, which are on the path towards chartered engineer status, will require a technical project. That is a requirement of the professional bodies that accredit civil engineering degrees.

1.5.1 The difference between non-technical and technical

Non-technical work may involve many of the 'soft' or 'subjective' management issues. The data collection and analytical processes may be qualitative, or indeed quantitative and involve statistical calculations or mathematics based on the soft data collected.

Technical subjects or technologies are likely to involve mathematical/quantitative work and science/chemistry; it will involve 'hard' or 'objective' data. It may involve an appraisal of what variables influence behaviour in the civil engineering specialist fields of structures, geotechnics, hydraulics and drainage, materials science, geomatics or land surveying and transportation. It may also be possible to classify your work in one or more of the three key strands of civil engineering work: design, sustainability and health and safety. Your project may not be exclusively technical. Your introduction and the literature review may be partly qualitative, but the literature review may also bring to the table the latest up-to-date technical and scientific position in your subject area. It is also good that you do some qualitative work by getting out and communicating with individual practitioners and companies about your project, and if you do so, mention it in your methodology chapter. However, in the middle part, there must be strong focus on analysis of a technical dataset, and that will very likely involve some mathematical tools. It is unlikely that your method would include a data collection tool such as an

electronic questionnaire; yes, do question people but that may be best done as part of some supplementary qualitative work and networking to support the validity of the problem that you will investigate or interpret using some of your results and findings.

What happens if you do non-technical research on a technical programme? Anecdotally, a really good non-technical dissertation may get a 55% mark from your university and a ‘glum’ look from the accreditation body, while a similarly good technical document might get 65% and a smile.

The next key issue is ‘where should the dataset come from?’ There is the possibility that you could take the data from the literature, and then, to meet the requirement of your work being original, perform some type of analysis that has not been done before. Perhaps the data collection will involve some experimentation in laboratories or some fieldwork or some computer modelling – though not all students will use these types of methods. Getting your own data supports a view that it is good to demonstrate that you have been proactive in your research, not passive.

While the project may include some sketches, drawings or photographs, the requirement for some analysis excludes the possibility of engineers, architects or architectural technologists submitting a design portfolio or such like.

The building disciplines also welcomes technical research; the content of building degree programmes often involves problems related to such issues. There may be a perception, hopefully unfounded, that building students are less likely to take on the challenge of maths and/or science. If as a building student you can take on these challenges, you may decide to ‘go for it’. An issue such as climate change can be addressed from a non-technical or technical perspective. Non-technical research may be around human perceptions or behaviours, while technical work may involve scientific issues.

1.6 Qualitative or quantitative analysis?

The middle of the document should include some analysis – taking one element of a problem, breaking it down and establishing relationships or causes and effects. Robust analysis involves the application of some kind of academic tool, although some academic tools may be considered more robust than others. The way you go about collecting data for analysis, and the way you do the analysis, is one facet of a dissertation or project that can distinguish it from more conventional assessments or courseworks.

Often, analysis is the most challenging part of a dissertation or project. Students beginning to read about research are often faced with a myriad of new terms and complex ideas: ontology, epistemology, positivist, interpretivist and many more. This can make research very daunting and often very confusing for students new to the process – but do not panic! Knowledge and understanding of such ‘research paradigms’, while beneficial for an undergraduate dissertation, may not be essential. They do, however, become more relevant for MSc students, and certainly for those undertaking a PhD.

These terms all relate to philosophy and the questions around ‘what’ can be known about our world (ontology) and ‘how’ can we know it (epistemology). All research is based on such ideas. Much research is not ‘bothered’ by such thinking. Take for example testing concrete strength; this is an objective fact that can be measured empirically and scientifically – the underlying philosophy of this is well established and does not need restating. Research involving people is more complicated – it can be less objective and more subjective, and this is where

research paradigms become more relevant. The terms objective and subjective can be used to illustrate research paradigms at the ends of what is termed the ‘research continuum’. Objective or positivist research lies at one end, and seeks to establish *facts* about the world. Subjective or interpretivist research lies at the other, and seeks to explain *why* things are as they are. There are many other approaches to research that lie between these extremes – and indeed some that overlap – which is why students often feel overwhelmed.

Another way of looking at research paradigms is from the perspectives of the two major analytical schools: quantitative and qualitative research. Crudely speaking, qualitative methods involve analysing words (interpreting the *why*) and quantitative methods involve the analysis of numbers (establishing the *what*). Some people may be able to use both methods, but sometimes a person is specialist in one or the other. In their approach to a problem, researchers may lean towards methods that they understand best, but it should be noted that neither approach is ‘easier’ and both require rigour and significant efforts on the part of the researcher. A simple way of looking at research paradigms is shown in figure 1.2. More explanation of some common research terms can be found in a glossary at appendix A.

Whether to use a qualitative or quantitative approach must be driven by the nature of the problem and the objective to hand. The objective must drive the choice of method, not the other way round. Ideally, you therefore need to have at least an appreciation of each objective to allow you to select the best method to meet that objective. Mindful of your limited time, it may be that your data collection should be only one of qualitative or quantitative. It does not matter which, provided there is some type of analysis of some type of data. In business terms, objectives are often non-negotiable; business executives or politicians will set objectives. They will then select the people with the appropriate methodological expertise who can meet those objectives. In your dissertation or project, it is possible that while objectives should drive

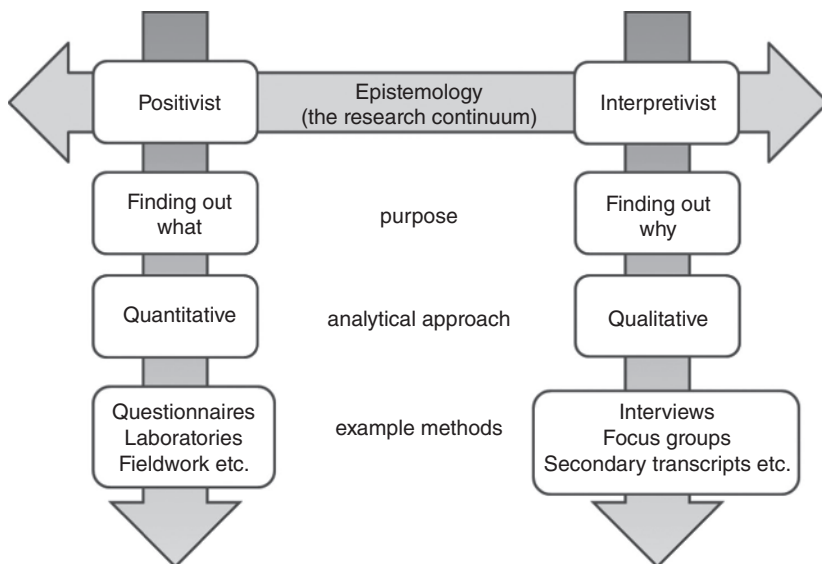


Figure 1.2 Research paradigms.

methods, in reality it could be the other way round, and if you are setting the objective, you can set it to suit your strengths.

For example, in a management research project, you may wish to research motivation. You may set an objective to determine the most effective ways of motivating the workforce. You could adopt a positivist research paradigm, and use a quantitative survey to establish what different measures are used in different organisations, and seek to quantify and measure their effectiveness. This may involve setting a hypothesis – for example that financial motivation is the most effective method – and then testing this using your quantitative survey data, possibly using an electronic tick box format. In this case, you would be seeking to establish facts about motivation. Alternatively you may set an objective to explore why some motivation methods work better than others. You could adopt an interpretivist research paradigm and a qualitative approach, interviewing managers and employees to understand their experiences and attitudes to motivation. In this approach, you have to interpret the answers given in the interviews and develop your findings through analysis, rather than simply presenting them as facts.

