

Research Methods Notes

Research Methods for Master's Students

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1. RESEARCH METHODS

Welcome to the Research Methods Unit. You are now coming towards the end of your course and starting work on a major project or dissertation. The project will require considerable effort from you and in particular you will be expected to carry out significant research to support whatever project idea you have.

Sound research is the cornerstone of any project and without significant research you will not be able to reach the standard required for a Master's award.

For this reason we will study a unit devoted to research and research ideas so that you understand what research is and be in position to carry it out for yourself. Research may be new to you but if you engage with the material I am sure you will find the learning experience exciting, stimulating and self-rewarding

The set book for this part of the course is: Robson, W (1997), Strategic Management of Information Systems, Prentice Hall, 0-27361591-2

1.1 What is Research?

In this unit you will 'say hello to research'. Walk around any good University and you will see academic staff busy with research projects, going off to conferences, writing scholarly papers and collaborating with colleagues and students on research tasks.

So what's it all about? In academia, research has to be carried out in a rigorous and systematic manner. Research methods have evolved which guide researchers through the process of research. In any one piece of research, several methods may be used and drawn together and expressed in the over-arching 'Research Design'. There are several ways of categorising research methods and one way is to think of a research method as either being qualitative or quantitative. To some people, these distinctions are irrelevant since the important thing is which method is useful in a given context. It is often the case that both qualitative and quantitative methods are used within one study. To others however, the distinctions are passionately debated. In this lesson, we will look at a model of research which fits well with a deductive research design using quantitative research methods. We will see that the stages of research can be viewed as cyclical and iterative. The process starts with asking a question, and if the deductive approach is used, formulating a hypothesis, deciding on what the variables are, collecting data and then the hard part – asking what does it all mean?

1.2 Exploration

To start the lesson off we will just do an exploratory exercise that looks at a simple research question but at the same time deepens your understanding of the various viewpoints and issues – now try to remember this is just an exercise and it is intended to show you how complex even the simplest question can be once you are determined to explore it and its issues.

Every business requires assets to carry out its function and these range from photocopy papers to desks and chairs to computers, staff and premises and even policies and procedures. In general each asset costs something to buy and support throughout its life and therefore every asset contributes to gaining commercial success. For example, suppose you were asked the question 'what can we do for staff to improve their productivity?' How would you go about answering this question? Well one way is as follows:

Viewpoints – we may look at the above question from several viewpoints: technological, managerial, financial, worker view and so on.

Issues – we may conclude that there are many issues surrounding personal productivity for each of these viewpoints: working conditions, tools available, staff working space, computer systems, training and so on but after much thought we decide to concentrate on staff personal working space: is it poor, overcrowded, not suitable for computers etc. Now I need to analyse the issues surrounding personal working space to see if I can find an 'angle' (lighting, furniture, feelings of staff, decoration, safety etc) that is something that I think is important and will allow me to focus my research. So let's say my angle is desk furniture so how do I now proceed?

Context – issues will always exist in a context and you must be aware of the context if you are to avoid making serious misjudgements. For example in this case the context may be that the company we are working for is in a major expansion phase, or the departments involved all have new staff, or this new expenditure comes after a major phase of redundancies and so on.

Scope – what area will I look at: manager's desks, junior staff desks, just one department etc

Belief – that personal productivity is related to working space and in particular desk space?

Predicted Outcome – productivity will improve. One needs to be very careful here as it is always difficult to predict outcomes. The tendency is to predict only good outcomes and forget that there may often be very undesirable side effects of any decision.

Logistics – that is how can we allocate all the necessary resources to make sure this project's outcomes are realised.

Risk – that the introduction of the new furniture will disrupt normal work in the first instance but also may not realise the intended outcome.

Side Effects – there may be side effects to this decision that have a positive effect and also there may be ones that have negative effects

Values – that I value highly the staff, their comfort and general health.

Resolution – buy staff new ergonomically designed desks and chairs. But note that this is only one alternative and you should explore several

Cultural Feasibility - how acceptable is it to situation actors?

