Rugg, G. & Petre, M. (2004), The Unwritten Rules of PhD Research, Open University Press, Maidenhead, UK, pp. 54 – 94.

6 Reading

. . . those frightful parts of the Pnakotic Manuscripts which were too ancient to be read.

During a PhD, you have to do a lot of reading. That reading needs to be the right reading, and you need to make correct use of it. This chapter covers these topics.

The chapter overlaps considerably with the chapter on writing. This is for various reasons. One is that you are doing the reading so that you have the information required for writing (for instance, writing your thesis). Another is that if you know about the concepts and structures used in writing by experienced academics, then you will be able to make much better use of what you read.

We have included a fair amount of detail about online searching, as opposed to internet searching. If you're going to be a good professional researcher, you need to be aware of the differences, and able to use the tools of your trade efficiently and well. Few students are strong in this area; few students do outstanding work.

We have also included a fair amount about different types of papers and about different types of research. If you understand these concepts then a lot of things about the literature start to make more sense. It's also worth reading this part if you're thinking about writing a paper, or about planning some research with a view to publication outside the dissertation – if you know what you're aiming for, then you can plan and conduct your research much more efficiently.

Finding the right references

You have to convey the right message when you are writing, and that involves some hard work beforehand reading what you need to read (the first golden principle: *don't lie*, in this case by pretending to have read things which you haven't read). However, there is no point in overkill. One of our usual examples of strong academic writing contains eight references in one paragraph on the first page. Do you think that page 24 of that thesis contains the same number of references per paragraph? It doesn't, because it doesn't need to – the writer has by then already cited practically all the references he or she needs to. How do you know what references you need to cite?

The easiest solution is to ask your supervisor, politely, where to start. If your supervisor doesn't know, ask someone else, politely, and keep your supervisor informed, in case you start blundering in where angels fear to tread. You need to send out the signal that you're a hard-working individual who will make good use of the advice, rather than an idle brute who can't be bothered to do their own research (mentioning what you've already read and asking where you should go next is a good start). Your supervisor can be invaluable here.

If you are lucky and virtuous, your supervisor might say something along the lines of, 'The person to talk to about this is X; I've emailed them, and they're happy to give you some guidance. Here's their email address'. This is an encouraging sign, and is academic shorthand for the following things:

- here is something which will save you a lot of effort;
- here is a chance to make contact with a major player in this area;
- I trust you to enough to let you speak to important players in this area by yourself.

(It does *not* mean, 'I am too ignorant or idle to provide guidance on this by myself'.) If your supervisor offers you this opportunity, then grab it with both hands.

The researcher's core literature

Most good researchers carry around in their memories a good, accessible database of relevant papers. That means, out of all the reading they do, they maintain a working knowledge of about 100–50 papers. As they continue to read, the core adjusts, shifting to follow developments in the discipline or to follow their changing interests. But some of that core will persist for years. Interestingly, the lower limit for a good bibliography on a dissertation tends to

be around 100 citations. One of the things a good doctoral student will accomplish is to amass a first 'core' literature. (Of course, there's huge variation, but the numbers don't really matter – the idea of keeping a selection of pertinent literature accessible in memory does.)

So, where is a good place to start looking for references? Your supervisor is likely to remind you about literature reviews in the papers you've already read, and also about review articles. You may also be pointed towards some online searching, with keywords either supplied by your long-suffering supervisor, or included in the articles which you have already found. The following sections cover these topics in more detail. We've included some discussion of how papers as a whole are put together, not just literature reviews, to save duplicating this in the section on writing.

After that, you have the problem of evaluating the quality of what you're reading. This is not always easy for the average student. If you find a paper impossible to understand, is it because the paper is far too brilliant for you to understand, or because it's a pile of pretentious, obfuscatory garbage? A later section of this chapter describes some ways of reading between the lines of academic writing, so that you are in a better position (a) to evaluate what you're reading and (b) to improve the quality of what you're writing.

Literature reviews

Academic papers and dissertations normally begin with a literature review. There are good reasons for this.

The ostensible reason for a literature review is to set the scene for the work described in the paper – explaining what has been done previously by other researchers etc. This is done via standard referencing conventions, so that interested or sceptical readers can locate the original sources and read them to check the alleged facts in the literature review, if they so wish. The second, and equally important, reason for a literature review is to demonstrate that you have done your homework thoroughly, so that readers are assured that they will not be wasting time wading through the rest of what you have written.

The literature review needs to have a structure, since even the best academic prose is pretty hard reading at the best of times. The structure is also a way of demonstrating that you have a clear understanding of what you are doing and why you are doing it. It is your responsibility to make your work understandable; it is not the reader's responsibility to make sense of a pile of references indiscriminately grabbed from the internet and then tacked together with semi-coherent prose.

The usual structure, and one with which we have no quarrel, is one which begins with the earliest work in this area and proceeds via the most important past work up to the present. Your references will therefore usually begin with

old seminal references, then continue with more recent key references and assorted examples of less important references, and end with very recent foundational references. Some readers may notice the similarity to the Whig view of history; this is probably a suitable subject for a paper which would be viewed as quite amusing by at least four readers . . .

One widespread source of confusion is the link between literature reviews and introductions. Institutions and people differ. Some favour a completely separate literature review and introduction; others favour a complete integration of the two. The best advice is to find out whether there is a specified formalism for your venue (including PhD regulations). If there is, follow it; if there isn't, use whichever approach you prefer. There's no point in getting into a war on this topic.