The boundary between the qualitative and quantitative can be blurred in questionnaires, by taking qualitative responses to closed questions, and coding them with numbers that have real quantitative value. For example, questions about product or service satisfaction may give participants four qualitative labels as possible answers: (a) very satisfied (b) satisfied (c) not satisfied and (d) not at all satisfied. The analytical process could allocate numbers 3 to 0. The answers given are clearly qualitative; they express the feelings of participants using a carefully selected word, such as 'I am very satisfied with this product.' The passion intended by the qualitative response is diluted by the quantitative number. There are instances where boundaries between qualitative and quantitative are not blurred. Unstructured interviews, whereby interviewees speak freely, are clearly qualitative, and it would be inappropriate to allocate numbers to that data.

Qualitative analysis aims to gain insights and understand people's perceptions of the world; people may deliberate with themselves and have to give careful thought to their answers. Beliefs, understandings, opinions and views of people are examined. They may 'pour their heart out to you' about a particular problem. Expression and tone may reveal as much as the actual words. The data you receive is 'rich' and gives valuable insight. The data will be unstructured in its raw form. Such rich data could never be obtained in a tick box electronic survey. If your study was to seek out causes of dissatisfaction among some parts of the workforce, that is probably best done with at least some element of qualitative work. Data needs to be filtered, sorted and manipulated if analytical techniques are to be applied. Qualitative analysis may be merely findings derived from reading other work or from reading transcripts of interviews conducted by others; alternatively, it may be from transcripts of interviews conducted personally. Analysis may involve simple content analysis, whereby there is counting of key words, and deriving data meaning from high frequency hits. A more rigorous approach may involve some kind of coding and comparison of findings through thematic analysis of data. Examples of this can be found in chapter 7. The qualitative analyst will labour meticulously over transcripts. There could be analogies with criminal investigations where prosecutors labour over police interview transcripts; what did the suspect really mean when he/she said '...'? A famous example is the trial of Derek Bentley (BBC, 2005), who told his gun-wielding accomplice to 'let him have it' when a policeman apprehended them. But did he mean let him have the gun or a bullet? A manual approach may be used to analyse data, whereby there is coding,

photocopying and then sorting by 'cut and shuffle'. Alternatively, analysts may use specialist qualitative data management software such as NVivo, which enables electronic coding and analysis, or by using standard word processing software.

Quantitative analysis at its simplest level may be a mere comparison of figures. It may involve some descriptive statistics, such as calculation of means. It may include some medians, modes or standard deviations. More rigorous statistical analytical methods involve inferential statistics. Most students should be able to understand and execute the simpler inferential tests; to do the tests is part of hypothesis testing. It requires that you understand the concept of variables; tests seek to determine causes and effects, and whether an independent variable (IV) influences a dependent variable (DV). Some people may have an inherent fear of quantitative analysis or statistics. Be mindful that the use of statistical data is part of everyday life, at its simplest level, dealing with money. If you have a non-negotiable position that you will not do statistics, that is fine, but, be sure that if you do go down the qualitative route, you use robust data collection and analytical techniques as far as is possible.

Constructing Excellence may be used as an example of where qualitative and quantitative data merge or melt into each other. It collects an array of qualitative data to measure client satisfaction. The construction industry needs to know whether its clients are satisfied, and it needs a measurement system to help it monitor its own performance. An output is needed that summarises data, gives quick comparison and allows executives to quickly pick up on areas that need corrective action. The way chosen to do this is to use numbers. Client satisfaction, which has its origins in the collection of qualitative data, is therefore scored on a quantitative scale of 0 to 10. It is important not to allocate a number to client satisfaction 'anecdotally'. A robust set of criteria should be written that would allow a qualitative narrative to be scored within a specified range. The criteria may be in the form of expectations; what would be qualitative expectations of a score in the ranges 0–2, 3–5, 6–7, 8–9 or 10?

It is argued that the best studies comprise the analysis of both qualitative and quantitative data. The qualitative analysis may come first: speaking to people, teasing out issues and problems. The quantitative analysis follows, using numerical data to test hypotheses. The researcher may then revert back to more qualitative data gathering to help in interpreting results and findings from the quantitative tests. The review of the theory and the literature at the early part of the study may be considered to be a qualitative analytical tool, although the review may also include some quantitative analysis. Using both qualitative and quantitative approaches in a study can be called 'mixed methods' or 'methodological triangulation' (Clarke and Creswell, 2008). In the latter case, the three-sided analogy comes from two methods focused towards meeting one objective.

Campbell and Kerlinger quoted in Miles and Huberman (1994) cite two strap lines at opposite ends of the qualitative/quantitative spectrum. Donald Campbell stated, 'all research ultimately has a qualitative grounding', while Fred Kerlinger wrote 'there's no such thing as qualitative data. Everything is either 1 or 0'.

The key thrust of your analytical framework could be quantitative. There are possibilities to flavour your work and to create links into the qualitative school in two ways. The first is the literature review which by default is a qualitative appraisal even though it may include some numerical data. The second is the possibility for you to speak to people, even informally (though better formally in interviews), at various stages of the study. At the early stages it could be around helping you to define the problem and objectives, at the later stages to interpret your results and develop conclusions. You can write up some brief notes that summarise

your discussions and place them in an appendix. It would seem very inappropriate for you to jump into a quantitative study, having based it on what you have read; desk bound studies can be insular and misguided.

It would seem reasonable that your work could be substantially, almost exclusively, qualitative throughout. That should not be to the complete exclusion of quantitative data, as though you had a phobia about numbers. You may draw on some quantitative data in the description of the problem or in the literature review, merely by citing some numerical data to perhaps justify the reason for your study. Further qualitative work does not preclude you from needing an appreciation of quantitative methods. Your approach may be to undertake an in-depth qualitative study that investigates a problem, teasing out potential variables. The closing part of the study is a recommendation which sets up a study for another student, perhaps next year. The recommendation should be fully developed, to include the definition of variables and the suggested quantitative analytical tools.

It is not a reasonable expectation that your research should be based on the collection and analysis of substantive qualitative and quantitative data. You can only do what you are able to do, in the given time frame. Research programmes that are well funded may start with an in-depth qualitative investigation, followed by a hypothesis to be tested quantitatively. The whole research programme will close with some more in-depth qualitative work to help in the interpretation of quantitative results, and help in the development of conclusions. It may include a series of pilot studies at each stage, and some intervening qualitative work between the pilot and the main study.

1.7 The student/supervisor relationship and time management

There are lots of factors that influence whether dissertations and projects will be successful or not. A major factor could be the quality of the relationship you have with your supervisor. As far as is possible, it is for students to be in the driving seat. However, supervisors take different views of their role. At one end of the spectrum there are regular meetings, students regularly providing drafts of chapters and supervisors promptly reading and providing feedback, and some supervisors actively chase students. At the other end, are supervisors who do not chase (most will not since they are busy people); they may even refuse to read interim draft submissions, which may be departmental policy. There may be little contact between student and supervisor and a document may be presented by the student that has received no interim feedback.

How much contact there is in a student–supervisor relationship seems to be important. So what level of supervision is appropriate? There is no definitive answer. The volume and type of feedback will vary between supervisors. Most will not identify mistakes in spellings or grammar; feedback may be of a strategic nature, limited to such things as how the overall structure of the documents can be improved, correcting fundamental misunderstandings in research methodology or in the subject area, and identifying gaps. It is absolutely clear that supervisors will not ‘write’ the dissertation for you. Key learning outcomes of dissertations are that students must demonstrate independent working and use their own initiative in developing their research.