At the heart of your literature review is a good plot. The story should start with a problem of some sort (for instance, a dragon laying waste the land, in a good legend, or a problem in the domain, in research). The literature review and/or introduction then follow the steps taken by previous work in an attempt to resolve the problem. The literature review and/or introduction end at the point where you, the hero or heroine, enter the scene, armed with your enchanted sword/improved research methodology. The rest of the paper/dissertation follows your adventures, to the point where you emerge triumphant. If you do not emerge triumphant, then you should have got your experimental design right before you started, and it is your problem. (Interested readers might wish to try reading Propp's work on formalisms in Russian folk tales, or Campbell's examination of archetypes, or a good book on experimental design, depending on their precise problem.) This strand is known by various names, such as 'plot', 'red thread' and 'narrative spine', and is viewed as extremely important by most experienced and able writers.

Novices usually have a lot of trouble with narrative spine. The situation normally improves with practice, if you deliberately work at it, but will not automatically improve otherwise. There are various ways of helping yourself with this issue. One simple way is to use top-down decomposition. This involves starting with a very short list of key points in the story – half a dozen brief sentences at most. For example:

Elicitation of software metrics via card sorts

- Choice of metrics for software is difficult
- Card sorts should have advantages over previous methods for choosing metrics
- What happens if you use card sorts in this area?
- Card sorts do have advantages over previous methods

Once you are happy with this top-level structure, you then break down each part of it into smaller parts, and keep on repeating the process as necessary.

You should end up with a set of section headings, subsection headings etc. which will give you the main structure.

In practice, readers tend to get lost quite easily, even in a well-structured paper, because of the sheer volume of information which should be in there. (If there isn't much information, this is usually a danger sign.) The wise writer therefore uses bridging text and signposts. Bridging text is used to join two sections of a paper or other document. It usually consists of a closing paragraph or two at the end of a section, summarizing that section, telling the reader what will be in the next section and explaining how the previous section leads on to the next section. A signpost is a piece of text flagging (i.e. indicating) something which will be mentioned later.

At this level, you should be making extensive use of journals as your main source of information. Although textbooks and the internet are useful starting places, they are usually not appropriate as main sources of information because they tend to present simplified accounts.

Cynical supervisors have been known to give students explicit advice about which sources to read, but not quote, as a source of an initial overview so that they understand the area. Alleged examples range from *How to Lie with Statistics* (almost certainly true) to *The Ladybird Book of Computers* (surprisingly, perhaps true to some extent).

Online searching

Although literature reviews are a useful way into the literature, they are not infallible, and were not written with your particular needs at the forefront of their writers' minds. You therefore need to do your own trawls through the literature, to see what's out there and find bits of the literature that are relevant to you.

Supervisors and externals are not allowed to kill students who include in their literature reviews a sentence starting, 'A search on the internet found no previous work on this topic'. They are, however, allowed to fail students, and to write elegant, cutting comments on the offending page, which goes some way towards remedying this shortcoming in the legal system.

Why do supervisors and externals get so worked up about that sentence? Answer: because it's equivalent to writing in large letters, 'I am either ignorant or lazy or both'. That is not a signal that you want to send out to the reader.

Sending out the right signals

If you want to be treated as a professional, you need to send out the signals that show that you are a professional. Professionals know the tools of their trade – for instance, a brain surgeon should know about surgical instruments

and about other relevant issues such as the physiology of the brain. If someone claimed to be a leading brain surgeon and then appeared to be unsure of the difference between a clamp and a retractor, that would not be an encouraging sign.

Anyone in the academic system ought to know the tools of the academic trade. The amount of detail required will vary with the academic level – for instance, undergraduates will not normally be expected to know as much as PhD students, who in turn will not be expected to know as much as leading professional researchers in the area. However, if you know more than you are expected to, this is usually viewed as a very encouraging sign.

Academics deal with knowledge and information, and should know how to find, interpret and present knowledge and information. An important part of this is finding the best possible sources so that your assessment of the problem in question is based on the best information and knowledge available. The academic literature has a pecking order, ranging from publications which are accepted on sufferance through to publications which are treated with considerable respect. Some of this pecking order is quite possibly based on snobbery, but most of it is based on the quality control that the publication uses. The more rigorous the quality control that a publication uses, the more prestigious the publication is. It's a simple and sensible concept, and it makes life a lot simpler and more reliable for everyone involved. If you are about to spend months or years of your life, and perhaps sizeable amounts of money researching a topic, then it's very reassuring to know that your initial assumptions are as solidly based as they can be.

At the top end of the pecking order come encyclopaedia articles and the top journals. Encyclopaedias usually choose the leading international experts in an area to write their articles – it is a considerable compliment to be asked to write one. Anything submitted to a top-quality academic journal for publication will normally be checked in detail by several leading international authorities on the topic before being accepted for publication. Anything which is not of suitable quality will be rejected.

Further down the pecking order come the middle-range journals, which also use refereeing, but which normally use less eminent referees. Towards the bottom of the scale come specialist newsletters and professional trade magazines, where articles may be reviewed by the editor rather than specialist referees.

The precise status of a publication will be affected by individual factors – for instance, some specialist newsletters will be edited by very eminent authorities, have very high-level contributions and be higher on the pecking order than some journals. Books are also very variable in their status. As a fair rule of thumb, textbooks are low on the pecking order, because they usually present simplified accounts for students. Specialist books may be extremely prestigious.

The observant reader will by now have noticed that this description of the

pecking order contains absolutely no mention of the internet, of newspapers or of popular magazines. There is a good reason for this. The internet has absolutely no quality control as regards the content of the sites accessible through it. If you find an interesting-looking site relating to your chosen area, it may possibly have been written by a major authority on the area, but it could just as easily have been put together by someone who believes that they are being controlled by devices put in their brain by aliens, and who has a degree from a college based above Joe's Pizza Shack in Peoria. Newspapers and popular magazines at least have some quality control, but if you think that reading a newspaper sends out the signal that you are a professional with considerable expertise, then you might be better advised to transfer your registration to that college based above Joe's Pizza Shack. Remember that 'online' includes things like using library databases and CD-ROM indexes: you don't have to be on the internet to be online.

Online searching: overview

One of the main reasons for performing an online search is to find out what has been done before, so that you don't reinvent the wheel and make it square. If something has been done, then you need to get a clear overview of that previous work. If you can't find any sign that anything has been done previously, then you need to be pretty sure of your ground before saying, 'No previous work has been done in this area'. At best, you might look a bit silly if there is a major literature which has been missed; at worst, you might be accused of academic malpractice in claiming priority over a previous researcher in this area (not too likely if you are a final year undergraduate, but more of a worry if you are a PhD student aiming for a career in academia). For this reason, saying, 'No previous work has been done in this area' is simply asking for trouble, and most sensible professionals use expressions such as, 'This area appears to have received little or no attention in the past', which allows them to wriggle out with some face saved if a previous literature does exist.

So, how do you set about finding out what has been done previously? There are three main things you need to think about: sources, strategy and tactics. 'Sources' involves where to look; 'strategy' involves ways of structuring the search process; 'tactics' involves things such as the search engine features that you use.

Sources

The amount of information in the world is enormous. For instance, the number of physics journals alone is so huge that reading the physics journals which are published each year would take more than a year of non-stop reading – you simply couldn't keep up with the current publications, let alone the previous issues stretching back to the nineteenth century.

To make life simpler for everyone, librarians and professional indexing bodies thoughtfully index the contents of journals (and other sources of information too, for that matter). This means that you can look up a term in an index of this type and find out when and where something about it was previously published. For obvious reasons, indexes usually cover journals relevant to the index topic, so physics journals will be indexed together in one index, chemistry journals in another and so on. The old indexes were printed; more recent ones are on CD-ROM or accessible on specialist sites, usually password-protected (librarians will have passwords to many relevant sites, though some sites will charge you for searches).

This means that if you want to find out what has been done previously in a particular area, then your friendly campus librarian will probably be able to direct you towards an appropriate index covering the relevant topic. This in turn means that (a) you will have a good chance of finding anything worth mentioning on the topic, and (b) that if nothing turns up in your search, then this probably indicates that nothing has been published previously – an important consideration if you're doing something like a PhD where originality is important. (It might also mean that you've mis-typed a keyword, which is why the next two topics below are important too.) An added advantage of the indexing process is that there is a certain amount of quality control – only reputable sources are usually indexed. If you find a fact or a claim via an index of this type, then it will probably be sound.

Strategy

Once you have found the right index, you need to have a strategy for searching it. The usual novice strategy is to type in two or three keywords and see what happens; the usual system response to this is to say either that no records have been found, or that 231,768 records have been found. A more sophisticated strategy offers some advantages over this.

There are various good articles about conducting effective searches, and time spent reading them is time well spent. This section is just an introduction to the topic and you would be well advised to read some of the specialist articles.

One useful strategy is to plan in advance what you are going to do during the search. Another is to keep a written record of the things you have done, so that you don't end up going round in circles.

There are different types of search. The standard information science literature has the useful concept of the 'known item' search, where you are looking for one specific item or fact – for instance, trying to locate a copy of J.R. Hartley's *Fly Fishing*, or to find out its date of publication, when you already know that the book exists. For this type of search, as soon as you have found the answer, you can stop.

With other types of search, however, you will not always know when to stop. If you are trying to get an overview of the main previous work in an area, for instance, you will need to do a fair bit of searching and you will almost

certainly encounter problems with the system either claiming that there are no relevant records or claiming that there are millions. You therefore need strategies for improving your hit rate.

One simple but effective strategy is to use a keyword search and then wade through the list until you find a relevant record. You can then look through the relevant record for other potential keywords to use in your next search. Authors' names are well worth considering for this (unless they are extremely common ones such as Smith) – someone who has published one relevant article on a topic will probably have published more, and you can then start adding their co-authors' names to your list. The same is true of technical terms, where you might find different names for the same concept, or more specialist names (if the number of hits was previously too large), or broader terms (if the number of hits was previously too small).

Tactics and commands

Different search engines operate in different ways: it is an instructive experience to type in the same keyword to different search engines on the internet and see what results you obtain from each. Underlying them all, though, are a few basic concepts, and understanding these can make your searching a lot more productive and efficient.

Two key concepts are weighting and Boolean search.

Weighting

Weighting involves assigning different weights (in the sense of e.g. importance or relevance ratings) to something – in this context, usually keywords or records. This allows the search engine to list in a systematic order the records which you find. One popular way of doing this is to use 'inverse frequency weighting' – the rarer a term is, the more weighting it is given, on the assumption that it will be more specific and information-rich. So, for instance, a search on 'low entropy systems' would result in low weightings for 'low' and 'systems' on the grounds that there would be millions of records containing these terms, and a much higher weighting for 'entropy', which is a much rarer term.

It is worth bearing this in mind when choosing your keywords: more specific terms usually produce lower numbers of hits, but a higher proportion of relevant hits.

Boolean searching

Boolean searching involves using the operators 'AND', 'OR' and 'NOT' on the keywords which you enter. So, for instance, 'repertory' AND 'grid' would find only records which contained both the words 'repertory' and 'grid'. A search for 'repertory' OR 'grid' would find records which contained either 'repertory'

or 'grid' or (usually) both. A search for 'repertory' NOT 'grid' would find records which contained 'repertory' but which did not also contain 'grid'. This approach can be very useful when you are trying to exclude records on a topic with a similar name – for instance, if you are trying to find out about repertory theatre, but keep finding records about repertory grid technique.