A supervisory grid is illustrated in figure 1.3. You have control over which cell you will be in. Subject to you not having difficulties in your business or personal life, you

<p>Cell A</p> <p>Proactive student</p> <p>Proactive supervisor</p>	<p>Cell B</p> <p>Proactive student</p> <p>Laissez-faire supervisor</p>
<p>Cell C</p> <p>Laissez-faire student</p> <p>Proactive supervisor</p>	<p>Cell D</p> <p>Laissez-faire student</p> <p>Laissez-faire supervisor</p>

Figure 1.3 The supervisory grid and the proactive or laissez-faire relationship. Which cell do you choose?

have absolute control over whether you will be proactive or laissez faire; the latter meaning in the Oxford dictionary ‘the policy of leaving things to take their own course, without interference’ (Stephenson, 2010). In a research sense, laissez faire may not absolutely mean ‘... leaving things ...’, perhaps giving the impression you are not working; it may be that you can work independently, and if that is the case, excellent. You also have some control over selection of your supervisor; you will know the supervisors who are likely to be proactive and those who are not. You may be quite happy or best suited to a laissez faire supervisor; such supervisors may quite rightly present themselves as such, with a view to promoting your independent working skills. Alternatively, you may need a supervisor who will push, pull and stretch you. One key element to selecting your supervisor, especially if you are in a large university, is to select that person at an early stage in the process. There is a limit to the number of students that supervisors can work with each year. Good supervisors may get fully booked at an early stage. Talk to more than one supervisor to try and tease out who has the expertise and interest in your topic area. Rather than a blank piece of paper and limited ideas, try to take to any meetings a page or so that outlines the problem you may wish to investigate. Demonstrate to supervisors that you have given some initial structured thought to your proposed study.

There are two key elements in selecting your supervisor. First, supervisors should have expertise in the area of your study. Second, you should have some personal chemistry with your supervisor. You may wish to ask your supervisor what the ground rules are in your relationship, such as frequency of contact, potential for feedback, expectation for interim submissions, preferred method of communication, e.g. email.

A possible template that may be agreeable to supervisors is as follows:

- You write a few pages to describe initial ideas and describe what the problem is to be investigated
- You meet with several potential supervisors and select appropriate person.
- You write regularly throughout the process.
- You, submit drafts of your writing.

- Your supervisor provides feedback – you redraft.
- You book face-to-face appointments with your supervisor, possibly every three, four, five, six weeks?
- You then promptly write up notes of these meetings as an aide-memoire for the next meeting.
- You communicate informally with your supervisor, ‘regularly’.
- You submit an almost fully complete draft of the document one month before the final submission date, and your supervisor then gives feedback.
- You edit and proofread before final submission.

Note the repeating word ‘You’. While some of the above may be ‘good practice’ and part of the service that universities wish to provide, it may just not be the way you and/or your supervisor want to do it.

Whether or not you make steady progress with your work may be another variable that influences whether your research will be successful or not. Research left to the last minute is less likely to be of good quality. Last minute research is often a tortuous journey for students, that is, it is constantly at the back of the mind as a worry and cause of stress. Research which makes steady progress is most likely better quality and an enjoyable journey. If you are not able to make good progress because of problems elsewhere in your business or personal life, you should keep your supervisor and personal tutor updated. Avoid getting to a late stage in the process before advising of your difficulties and do not just submit at all on the due date. University systems are generally paternal and supportive in cases of genuine difficulty outside your control.

Figure 1.4 illustrates a possible outcome of a hypothetical research project, the objective of which is ‘to determine whether the quality of the dissertation or project process influences

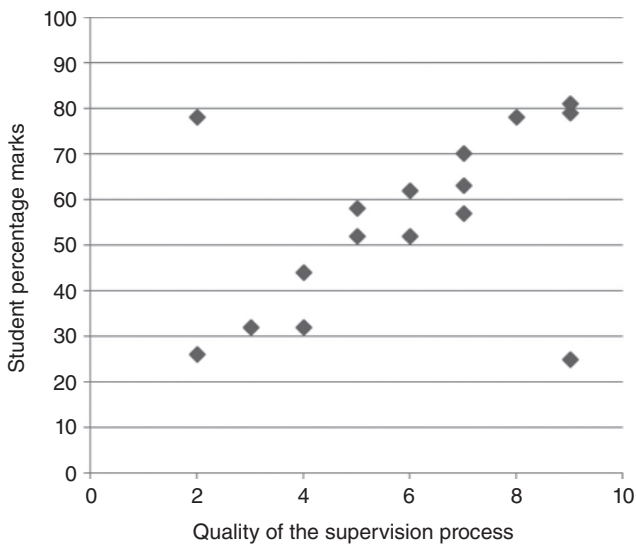


Figure 1.4 The relationship between the quality of the dissertation or project process (IV) and student percentage marks (DV); $n = 16$ (sample size).

student marks'. There could be several concepts wrapped up into 'the quality of the dissertation process'. There is just one measure of 'student marks': the raw number on the scale of zero to 100. If the study were 'real', careful consideration would need to be given to defining each of the variables and to designing a method to measure them. The terminology used later in the text is that the independent variable (IV) is 'the quality of the dissertation process' and the dependent variable (DV) is 'student marks'.

The results indicate that 'the quality of the dissertation or project process does influence student marks'. Marks in the lower left cluster are poor process and poor marks. Marks in the upper right cluster are good process and good marks. There is an outlier at the bottom right; that is a good process but a poor mark – hopefully in reality that would never happen. There is an outlier at the top left; that is a poor process and a good mark. Perhaps this was an extremely talented student, able to work without supervision.

As part of your first proposal to your supervisor you should prepare a bar chart or programme; this can be difficult since to some extent you are going into territory that, for you, is uncharted. Figure 1.5 indicates a typical programme for a dissertation or project that will start towards the end of one academic year and will be completed at the end of the next. It is produced in Excel, since students are often familiar with that software. Specialist planning software could be used too, such as Microsoft Project. Some universities may require that the research be completed in perhaps six months; in such circumstances there is absolutely no time to waste since even a one-year time frame can be tight too.

1.8 Ethical compliance and risk assessments

1.8.1 *Physical or emotional harm; laboratory risk assessments*

You should ensure that in your study you do not do physical or emotional harm to any person, including yourself. Obviously you will not do that deliberately, but you should not do it accidentally, thoughtlessly or carelessly. Construction is well practised at risk assessments to avoid physical harm. If your research is laboratory based or surveying fieldwork you should undertake a risk assessment and include it in an appendix. That assessment will follow your university procedures, including best practice promoted by the HSE (2014), e.g. avoid, prevent, mitigate: (a) identify the hazards, (b) decide who might be harmed and how, (c) evaluate the risks and decide on precautions, (d) record your significant findings, (e) review your assessment and update if necessary. Section 6.8.4 gives guidance on risk assessments.

The possibility of emotional harm is less well considered in built environment disciplines. Your university will have its own code of practice or similar on its website, detailing ethical standards to be maintained in doing your research. It may be underpinned by three key procedures (adapted from University of Bolton, UoB, 2006):

- (1) **Permission-to-do-research form.** For all research, irrespective of the subject area or data collection method, it is likely that you will have to complete a university permission-to-do-research form, and agree and sign it with your supervisor. Appendix A1 includes an exemplar checklist of items that might be included in a permission form. If some items on the checklist identify issues or risks, you will have to describe how you plan to avoid, prevent or mitigate. The form may require that you indicate that you have read the