Most online search engines on the internet use Boolean 'OR' searches as the norm, but offer 'AND' and 'NOT' in the 'advanced search' option. The same is true of most library online search systems.

In addition, 'advanced search' usually offers other features, such as being able to treat two or more words as a phrase (for instance, by enclosing them in inverted commas). In the case of repertory theatre, for instance, you might be able to search using the key phrase 'repertory theatre' in inverted commas, which would then ignore the phrase 'repertory grid'.

It is highly advisable to learn to use advanced search. Librarians are usually supportive if you ask for help with this – they have a hard time from many users, so it is a welcome change for them to encounter someone who wants to learn how to do it right.

Other sources of information

As usual, a cup of coffee with a friendly expert can save you an enormous amount of effort.

It is also a good idea to get an overview from a textbook, which will list relevant articles in its bibliography, and an even better idea to get an overview from a review paper or from a recent encyclopaedia. Review papers and encyclopaedias are usually good things to quote in your bibliography; textbooks are usually not a good thing to quote in your bibliography, since they are saying to the reader: 'I've read the simplified account for beginners, not the professional account'.

It is also worth being pleasant to librarians – they have a wealth of information which they are usually happy to share with polite, appreciative people.

How a seasoned referee reads a paper

The most interesting things in a paper are usually written between the lines. In the stereotyped picture of the good old days, this was something which your supervisor would teach you over a glass of sherry (and a very pleasant way of operating it was too for both parties, as we can testify from personal experience). Nowadays you usually have to pick this up the hard way.

This section describes some of the things that an experienced professional (such as your external examiner) will be looking at.

One point worth mentioning at the outset is that it is not a safe strategy to hope that the reader won't notice mistakes if they're tucked away late in the text. There really are readers out there, particularly external examiners, who actually do read every single line of a thesis – for instance, by moving a ruler down the page a line at a time to make sure they don't miss anything, and noting every mistake, question or comment that they want to draw to your attention. It's also worth mentioning that experienced professionals can skim-read and spot errors at speeds you might find hard to believe.

The sections below are arranged in roughly the sequence in which a seasoned professional might look at them. This is not the same as the sequence in which they would appear in a paper, which is different again from the order in which you would write them.

References

Seasoned professionals often turn straight to the references before even looking at the main text. References tell us a lot. Usually failure to do the right thing in the references is reflected in shoddy work in the main text. Things the professionals will be looking at include the following.

Mandatory

- Are your references laid out correctly down to the last comma?
- Have you cited all the seminal and core references?
- Have you cited a good spread of sources, ranging from the seminal texts to something within the last year?
- Are your references all from respectable journals rather than textbooks or the internet? (At this stage you should be using journal papers as the norm, with textbooks and the internet being the exception.)

Desirable extras

- Have you cited work which is little known except to people doing advanced work in the area?
- Have you cited anything which is in press? (This implies you are sufficiently part of the research community to be given pre-prints by researchers.)
- If you have cited something in press, is the author a major figure in the field?
- Have you cited a discreet number of your own papers, in respectable journals, preferably co-authored with an authority in the field?

Appendices (for theses, not papers)

Seasoned professionals also tend to turn to the appendices before reading the main text. The appendix contains copies of things such as the briefing sheet which you gave to research subjects. If these are badly designed or presented, then the data which you have collected are likely to be garbage.

Good signs

- Complete 'cradle to grave' examples of each stage of the process from data collection to final tables
- Materials that were seen by respondents which look neat and professional

Bad signs

- All the raw data are in the appendix, making the appendix longer than everything else
- Scruffy, tatty, poorly presented materials seen by respondents

Title pages and acknowledgements

A seasoned professional reading a student's thesis will look at these to check for spelling mistakes and the like. A seasoned professional is quite likely to find some. A favourite mistake is to misspell the supervisor's name and/or to get their title wrong. By PhD level you will probably have learned the nuances, but at MSc level a significant proportion of students, particularly those from industry, will not bother to check, or will not understand the rules. If in doubt, check the staff list, or ask. Getting titles wrong is a good way of irritating people, in industry as well as in academia, and is a sign that you still have a lot to learn.

Acknowledgements are usually a source of harmless amusement before grappling with the abstract and the main text. Sometimes they are useful – for instance, an acknowledgement to a leading authority in the area for help given is a sign that this student has probably been doing some interesting work.

The choice of title for the thesis is itself interesting – is it pompous, vague, full of empty buzzwords, impenetrably technical, boring or forgettable? A good title is informative, short and memorable (so that it will stick in the mind of the reader and increase your prospects of fortune and glory). One device which often works well is the two-part title, with the first part being memorable and eye-catching, and the second part, after the colon, explaining what the first part is about. Our own titles include a range such as: 'laddering' and 'knowing the unknowable: the causes and nature of changing requirements'. The first is a brutally short minimalist title for a brutally short minimalist paper; the second is a deliberately eye-catching title, which did attract quite a bit of attention.

Bear in mind that people searching for relevant documents about a topic will often search on titles, so a whimsical title with no relevant keywords in it will probably be doomed to oblivion (unless it's so good that word of mouth makes people aware of the title), whereas a title like 'laddering', though brutal, is a fair guarantee that a search for 'laddering' will come up with a hit. If you use a two-part title, the second part is usually the one which contains the keywords (but doesn't have to be).

One plausible story is that some seasoned researchers include in the acknowledgements anyone that they don't want to have as a referee for a paper being submitted to a refereed venue. The rationale for this is that the editor will not use as a referee anyone mentioned in the acknowledgements, because of potential conflict of interest problems. So, if you have fallen out with someone in your field who might relish the prospect of refereeing one of your papers, you use a form of words such as 'we would like to thank X for various discussions about this topic' and reduce the risk of unwanted trouble.