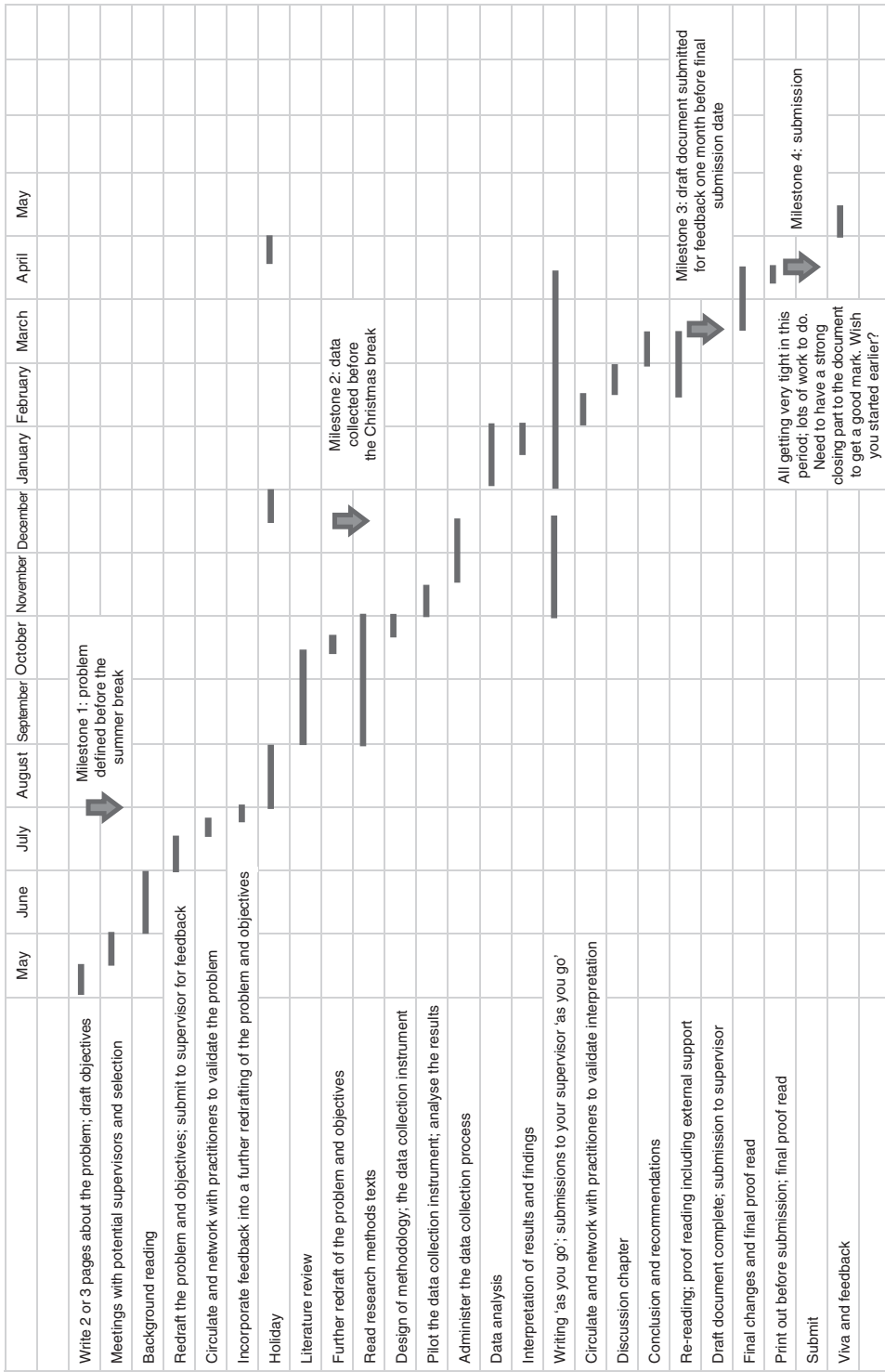


Figure 1.5 Typical programme. Assumed: one-year study period, and the university submission date is before the Easter break in April.

university's ethical code, and that you agree to comply with it. Include your completed form in an appendix to your document, and in your methodology chapter describe the process that you went through to ensure that you complied with ethical rules. If there are some issues which are thought high risk, approval may be needed through an ethics committee. Very unlikely in built environment research, but some disciplines may propose the testing of animals or taking blood from participants. Without very strong arguments to substantiate such methods, permission to do research may be refused.

- (2) **The information sheet.** At the point where you come face to face with others in interviews, focus groups (a group discussion) or when observing people, the correct ethical procedure is to give participants an information sheet before data collection begins. In some cases it may be necessary to obtain a signature to evidence informed consent, although it might be sufficient to just make a note in your diary that consent has been given. A typical information sheet, based upon guidelines by the University of Bolton (UoB, 2015), is included in appendix B3. One principle of the information sheet is that it gives potential participants the opportunity to decline involvement in your research; you must not try to force yourself upon unwilling people.

The information sheet should normally include: (i) study title, (ii) identification affiliation and contact details (iii) invitation paragraph (iv) purpose of the study (v) why that person is being invited to take part (vi) what will happen if they agree to take part and how long it will take (vii) possible benefits, disadvantages and risks (viii) assurances of confidentiality and anonymity (ix) what will happen to the results (x) contact details for further information or complaints about the way the research is conducted. Also say thank you.

You will need to give potential participants time to read the information sheet. If you wish to speak to members of the public in a public place, you must introduce yourself politely and step back for a few moments to let them read alone the information sheet. If you are arranging appointments with people, you may be able to send a copy of your information sheet and get consent in advance. If you wish to digitally record any discussions, you must clearly ask for permission, and respect the wishes of participants if they decline; if permission is refused just take some field notes. Always take your student identification card with you and show it to participants.

- (3) **The covering letter.** If you propose to collect data from people, though not face to face (e.g. questionnaires that are administered electronically, less often these days by post), you do not need consent forms, since that is implied by returning the questionnaire. However, a covering letter is required in order that potential participants can make a quick informed judgement about whether they wish to reply. You should state how long it will take to participate; if your survey takes five to ten minutes you might get a good response rate, but if it is longer, perhaps not. Section 5.4.3 describes how you should pilot your survey to ascertain a time estimate. Also important is that you should make it clear that participation is voluntary. A sample covering letter is included in appendix B2. It includes information similar to that in an information sheet.

You should not undertake questionnaires or interview or observe people in such a way that it might put participants under pressure, cause anxiety or induce psychological harm. Neither should you do anything that people might consider offensive, even if only mildly offensive, e.g. asking about things that people may consider private, such as family details or personal or company finances. Issues around gender, culture and religion should be treated sensitively.

Obviously you will not convey untruths to people in your research, but making judgements about the issue of deceit can be more difficult. For example, is it appropriate that you covertly observe people in their place of work without advising them you are collecting data for a research project? You will probably be forced to seek permission and notify people if you are a guest in a given situation, but careful judgement needs to be made if your data collection is made alongside your normal work activity, e.g. a study about the effectiveness of site meetings in which you are routinely involved as a participant and in which you now propose to also collect data as a researcher. In this case, should you ask permission of participants to digitally record meetings or take notes, or should you just ask permission of the meeting's chair, or should you just do it without anyone knowing? Since this is not a public meeting, especially if there is to be a digital recording, it is probably best that consent of the meeting is sought through the chair. Also envisage a situation where you may wish to record observations of craftspeople while they work. You may do this as part of your routine employment, or you may spend extra time observing with their knowledge, or perhaps observe from a vantage point without their knowledge. 'Deceiving' people is sometimes justified, providing that the value of the research outweighs the principle of gaining permission. You would have to substantiate this in your permission-to-do-research form. Your argument may be that if participants know that you are collecting data for research, it would unduly impinge upon the study's validity, and prevent tangible benefits being realised. If you are to deceive people it is argued there needs to be a 'greater good for society'. This 'greater good' may be difficult to substantiate at undergraduate level, so openness and asking permission is likely to be the norm.

You must be particularly careful if participants are considered vulnerable – talk to your supervisor. As construction designers, we may legitimately wish to communicate with vulnerable users of buildings and other parts of our infrastructure. You may wish to talk to 14 or 15 year olds about their perceptions of construction as a potential career option. People who are in training or who are accountable to you at work, such as craftspeople, may feel that their job positions are threatened by your wish to collect data. People more senior than you may be fearful about data getting to their superiors or into the public domain. People with a disability or learning difficulties may be reluctant to talk about adjustments they need for their work. People in organisations that are downsizing may be reluctant to talk about anything, and if that is the case, you should respect their wishes.

Part-time students may be able to get data from their own organisations. If it involves other people, permission should be sought from their employer; if it involves taking data from current or archived files, again permission should be sought. If your research involves collecting data in the National Health Service or social services from patients, carers or staff – perhaps about the merits of various building designs in patient recovery – you should gain approval from those agency research ethics committees.

1.8.2 Confidentiality and anonymity

Confidentiality and anonymity are often written of, as though they are the same concept. They are related, but they are different. In a practical sense you will offer participants confidentiality and anonymity, though in your own mind you will recognise there is a difference between the two. Participants do not get complete confidentiality but must always get anonymity.

Confidentiality implies that whatever is written or said will not be shared with other people. That is strictly not the case, since verbatim quotes may be included in documents that will be read by supervisors, external examiners and possibly placed on university library shelves that are accessible to the public. What is important in such circumstances is that there is no attribution to the source; participants cannot be identified and will have their anonymity preserved.