Abstracts

Writing abstracts is an art form in its own right and needs practice. You need to say (preferably on one side of A4 for a thesis or in one paragraph for a paper) what you did, why you did it, what you found and why it is significant work in terms of both theory and practice. If you can't guarantee from the outset that you can achieve all of this, then you need to replan your research design, but that's another story.

The best advice is to practise a lot and to get feedback from experts. The next best advice is to look at the abstracts of papers that are generally viewed as significant in your area.

Good signs

- Appropriate use of specialist language
- Clear
- Significant findings and implications
- Immaculate spelling and punctuation (this is the first page of text, after all, and the one which makes the first impression, so you should make a lot of effort to get this one right)

Bad signs

- Inappropriate style
- Buzzwords
- Sales pitch
- Content-free
- Unclear

The contents page (for theses, not papers)

There should be a contents page.

Good signs

- Layout and structure of the thesis follow standard conventions for the domain (if there are standard conventions)
- Neat
- Clear
- Informative
- Appropriate number of tables for the domain
- Appropriate number of figures for the domain

Bad signs

- Non-standard layout and structure for no obvious reason
- Tatty and scruffy
- Inappropriate number of tables and figures for the domain
- Page numbers do not correspond with those in the text

Domains differ. Some like tables and figures, some don't. If you're using figures from other people's work, watch out for copyright.

Every table should be there for a reason; there should be as many as necessary, but no more. Beware of presenting the same information more than once in different formats – for instance, once as a histogram and once as a pie chart. This looks like gratuitous padding and makes the reader wonder what you're trying to divert attention *from*. There are some situations where it is necessary to use different formats, but these are rare and should be preceded by a clear explanation of your reasons.

Favourite methods of padding a weak piece of work include:

- Humour (second golden rule: don't try to be funny)
- Clip art
- Excessive reworking of the same material into different tables
- Gratuitous use of colour in tables and figures
- Excessive quantities of appendices

If any of these are visible in your contents pages (or anywhere else) you are looking for trouble.

The first page

This normally forms part of the introduction (though some writers have eccentric styles and domains differ). It is an important page, because it is here

that most referees and other assessors will form their first impression of whether your work is excellent, acceptable, borderline or dreadful. Once they've formed that impression, it's pretty hard to change it. Here are two examples of text from first pages of published papers.

Example 1

Laddering is a technique initially developed by Hinkle (1965). Like repertory grids (e.g. Shaw, 1981), laddering originated in clinical psychology and personality theory, specifically in Kelly's (1955) Personal Construct Theory (PCT). However, similar techniques appear to have arisen independently in cognitive psychology (e.g. Graesser, 1978; Graesser, Robertson, Lovelace & Swinehart, 1980), and in occupational psychology, in the form of hierarchical task analysis (e.g. Annett & Duncan, 1967; Hodgkinson & Crawshaw, 1985). It should, though, be noted that although the output from the latter is similar to that from laddering, the elicitation method used to generate it appears generally to consist of unstructured interviews (see Hodgkinson, *op. cit*).

Example 2

The basic idea behind the sorting techniques is simply to ask respondents to sort things into groups. The things may be *objects*, such as different types of mouse, or *pictures*, such as screen dumps of various screen layouts, or may be *cards*, with the names of objects or situations on the cards, such as the names of different editors. The groups may be ones chosen by the questioner, or ones chosen by the respondent, or a mixture of both. The sorting techniques are a useful way of eliciting respondents' groups, and of finding out how much agreement and disagreement there is between respondents about the categories.

The first example is tersely written and includes the seminal texts, as well as references to relevant approaches in two other literatures. This shows that the authors have done their homework and more. There is also a note about differences between approaches, which shows that the authors have read the other texts in detail and understood them. The language is formal and the authors use specialist academic forms of abbreviation such as '*op. cit.*' This was clearly not a paper written by someone making it up from general knowledge supplemented with secondary sources from the internet.

The second example is written in a much less formal style, with no references, and with unsupported assertions. The authors clearly have practical experience of what they are talking about, but the paper gives little clue about whether they are from academia or industry, or whether they are expert or novice.

The first example is user-hostile at first glance, but sends out a clear set of positive signals to the academic reader – it is solid, heavyweight and written by professionals who know what they are doing. Although it is heavy reading,

it is not vague or packed with buzzwords. A journal referee or an external examiner's reaction to this text would be to think: 'Well, we're not looking at a rejection/fail here if the rest is like this'.

The second example looks user-friendly, but would set a referee or external examiner's alarm bells ringing because of the lack of visible evidence of academic weight (as opposed to practical experience of the technique). Their reaction would probably be to flick rapidly through the next few pages to see whether there was any improvement later; if not, there would be a real risk of a rejection or fail.

One of the interesting things about these two examples is that they were written by the same authors, on closely related topics, but for very different venues. The first example was from a journal paper submitted to a journal through the normal channels; it had to be heavyweight enough to convince the referees that it was well worth publishing. The second example was from an encyclopaedia article, where the encyclopaedia invited the authors to write the paper for a non-specialist audience. This meant a quite different set of possibilities and constraints from the journal paper – there was no need to use a terse, condensed style for instance.

Good signs in a first page

- Clear
- Appropriate writing style (formal, erring on the side of being dry and terse)
- Right references
- Good research question

Bad signs in a first page

- No evidence of academic content
- Unclear
- Poor or missing research question
- Pleas for mercy and other indications of blood in the water

The next thing the critical reader usually turns to is either the method section or the results section (not always, but often – they will return to the second page later).