To elaborate the difference between confidentiality and anonymity, consider a situation where you go to your doctor with perhaps a strange phobia. What you tell the doctor is confidential between you and your doctor, though when you leave your appointment the doctor will spend a short time writing down electronically your symptoms and your diagnosis. You may go back to your GP practice some time later with the same problem and see a different doctor; what you said at your first visit is not confidential between you and the first doctor, since the new doctor will most likely read your file before you enter the room. Some medical secretaries in the GP practice may also need to view your file. So what you said initially is not confidential between you and the doctor you initially spoke to, but it is confidential within the bounds of the GP practice. Consider then the situation where several months later one of your doctors is being interviewed in the national media and tells of a young person who came to the practice with a strange phobia. That person is you! The doctor tells the world of your phobia that you thought you were telling the doctor in confidence, and now everyone knows. That is fine. What the doctor does do, is preserve absolutely your anonymity; there will be no small clue that would enable you to be identified.

In the raw data that only you have access to, for example interview transcripts, it is not really necessary to record names of people. In electronic surveys, it would not be usual to ask for names of people. However, consider an example where your supervisor allows you to survey the same group of students on two occasions, with a time gap of perhaps one week. You may be taking the viewpoint of a designer, and wish to measure their learning preference immediately after they have experienced lectures in two different lecture environments. That may involve pairing up scores for each person without using a name; just ask students to label their survey with a code of their choice, known only to them, which would not allow them to be identified personally; but the same code would be used each week.

If names are used anywhere in your research, these documents should be stored securely, with electronic files password protected, just in case pen drives or laptops are lost in public places. Paper files that name people should be shredded on completion of your work. When you refer to this data in your document, anonymity of individuals and companies should be maintained, by typically referring to person A or organisation B. If using a dataset about a company, which is already in the public domain, such as the profit figure for a public liability company, it is acceptable to name names, providing the name cannot be used to find a link to other confidential information. You should offer participants in your study access to a summary of your findings; if they wish to take up that offer, that will require they give you names and contact details which you will tell them you will store securely.

1.8.3 Generally

If you want to observe in a public setting how people use a particular facility, that is ethically acceptable, but if you want to talk to them, you should provide an information sheet. If there are any adverse events during your research, involving either yourself or others, you should report these immediately to your supervisor.

The need to follow ethical rules should not be viewed as a deterrent to you being proactive in your research, and then alternatively encouraging you to undertake passive desk studies. If you consider the checklists in permission-to-do-research forms, that should prevent you making a mistake. Your research permission form is good practice, morally appropriate and is your plan; your information sheet helps your participants and hopefully puts them at ease. If you are able to grasp the principles of research ethics, there is the potential for lots of spin-offs into other spheres of your personal and professional life.

1.9 House style or style guide

Your research document needs to be accessible to all potential readers, and its style needs to be consistent within itself. Some readers have disabilities that make conventionally presented text inaccessible. Some disabilities, such as partial or whole sight loss, affect only a relatively small percentage of people, but dyslexia is relatively common, affecting about 12% of students in higher education. You need to be mindful of how you set out text, font style and font size.

For many people with poor sight, using well-designed printed documents using a minimum of 12 point text is enough, although the Royal National Institute of Blind People recommends 14 point, to reach more people with sight problems. People with dyslexia usually find sans serif fonts such as Arial easiest to read. Left justification is thought to be better than full justification, since the latter necessitates that the spacing of letters within words open to take up the full width of lines. This exacerbates a feeling that some people with dyslexia have, of words merging into one another.

It may be prudent to place a CD ROM version of the document in a plastic wallet stuck to the inside cover. An electronic version allows people to increase font size or use other sophisticated software to read documents to suit their needs. Even if your CD is not used, you would at least be demonstrating to examiners that you have empathy with difficulties experienced by others.

Your university may have a house style that you must follow. Hopefully, it will not be too prescriptive, thus leaving you with a degree of flexibility and personal choice. Some students may find it frustrating to have to follow a style they do not like, and prefer to impose their own tastes on their document. In any case, you should aim for absolute precision in use of the style. Even small differences within the same document can frustrate readers, and distract their attention away from the subject material. Adapting to the discipline of house styles is good practice for industry. Most businesses have styles, so that they have consistency in the way they present information to clients and customers. If you are a part-time student, you may find it frustrating to have to learn two house styles; one in your workplace and one at university. Since the real issues are about accessibility and consistency in documents, and not about the style itself, your university may be happy to let you use your workplace style. If you want to emphasise to examiners that you have not put your document together without regard to accessibility and consistency, write a precept in your preliminary pages stating that you have followed a style, and then put details in an appendix.

If you are not required to follow a style, and do not have one in your workplace, one is suggested below, based on disability literature (ABECAS, 2005). Use the following:

- font type: Arial or Times New Roman
- chapter headings: 14pt bold, sentence case
- subheadings: 14pt bold, sentence case

- main text: 12pt line and a half spacing, sentence case
- table text: 12pt single line spacing, sentence case
- margins 3 cm all round
- one and a half line space between paragraphs; not indented
- one and a half line space between headings and text, text and new heading, and tables/ figures and text
- page number at centre bottom of each page, 12pt
- left justification with ragged right edge
- allow generous spacing generally within documents
- black or dark blue print colour

Generally, avoid the following:

- centred text except for headings
- upper case fonts (or capitalisation)
- italic fonts (bold is a better form of highlighting)
- underlining
- roman numerals, e.g. (iii), (iv), (vi), and numbering 3 and 8, 6 and 9, which could be mistaken for each other. Bullet points or (a), (b), (c) are preferred

Unfortunately, the majority of literature in the public domain does not follow accessibility guidelines; it is impossible to make it compulsory.

1.10 Writing style

You are likely to have a word limit or word guide for your document; perhaps 10,000 words. While initially this may seem to be an enormous amount, it is not. A draft may be say 20% higher than your final document, and you will have to work hard to remove irrelevant information. A rule to follow is, 'If what you have written should be in, it should be in; if it should be out, it should be out.' This rule requires a robust editing process. It follows that you must write concisely and with precision. Every sentence must read with absolute clarity – it should mean to readers exactly what it means to you as the writer.

This is not a book about writing style or grammar, but here are some tips arising from common mistakes by construction students:

- (1) Do not write in the first or second person. The following first person words should not appear: I, me, mine, my (singular), our, ours, us, we (plural). Nor the following second person: you, yours, your. While they are all acceptable in informal writing, they are not thought to be professional writing styles; a passive approach is required. If you accidentally write in the first person in your first attempt at writing, it may be just that you need to rearrange sentences. For example a first draft may be 'we need to improve the safety performance of the construction industry', but can be rephrased 'there is a need to improve safety performance of the construction industry'. On the occasion that you may need to refer to yourself, you can be author or the writer, not 'I', e.g. 'this study arose from the author's experience working in private practice'.