Method section

The method section is there for a reason. The reason is that if anyone wants to replicate your work, or to build on it, then they need to know exactly what you did, how and to whom. A second reason is that the reader needs to be able to make an informed judgement of the quality of what you did. If, for instance, the reader discovers that you recruited all the subjects for your study of hobbies in the high street on a Saturday afternoon, then the reader may have

just cause for suspecting that hobbies such as mountain climbing might be seriously under-represented.

In some disciplines, such as psychology, the methods section is usually so formulaic that it is (a) extremely terse and (b) more or less incomprehensible to a layperson. Using such formulae can be a useful way of sending out the right signals to the reader. For instance, if you see something along the lines of 'a counterbalanced within-subject design was used' then this implies that the writer is a professional who knows just what they are on about.

The method section is a feature of experimental research and will not usually be present in papers following a different approach.

Results section

Domains differ. In experimental domains, the usual preference is for the results to be given as baldly as possible, preferably with no comment or discussion. Explanation or clarification is usually acceptable, especially if space constraints mean that you have to use short names for column headings etc.

Good signs

- Enough tables
- Clear rationale for each table and its position in the sequence
- Tables well laid out
- Numbers add up correctly

Bad signs

- Too few or too many tables
- No clear rationale for why each table is where it is, or why it is included in the first place
- Poorly laid out; tatty and scruffy
- Numbers don't add up

Discussion

For some reason, discussion sections are less rich grounds for hunting signs of expertise and weakness. It may be that desperation spurs even inexperienced researchers to generate eloquent and plausible stories to explain what they have found.

As usual, appropriate use of technical terms and of references to the literature are a good sign; buzzwords, general knowledge and irrelevant references to outdated textbooks (more likely to occur in theses than papers) are a bad sign. An elegantly constructed experimental thesis will often have a discussion section whose structure mirrors the introduction and the results sections,

with a series of questions being asked in the introduction, answered in the tables in the results section, and then discussed in the discussion section.

Conclusion

The conclusion section often also includes a section on 'further work'. The conclusion should provide a clear set of answers to the questions raised in the introduction. These should be supported by the evidence in the results section (if it is an experimental piece of work) and in the discussion section (whatever type of work it is).

The further work section is a useful place to stake a claim and establish priority in an area. An experienced researcher will often include here a brief description of something which they are planning to do; an experienced reader will know that by the time the paper has appeared the writer will already have spent at least a year on the topic described in the further work, so there is no point in rushing into that area.

Critical reflections section

Some people favour a critical reflections section in which the writer reflects on what they have learned during the research process, and on what they would do differently knowing what they know now. Other people believe that this is pretentious navel-gazing at best, and gratuitous pouring of blood into the water at worst, not to mention a gross breach of the third golden rule (don't panic and blurt out the truth). We can appreciate the arguments on both sides.

Sometimes a critical reflections section is a requirement for MSc theses. If you are an MSc student reading this book with an eye to the future, and this is the case for you in your MSc, then you don't have a lot of choice about omitting the critical reflections section completely. All is not lost, however, if you are in this situation. Here are two examples.

Bad example

I realize now that my questionnaire was poorly constructed, and would pay more attention to constructing it better if I started again.

(Subtext: I am a raw amateur, ignorant and low in self-worth; there is no good in me.)

Good example

It would be interesting to compare the rough set theoretic analysis used here against Rosch's concept of prototypical set membership with fuzzy boundaries.

(Subtext: I analysed my respondents' categories using a state-of-the-art mathematical approach which few people have even heard of, instead of boring old standard content analysis. I am also familiar with a completely different approach from a completely different discipline, which not

many people have heard of. I am not the sort of person who pours blood into the water at any time, and I certainly don't plan to start doing it now.)

As might be apparent from the closing sentence of the allegedly good example, there are potential dangers in sending out too strong a signal of this sort, so this approach needs to be used with discretion.

Reading a lot

You need to read a lot. You need to read a lot in your own discipline (so that you have a thorough grasp of what it is all about) and in other disciplines, both apparently relevant and apparently irrelevant. Much of the best work comes from cross-fertilization between apparently unconnected fields.

In your own field, you should read in depth and in breadth and in *time* – you should have a detailed knowledge of the relevant literature in your chosen area, and a general knowledge of the main work in related areas, and of previous work in your area for as far back as possible. For your own area, you should be reading everything up to and including the most specialized journal articles. For other areas, you might find book chapters a more appropriate level (though be careful about the level of the book – don't even think about popular books for the lay public, and be wary of textbooks unless they are prestigious ones).

Reading habits of lifelong readers

- Steady consumption. The idea is not so much to read voraciously as to read regularly. Use a tortoise strategy, rather than a hare.
- Always carry reading with you – use the ten minutes on the train platform, or while you're waiting for your supervisor, or between seminars, or while dinner is cooking.
- Leave papers in the loo.
- Keep an annotated bibliography – and keep it up to date.
- Find a regular reading time, about an hour a day. For many, this is first thing in the morning. Don't go straight to your office; go to the library first for your hour.
- Read books as well as papers.
- Most great readers are a little obsessive and like to get a sense of 'completeness' when they're reading on a new subject. Many 'map' the key writers.
- Make sure all your photocopies of papers have full citations on them, down to the ISSN or ISBN and page numbers.
- Most great readers maintain more than one reading strand – so morning time may be technical reading, but bedtime is philosophy reading.

- Read a chapter every night before you sleep, no matter how tired you are.
- At conferences, carry the proceedings to the sessions with you and annotate the paper with your notes during the talk.
- Even when you find a paper uninteresting, cast your eye over the remainder, so that you have a portrait of the contents.
- Use your network to filter your reading, hence increasing the interest level of what you pick up.
- Join (or form) a reading group, or find a reading buddy.
- From Feynman (as recalled by Michael Jackson): when reading something difficult, if you get stuck reading something, start again from the beginning (this allows you to rehearse the early sections, correct misunderstandings that accumulate and benefit from elapsed time).
- Elapsed time can help: skim-read the material, then set it aside briefly before coming back to read it thoroughly.

Using material from the literature

You will never lose by giving credit. Indeed, you are likely to gain respect and trust by doing so fastidiously.

Plagiarism

The interpretation of what constitutes plagiarism is subject to cultural variation, but it's the British academic interpretation that applies to your work, and the British academic interpretation is strict: plagiarism is using someone else's ideas, words or material – directly or indirectly – without giving them credit.

The rules are very clear:

- Any time you use ideas, words or material of any sort that relates to a specific source, you must attribute it to that source. Paraphrasing (restating) still requires attribution.
- Any time you use someone else's works verbatim, you must put them in quotation marks and attribute them to that person.

Let's be absolutely clear. Plagiarism is academic suicide. In British academia, plagiarism is a 'mortal sin'. If your dissertation plagiarizes, *you will fail*. If you submit work for publication that plagiarizes, your work will be rejected and *you will be blacklisted*. So, if in doubt, attribute.

Uses of citation

Authors convey many things through their use of the literature. Some of what they 'say' is about the content of the paper (instrumental use). But some is about themselves (expressive use):

- establishing your authority;
- siting your work in existing knowledge;
- coverage – showing that you know the conventions, what is expected;
- depth – showing you've come to grips with esoteric aspects of the literature;
- excluding areas you don't want to cover, while indicating that you do so informedly;
- showing respect for your referees;
- establishing a justification for your research question;
- establishing a justification for your methodology;
- establishing a justification for your analysis;
- providing a theoretical context or perspective;
- corroborating your findings.

Consider the following:

- If you cite a philosophical text from 1925, what are you saying?
- If your bibliography contains mainly books, what are you saying?
- If your bibliography includes the three key players in the field, what are you saying?
- If your bibliography includes only papers published in the last two years, what are you saying?
- If half of your bibliography is self-reference, what are you saying?
- If your citations appear in clumps (e.g. Sponge 1982; Bloogs 1998; Gloomer 2002), what are you saying?

Now try the following:

- Look at the first page of a few published research papers.
- How many citations are there?
- How are they grouped?
- Where does the first citation arise?
- What sorts of paper are cited? Are the titles general, or specific?
- When were they published? Who are the authors?
- Look at the discussion/conclusion portion of the papers.
- How many citations are there?
- How are they used?
- Are they the same citations that appeared in the background/introduction, or are they different?

Incomplete or non-existent references: why they are sinful

So there you are in the library, two long weary years into a PhD on critiques of Marxism, browsing a book on something totally unrelated as a displacement activity, when you come across the following lines:

> A critical flaw in classic Marxist theory, identified clearly in Mackay's classic work on the topic, is that Marx was not only writing before system theory, but also before even deterministic game theory. Mackay's recasting the Marxist enterprise in terms of system optimization versus subsystem optimization via multi-goal stochastic game theory, brilliantly synthesized with a version of possibility theory which incorporates schemata usage in implicit behaviour and provides a firm grounding for political thought in what might be termed the mathematics of virtue.

After some frenzied work with an encyclopaedia and the internet to discover what the technical terms mean, you realize that you have stumbled across a fleeting allusion to what appears not only to be a coherent, solidly based critique of Marx, but also a solid, coherently based model for a viable neo-Marxism, with enormous implications for politics and economics. This looks like something which could devastate your thesis, so you turn to the references to find out more about Mackay's classic work. And you find that there's no mention of it in the references. Nor is there any mention of any Mackay in any of the co-authored works in the references. Nor is there any mention of Mackay anywhere else in the text. A quick despairing search session in the library confirms your suspicion that there are a lot of Mackays in the world, but none of them appears to have written the text in question. You find yourself wishing that you could slowly torture the perpetrator of that missing reference to death. In desperation, you try to contact the perpetrator to ask them for more information, only to find that they died some years ago (perhaps at the hands of someone else who encountered the same missing reference).

You are now faced with a hard set of decisions. Do you continue with your thesis knowing that there might be a fatal flaw at the heart of it? Do you spend years trying to track down the missing reference? Do you abandon your approach because it looks fatally flawed? Do you give way to the dark side, use Mackay's approach, pretend that it was your own bright idea, and wake every night screaming from a dream in which your supervisor introduces you at your viva to your external examiner, one Dr MacKay, who has apparently taken considerable interest in your work?

An extreme scenario, perhaps, but many – perhaps most – researchers have had the experience of stumbling quite by chance across a piece of work in an unrelated discipline which has enormous implications for their own work. That has happened to us. It is enormously frustrating to have to spend months or years trying to track down the relevant article because the person who mentioned it does not give an adequate reference. That has also happened to us.

And this is why references are taken so seriously by professional researchers.

What's the difference between a literature survey and a literature review?

Students' use of the literature usually matures and focuses during the course of their research in a way that corresponds to the development of their research question. The development goes through several phases, as shown in Table 2.

So, the difference between a literature survey and a literature review is the difference between report and critique. Ideally, the completing student should have developed a 'critical voice'. The literature review in the dissertation should 'make sense' of the literature in terms of the thesis. If the literature review is well-structured and appropriately critical, then, ultimately, the research question 'emerges' as an 'inevitable' conclusion of the literature review.