- (2) Avoid writing in the singular; do write consistently in the plural. Therefore, instead of a manager, a contract, a client, a subcontractor, write managers, contracts, clients, subcontractors. This can be really difficult, even with practice, but it does have advantages:
 - (a) It helps keep writing concise. A sentence that reads in the singular ‘the project manager is responsible for the quality on the site’, reads more fluently and with four fewer words in the plural as ‘project managers are responsible for quality on sites.’
 - (b) It can eliminate inappropriate mixings of singulars and plurals, so that a sentence written ‘an architect should be the chair of a meeting and they should ensure ...’ (a singular architect is not a they, but a ‘he’ or a ‘she’) is better as ‘architects should chair meetings and they should ensure ...’
 - (c) It almost fully eliminates the need to address the gender issue. Some people are quite happy to call a manager ‘he’, while others may be offended. You do not want to offend anyone, therefore avoid it. In the singular, you may write ‘the architect should chair the meeting and he should ensure ...’ In the plural this becomes ‘architects chair meetings and they should ensure ...’ You can write in the singular ‘an architect should chair the meeting and he/she should ensure ...’ but this attracts readers’ eyes to the gender issue. It is clearly acceptable to use the male or female gender if you are talking about an individual, e.g. ‘Mr Smith chaired the meeting and he ...’ In your literature review you may cite Richardson (2009), and ‘he stated ...’; but be sure it is ‘he’. But don’t get too hung up about the gender issue. Whether you write for example craftsmen or craftspeople is not likely to make any difference to your mark. UK statute routinely uses the ‘he’ to also mean ‘she’, using a precept such as ‘any reference to the masculine gender shall be taken to include the feminine’. If you are most comfortable writing of craftsmen, you can do so. Deflect the potential for criticism by including a statement in your preliminary pages or introduction chapter. But otherwise, still try to avoid gender in your writing where possible.
 - (d) Writing in the plural promotes consistency in your writing. In some cases it will be inevitable that you write in the plural. It would be a contradiction to write in one paragraph of a singular civil engineer, and then in the next of plural projects.
 - (e) Finally, the purpose of research is often to seek out how the population at large behaves. It would seem inappropriate therefore to write of the population as though it comprised a singular company, person or project.
- (3) As noted in 2(b), mixing singulars and plurals also occurs when students write of organisations like ‘a government’, ‘a professional body’ or ‘a company’ in terms of the plural ‘they’. Each is represented by many singular people coming together as ‘they’. While the latter is correct, individually, these organisations have a singular legal identity. A sentence that reads with the plural (they), ‘government decided they would change the law’, may better read with the singular (it), ‘government decided it would change the law’.
- (4) Double speech marks for verbatim quotations or citations and single speech marks for highlighting or emphasis or separating from the main text. For example you may cite thus with double speechmarks, the then chief construction advisor to government Peter Hansford, who wrote in the context of skills shortages in construction “Too few teachers know very much about the construction industry. We must create strong, lasting partnerships if we’re to develop a talent pipeline of eager, well-informed, inspired new recruits” (Hansford, 2015). Alternatively, use a single speechmark for emphasis or to separate a word from text e.g. the most important word in this text book is ‘objectives’. Also use single speechmarks for colloquialisms.

- (5) You should only usually use colloquialisms (not formal or literary), slang and nicknames if you are citing verbatim; otherwise avoid them. You must always write in professional academic language. Some of colloquialisms may arise from the construction industry itself or as local dialect. Not all readers may understand them, e.g. a mobile elevated working platform (MEWP) is informally called a 'cherry picker'. Not everyone may know that, and you should therefore formally call it an MEWP. If the context of your narrative is that you *need to* write of a 'cherry picker' or use slang or nicknames, that is fine, but put them in single speech marks to illustrate that this is not part of your professional writing.
- (6) Avoid using words abbreviated by apostrophes, e.g. can't, won't, don't, shouldn't. Write them out in full as cannot, will not, do not. These sorts of abbreviations are acceptable if you are taking them verbatim from other sources. If the latter is the case, again include them in double speech marks.
- (7) While your role is not that of a censor, it is probably best that you do not use any bad language, mild or strong. In qualitative work it can be important to understand the passion or anger that people may feel about some issues. People may use bad language to express their feelings. Passion or anger must not be lost in analysis. You may type up verbatim transcripts of interviews, and include them in appendices. Some readers may be relaxed about bad language that is left in. Other people may be offended, which may leave you open to criticism. You do not wish to offend anyone. Therefore, whether in the main body of your document or the appendices, it is suggested that you take bad language out. Substitute it with an appropriate number of dashes. Readers will understand.
- (8) Make sure that you can use apostrophes correctly. The two key uses are to indicate possession and to indicate missing letters in the middle of words. It is the possession issue that causes students most problems. For example, 'the house of the architect'; by deleting the word 'of' (the possessor) and switching house and architect around, it becomes 'the architect's house'. The apostrophe is used in place of the word 'of'. If the house is owned by more than two architects, the apostrophe is after the s, thus 'the architects' house'. If you are not sure how to use apostrophes, find out. There are lots of university guides and useful websites that you can locate through search engines. Imagine the discussion that may take place between two examiners who disagree about the mark for a document; one argues for a high mark, while the other suggests a lower mark stating 'this student cannot even do apostrophes'. Imagine employers discarding CVs because candidates cannot even do apostrophes.
- (9) Make consistent use of numbers written as figures or as words, that is the word 'one' or the figure '1'. By convention, anything less than 10 is written as words. Numbers used in calculations should of course be kept as figures; similarly ages, measurements and percentages. Also, 10% is better than 10 per cent.
- (10) Which writing tense to use often causes difficulty. There are four types of tense (a) past tense, which is subdivided into imperfect, perfect and pluperfect (b) present, (c) future and (d) conditional. In simple terms people often refer to only three: past, present and future. Students often write without regard to tense, and switch tenses within adjoining passages of text. You need to be mindful of the tense in which you are writing at each stage of the document. The abstract is written as a concise summary after the whole of the document has been completed. What tense is appropriate?

- present tense: ‘the objective is ... the method is ... it is found that ... it is concluded that ...’
- past tense: ‘the objective was ... the method was ... it was found that ... it was concluded that ...’
- a mixture to show that the beginning of the study is past, but the end of the study is present, thus ‘the objective was ... the method was ... it is found that ... it is concluded that ...’

The introduction chapter will be written as the document proceeds. Some parts will be written at the beginning of the process and some towards the end. The introduction is setting out what will appear in future chapters, but it is also telling the story of what has happened, in a real time frame, in the past. What tense is appropriate?

- ‘the objective is ... the method was ... chapter 2 will outline ...?’

The literature review is about work in the past. If writing about work that is well established and dated, the past tense will usually be used, e.g. ‘McKay (1943, p. 15) detailed a sketch of a foundation for a one and a half brick wall.’ Note ‘detailed’ in the past tense, not ‘details’ in the present tense. However, if the work is more recent, it may be written as ‘Ashworth and Perera (2015) describe value as ‘a comparative term expressing the worth of an item or commodity, usually in the context of other similar or comparable items’, or ‘Ashworth and Perera (2015) described value as ...’; that is ‘describe’ present tense or ‘described’ past tense. On the one hand, the methodology chapter tells the story of what you have done in the past, but it also describes what will be presented in the middle of the document. Therefore, it may be written as ‘a survey of existing buildings was (past) undertaken, and the data recorded will be (future) analysed in the next chapter’. The analysis chapter may use the present tense; the result is ‘this’ and ‘this is’ found. Discussion about the results and findings may be in the past tense – ‘in the last chapter the result was ... and it was found that ...’. Conclusions may start to arise in the discussion chapter, and may be in the future tense ‘it will be concluded that ...’. As you get to the end of the document you may revert to the present tense ‘it is concluded that ...’. There is no definitive answer about which tense should be used. The important point is that you should pick your tenses deliberately, recognising in your own mind instances where you have made choices and remaining consistent in those choices.

A useful guide, adapted from Parkin (2005), though not consistent with the above, is thus:

Abstracts: best in the present tense e.g. ‘The aim of the study is to ...’ and ‘The results show that ...’

Introduction: best in the present tense, but a lapse into the future tense is also possible e.g. ‘The literature review demonstrates that ...’ or ‘... it will be shown in the literature review that ...’

Literature review: could be either in the present or past tense depending on the age of the research and the context and particular sentence structure being employed, e.g. ‘Smith (1952) developed the theory of XYZ and Jones (2015) shows that data still supports this theory’.

Methodology, analysis, results, findings, discussion: usually written in the past tense. ‘Data from XYZ was analysed and showed that...’ Avoid the temptation to write in the future tense, particularly the method, even if you are writing up before carrying it out.

Conclusions: usually in the present tense, e.g. ‘It is concluded that ...’

1.11 Proofreading

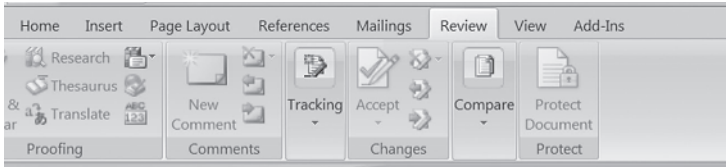
Proofreading is an essential part of all your writing. It must be thorough and meticulous. It must cover content, grammar, spelling, apostrophes, layout, house style and presentation. You should aim for perfection. You should be confident about putting your document on the desk of chief executives or other captains of industry. You should proofread your own work as much as possible. On the one hand you may aim to get chapters 'signed-off' as though floors on a building or phases on a civil engineering project that are being handed over. But, when writing subsequent chapters, you may need to go back to signed-off work to make amendments. Part of the process is that you will be rereading and rereading your work again on a continual basis. You must continue to polish it and polish it again; it will be the result of many iterations. A time gap between reading helps. If you 'finish' a chapter and then go back to it a week or so later, you will no doubt find many things you want to change to make it read with greater clarity, or text to delete or add.

If you are doing this thoroughly, there will come a time when you are just too close to your work. There will be mistakes that you will never find. To get the perfection required will need the independent help of a proofreader. Proofreading is a profession in its own right. It is not expected that you will pay fees to seek professional help. The proofreader may be a member of your family, friend or work colleague. Construction expertise is not necessary, since hopefully you will have been networking with construction professionals and your supervisor throughout the process. There is a line that you must not cross with proofreading by others. Proofreading is proofreading; it is not for someone else to rewrite your work. Students with dyslexia may be able to make a case for greater support in the proofreading process through their university disability advisors. Whatever support you do get with proofreading, declare it in your acknowledgements in the preliminary pages. In the final stages you are building up to the final print-off. In reality there may be several 'final' print-offs. The final print-off may go to the proofreader, who may find some typographical errors. Be mindful that even relatively minor changes can lead to substantive disruption to document presentation. In your final, final document, graphs, pie charts, histograms, photographs or maps should be colour printed.

During the production of your document, you should be repeatedly using the spell and grammar check functions in your software. Perhaps the very last task that you should perform before printing, is to spellcheck your document one final time. At the closing stages when you are doing final editing, there is always the possibility that you will accidentally type something that includes a mistake. Figure 1.6 illustrates the spell check function in Microsoft Word; this function will detect typographical errors other than just spelling mistakes, such as apostrophes, incorrect capitalisation and incorrect spacing between words.

One important element of proofreading is to check references. This chapter has 19 'citations in text' and 19 references; in alphabetical order that is from ABECAS (2005) to UoB (2015). In earlier drafts of the chapter there were fewer citations; some have been added and also some taken out. Care was taken to ensure that as well as changing the main text, citations and references match each other at 19.

If during proofreading you find a mistake that you know will apply to many parts of your document, use the Find and Replace function in Word to locate the other instances, as illustrated in figure 1.7.



Using spell and grammar check in Word ¶

¶ You should continually spell and grammar check your document as your writing-up proceeds. This function in Word will detect typographical errors other than just spelling and grammar. The spell and grammar check is just one part of many of that proof reading. As Holt (1998) wrote, when you submit your document it should "personify perfection". Do not just rely upon the red and green underlining in Word; though at each point there is a red or green line you should right-click to ignore or change a mistake. There is one deliberate error in this paragraph, let us see if Word picks it up? Yes; there are two spaces between the words 'us' and 'see'. Note the two dots between the two words, and a revised 'suggestion'. To use this function click on "Review" and "Spelling & Grammar". Your last task before submitting your document MUST be to spell and grammar check. ¶

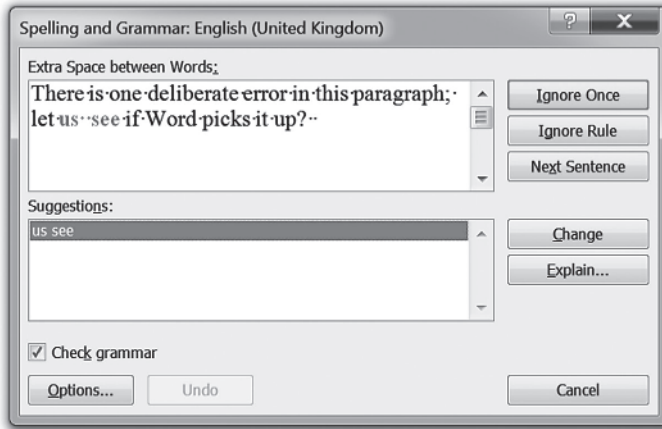


Figure 1.6 The spelling and grammar check facility in Word used to locate typographical errors.

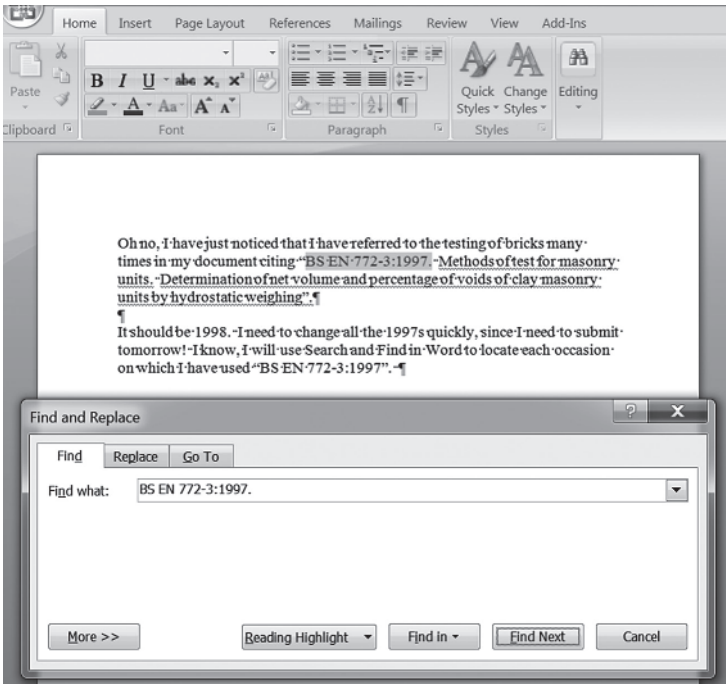


Figure 1.7 The find and replace facility in Word used to locate repeated errors.

1.12 Extra support?

There are examples of students who get to the final stages of their study before they realise that they qualify for extra support from their university. Support may be needed because they have Asperger's syndrome, dyslexia, dyspraxia, mental health difficulties and such like. Some of these students may be quite 'mature', and when they are questioned by academics respond something like, 'Well I knew there was a bit of a problem at school, but I never got around to doing anything about it'. If you think you may have a problem, or are unsure, get yourself assessed by disability specialists in your university. There are many opportunities for you to disclose any problems, for example at enrolment, when speaking to your personal tutor or by approaching central service units in the university. When you do inform them, you are promised confidentiality, and in this context that means only people who need to know are told.

Disability legislation requires that universities make 'reasonable adjustments' in their delivery and assessment to meet your individual needs. In examinations, extra time may be permitted, typically up to 25%. In the context of courseworks and dissertations or projects, there are a host of 'reasonable adjustments' that may be possible: submission dates may be extended or the type of assessment changed. If you have a medical condition that makes it difficult for you to do a presentation to your class peers, perhaps you can give the presentation informally to your tutor? In the UK, you may be eligible for disabled students' allowances (DSA). Such an allowance may enable you to attain laptops, software, specialist tutors, support workers who can be with you in class and take notes, or amanuenses (scribes in examinations).

Students sometimes find themselves in difficulty trying to study and simultaneously act as carers for members of their family, or have one-off problems in a variety of circumstances. You should speak with your personal tutor; as noted in section 1.7, university systems are generally paternal and supportive in cases of genuine difficulty outside your control. You can be given leads to organisations independent of the university to help you.