Keeping an annotated bibliography

The core literature repertoire

One of the things that established researchers have is a working knowledge of the relevant literature. Most established researchers have a core repertoire of some 100–150 works on which they can draw readily. These are a useful selection from the hundreds or thousands of articles and books the researcher has digested over time. The repertoire gives a researcher a context in which to place ideas: the collection characterizes the major strands of thinking in the field, identifies the major researchers, and provides research models and examples. Of course the repertoire evolves and must be updated.

Part of doctoral study is acquiring one's own core repertoire. The annotated bibliography is an effective mechanism for facilitating this acquisition – and for keeping a record of the majority of papers that fall outside the core. The annotated bibliography is a powerful research tool. It should be a personal tool, keying into the way you think about and classify things.

Table 2 Development of students' use of literature

Entering student	*Later student*	*Still later student*	*Completing student*
Knows which research area	Knows which research topic	Knows what research question	Knows what research evidence
Reads to find what's already known			Reads to know what isn't already known
Surveys, collects, reports	Organizes information	Selects information relevant to research question	Judges information (quality and gaps)
Wonders how to organize sources	Wonders how to identify problem	Wonders what has been already said about the problem	Wonders what has not been said about the problem

What the annotated bibliography should include

It should include, as a minimum:

- the usual bibliographic information (i.e. everything you might need to cite the work and find it again);
- the date when you read the work;
- notes on what *you* found interesting/seminal/infuriating/etc. about it. (The notes should not just be a copy of the abstract; they should reflect your own critical thinking about your reading. They can be informal, ungrammatical, even inflammatory, as long as they retain meaning about your reading. If you read a paper more than once and get different things from it, then add to the notes – but do keep the original notes, which can prove useful even if you've changed perspective or opinion.)

It can include many other useful things, such as:

- where the physical copy of the work is (e.g. photocopied paper, book borrowed from the library, book in one's own collection);
- keywords, possibly different categories of keyword;
- further references to follow up;
- how you found the work (e.g. who recommended it, who cited it);
- pointers to other work to which it relates;
- the author's abstract.

The discipline

Keeping an annotated bibliography is a discipline. It is easiest to establish a discipline of writing notes about papers as soon as you read them and not going on to the next paper until you have done so. It's *much harder* to go back and try to catch up. Because keeping the bibliography is an 'overhead', and because the point is to maintain access to material, it's best to keep entries to under a page per paper.

Never delete things from the bibliography. 'Discards' can be re-categorized or filed away separately, but one year's 'junk' may be another year's 'gem' (and vice versa). There is also genuine value in keeping track of the changes in categorization: one way is to keep a list of working category 'definitions'. Don't discard the old scheme after a revamp; rather, file it as part of the record.

The discipline is to keep up a continual, accumulating record of your reading and thinking.

Other ways the bibliography can help

- It can help you to 'backtrack' on your own thinking
- It will reflect the evolution of your reading, of what you found important over time, and of your writing about what you read

- When you find a reference and can't remember the paper's particular perspective, the notes can give you the key
- When you reread a paper just before your viva and say: 'Oh no, it doesn't say that at all, what could I have been thinking?' then the notes will be invaluable

The bibliography can help you to manage your reading effectively and keep accessible much more information than you can remember without aid. Always remember:

- keeping a bibliography allows you to use a 'flat', unambiguous physical filing system (e.g. alphabetical by author) while being able to categorize, re-categorize and search fluidly;
- the bibliography can help you avoid rereading papers that are useless and forgettable but have interesting titles;
- the bibliography can help you keep track of the physical form and location of materials.

Mechanisms

There are different ways to keep a bibliography. The most common forms are card catalogues and electronic databases.

Card system examples (from Sally Fincher)

- Kenneth O. May (1973) *Bibliography and Research Manual of the History of Mathematics*. University of Toronto Press. (particularly pp. 2–27).

- Robert M. Pirsig (1991) *Lila: An Inquiry into Morals*. Bantam Press (particularly pp. 22–9).

Bibliographic software packages
Papyrus: http://www.rsd.com/
ProCite: http://www.risinc.com/
EndNote: http://www.niles.com/

Many people don't use specialist packages, preferring to adapt database, spreadsheet or word-processor usage. Many effective bibliographies are simply kept as very long text files.

- Where possible, keep a written record of agreements at each stage – for instance, agree authorship via email.

Paper checklist

Content

- Do you have a clear question?
- Have you demonstrated why the question is interesting?
- Have you demonstrated why the question is non-trivial?
- Have you demonstrated why the answer is non-obvious?
- Is your 'red thread' evident; do you have a clear and coherent argument?

Setting your paper in context

- Have you located your work with respect to the existing literature?
- Is it clear what theory informs your work and how your work contributes to theory?
- Have you discussed the assumptions, antecedents and limitations of your work?
- Have you discussed how your work leads forward to future work?

Evidence

- Is your evidence clearly presented, according to the standards of your discipline?
- Is your interpretation distinguished from your data?
- Do your conclusions follow from your evidence?
- Can someone repeat or replicate your work based on the description given in the paper?

Due credit

- Have you agreed on authorship and on the order in which authors are listed?
- Have you acknowledged the people who should be acknowledged?
- Are the citations accurate and complete?

Use of literature

- Have you cited the seminal text(s)?
- Have you cited the classic texts?

- Have you cited the foundational text(s)?
- Do you have at least five references on the first page?
- Do your references span the period from the seminal paper to last year?
- Have you included a reference which shows you know the literature which goes beyond the standard references for a particular topic?

Venue

- Have you decided on the venue?
- Have you checked for deadlines (if applicable)?
- Have you read and followed the guidelines for authors?

Presentation

- Have you followed the guidelines for authors?
- Are figures and references in house style?
- Have you spell-checked the paper?
- Have you used appropriate national spellings (British or American)?
- Do the headings provide useful and sufficient signposting?
- Does your presentation conform to the conventions in your discipline?