It may be that you develop personal or family difficulties during your period of study. Being a student can be stressful. Many universities are members of the National Association of Disability Practitioners (NADP), and are able to share good practice among themselves. One recent initiative is the provision of 'life lounges', somewhere to relax and where there is close and free access to specialist services such as counselling, study skills, cognitive behaviour therapy (CBT) and student liaison officers

Students who write and speak English as a second language may need some extra English classes. One goal of study in a UK university may be that on completion of your study you are able to speak and write like a British person. Your aspiration may be that when you do write, readers will not know that English is your second language. Some UK based students may feel they need extra English language support too, or indeed support in other areas such as mathematics. Your university will provide extra support classes free of charge; go and seek them out and use them.

1.13 A research proposal

Some universities require you to submit a research proposal which is marked; perhaps as much as 20% or even 40% weighting of the overall mark. Universities often submit research proposals to seek funding to support postgraduate, doctoral and post-doctoral work over

long periods of time. Applications can be for large sums of money. Assessors of these proposals can only come to informed judgements about whether to award money if the proposals are fully detailed.

If the final submission date for your document is towards the end of the academic year, the research proposal may be required before the Christmas break. Your university will guide you about what is needed, but it will usually require that you (i) describe the problem to be investigated, (ii) give your aim and objectives, (iii) execute at least a preliminary literature review, and perhaps most importantly (iv) propose a data collection and analytical method that will enable you to meet your objectives. This last part is particularly tough at relatively early stages of your study; how can you propose some research methods when you are still learning how to do research? The answer to this has to be that you must read research methods texts at an early stage of your study, get involved in any support or seminar classes that the university provides, and meet with your supervisor as often as is reasonable. Appendix D provides eight examples of research proposals.

1.14 A viva or viva voce

Some universities require that you have a viva voce – Latin for an examination by word of mouth – and often abbreviated to viva. It is not a requirement of all universities for undergraduate work, so check your university documentation or ask your programme leader. Where a viva is a requirement, models in universities vary. It may count for perhaps 10% of your mark. Unfortunately some students submit a document that comprises very little of their own original work; for universities, the viva will help to detect whether this has happened.

Hopefully, the viva will be in an informal and relaxed environment, though you might want to dress as though for a job interview. Perhaps there will be two examiners: one the person who acted as your supervisor and a second person with some knowledge of your subject area. To prepare for the viva, it is advisable to reread your document a short time before, since it is likely that there is a time gap of several weeks between submission and the viva. You may be required to give a PowerPoint presentation with a fixed time limit, or you may just be asked speak freely at the beginning of the viva without the support of PowerPoint. Perhaps tell the examiners why you picked your subject area, what the problem is, your aim and objectives, the key literature sources, the methods you used to collect and analyse your data, what you found, what your conclusion is and what you recommend, all of this in perhaps just two minutes. Hopefully you can speak passionately about your subject area.

One view of the viva is that it is truly a verbal examination, a rigorous interrogation of the document. Another is that it brings for you closure to your research, where there is an enjoyable discussion around your work in which supervisors will learn too. From your side, view it as the latter; that will help you relax. In the viva you will be asked questions; the second person may ask most questions since your supervisor will hopefully have a good understanding of what you have done. You may be asked to substantiate your methodology: why you have done it this way and not that, why you favoured this piece of literature, why this method of analysis, why this data collection process, why you wrote this on page *x*? You should consider yourself to be in a strong position, particularly if you are confident in your work. Nobody knows your document better than you.

A viva can be an advantage, since an examiner may read parts of your work and think ‘my best guess is that the student does not really understand what has been written’ and will be minded to mark your document down on that basis. No doubt you will be asked about this in the viva, and if you can verbally demonstrate your understanding, your document will be marked up.

At the end of the viva you may be asked to leave the room while the two examiners reflect on some feedback for you and agree a proposed mark. You may be invited back into the room and given that feedback, perhaps also given a mark that will be proposed to the external examiners. If there is disagreement between the two examiners about the mark you should be awarded, a third academic will usually be invited to give a judgement too. The overall duration of the viva will be perhaps 20 minutes with a further 10 minutes for agreeing a mark and feedback.

The above narrative is one way to do it; you need to check with your university which way it does it.

Summary

The dissertation or project is the flagship document in your degree. Language used to describe your research goals can be fuzzy, but clarity in your objectives is essential. The opening part of your document may be an introduction and literature review. The middle part may describe your methodology and present your analysis/results. The closing part may be discussion and conclusions. When selecting a topic area, you should speed up your general reading around current issues. You may choose to do qualitative or quantitative analysis or a mixture of both; whichever is used, the analytical tools must be robust. If you are a civil engineering student, discuss with your programme leader whether there is a requirement for your work to be technical. You should be clear about the way you and your supervisor will work together. The presentation style of your document must be consistent within itself, and you should consider readers who may have partial sight, dyslexia or similar. You must read and understand your university’s ethical codes; do not harm or offend any person during your work. You should try to complete your document one month before the final submission date, and use the last weeks to make improvements that may be suggested by your supervisor and for proofreading.

References

- ABECAS (2005) *Guidance to higher education institutions: removing barriers and anticipating reasonable adjustments for disabled students in built environment degree programmes*. Farrell, P. and Middlemass, R. The University of Bolton. www.cebe.heacademy.ac.uk/news/abecas/index.php DOI: 10.13140/RG.2.1.5079.9205.
- Ashworth, A. and Perera, S. (2015) *Cost Studies of Buildings*. Routledge: Oxon. Chapter 1.5.
- BBC (2005) 1953: Derek Bentley hanged for murder. http://news.bbc.co.uk/onthisday/hi/dates/stories/january/28/newsid_3393000/3393807.stm Accessed 19.09.15.
- BIS (2013) ‘Construction 2025: industrial strategy for construction – government and industry in partnership’. <https://www.gov.uk/government/publications/construction-2025-strategy> Accessed 26.08.15.
- BREEAM (2015) The world’s lead design and assessment method for sustainable buildings. BRE. Building Research Establishment. www.breeam.org/ Accessed 27.08.15.

- Brundtland, G.H. (1987) *Our Common Future*. Report of the World Commission on Environment and Development. www.worldinbalance.net/intagreements/1987-brundtland.php Accessed 28.08.15.
- Clarke, V.L. and Creswell, J.W. (2008) *The Mixed Methods Reader*. Sage, London.
- Constructing Excellence (2015) The single organisation driving change in construction. Improving industry performance to produce a better built environment. <http://constructingexcellence.org.uk/> Accessed 28.08.15.
- Hansford, P. (2015) A letter from the chief construction adviser. Building 16.01.15. www.building.co.uk/analysis/comment/a-letter-from-the-chief-construction-adviser/5073088.article Accessed 26.09.15.
- HSE (2014) *Risk Assessment; a brief guide to controlling risks in the workplace*. Health and Safety Executive. www.hse.gov.uk/pubns/indg163.pdf.
- HSE (2015) The Construction (Design and Management) Regulations 2015. www.hse.gov.uk/Construction/cdm/2015/index.htm Accessed 26.09.15.
- McKay, W.B. (1943) *Building Construction*. Vol. 1. Longmans, London. p. 15.
- Miles, M.B. and Huberman, A.M. (1994) *Qualitative Data Analysis*. Sage, London.
- Parkin, J. (2005) *Notes on the structure of research and the research document*. Unpublished handout. University of Bolton. p. 13.
- Quotations Page (2015) Quotation Details. www.quotationspage.com/quote/2933.html Accessed 23.07.15.
- Richardson, S. (2009) Morrell takes the stage with a warning to government. *Building* 27.11.09. pp. 10–11 issue 47.
- Stephenson, A. (2010) *Oxford Dictionary of English*. 3rd edition. Oxford. Oxford University Press. Available online.
- UoB (2006) *Code of Practice for Ethical Standards in research involving Human participants*. University of Bolton. www.bolton.ac.uk/Students/PoliciesProceduresRegulations/AllStudents/ResearchEthics/Documents/CodeofPractice.pdf Accessed 07.07.15.
- UoB (2015) *Example 1. Participant information sheet*. University of Bolton. www.bolton.ac.uk/Students/PoliciesProceduresRegulations/AllStudents/ResearchEthics/Home.aspx Accessed 07.12.15.