Next we shall look at some variable factors that in some way are within our control but affect our decision and affect the way the decision is implemented, affect the perception of the change by users and finally affect or moderate the change.

2. RESEARCH PLAN

Here I am going to decide how I will find out all I need to know in order to support my 'angle'.

Literature Search – this is about preparation for doing the actual research – that is preparing your mind. To do this you need to learn all you need to know to be effective in your research. So in this case that might be include catalogues, books and journals that allow you to become expert in desk furniture and its uses.

Initial Costs? – these are easily obtained.

Installation Costs? – these are easily obtained.

Training Cost – these are easily obtained

Life Cycle Costs – these are hard to calculate but may be critical in the choice of what to buy. Here we are talking about support costs throughout the life of the asset.

Intangible Costs – these are hard to calculate but may include energy, time, emotion, power, stress and commitment.

Pilot Study – I decide that I must set up a case study before I can make my recommendations.

Conclusions - Once I have assembled all this information and tested my ideas I could now make a decision. I may then be able to conclude:

Intangible Benefits – hard to define and demonstrate but might be something like 'better working conditions' or 'improved staff morale'.

Tangible (Monitory) Benefits – I expect to get improved productivity, this has a monitory value and means that my operating costs are lowered. However, you might have a real hard time demonstrating this to anyone – what data would you collect, are working conditions a real variable and so on.

We could have come up with several other resolutions besides changing the desks. You might like to think of some, then work through the same process: viewpoints, issues, context and so on. Acquisition of desks and all the knowledge that goes with that idea may not be difficult but even in this simple case there is no obvious way to know that you have made an optimal decision or even a good decision. We may think of the above process: viewpoints, issues, context... as ways of answering a research question. In our simple example the question started off as 'what can you do for staff to improve their productivity' - this was later refined or focused onto 'how will the acquisition of new furniture affect business productivity'?

2.1 Testing/Evaluating Ideas

Later in the unit we shall have much more to say about ideas and how we generate and handle them – for now we will just think about how they might e tested. Whenever we get an idea that we want to take forward to implementation we must test it for feasibility – the method below was suggested by Checkland 1991. The usual tests are as follows where we attempt to identify those ideas, which are:

Systemically Desirable - that is will the change suggested improve the problem setting in some way. But in fact we also ask does the idea 'spill over' from its local setting into a benefit for the whole organization.

Culturally Feasible - consider whether a change would prove acceptable to those affected by it.

Efficacious - will whatever system you propose actually work –will it in some way resolve the issue?

Effective - will the system work in the long term? The implication is that the change will apply to the whole organisation in terms of benefits

Efficient - will the system work in some optimal manner to carry out the given tasks. Efficiency gains are often local to a section or department so the implication of efficiency gains tends to have a small net effect for the organization.

Ethicality - is the proposal change ethical or within accepted codes of practice.

Elegant - is the solution pleasing to the designers in a technical sense

2.2 How Does One Get a Strategic Plan?

Have you thought about this? In the above I gave you a little procedure for acquisition but did my procedure amount to an acquisition strategic plan? To construct a plan there is a simple VISA acronym:

- V – Build your plan on a set of values that you set your organisation
- I – Build your plan by looking at issues (needs if you like)
- S – Build your plan by looking at your strengths – concentrate on what you do well
- A – Build your plan based on aims that you have set

So there are many ways to construct a plan, in this example it is based on issues (needs):

- Step 1.** Review your market position and potential so that you really understand where you are.
- Step 2.** Review your resources to see if they really meet one's needs.
- Step 3.** Review your logistics – how can I get the resources to where they are needed?
- Step 4.** Outline as best you can your values (principles, standards, morals, ethics and ideals).
- Step 5.** List your needs at an appropriate level of resolution.
- Step 6.** For each need state an action (your strategy) again at an appropriate level of resolution.
- Step 7.** Assess the major risks.

In practice it is usual and I think best to start with needs and one often finds that the other elements begin to emerge as you list them. Let me give you some examples. Consider these two simple examples and see how they are constructed. In the first example I just list the various issues under each heading and in the second example I just use needs to generate an action plan.

2.3 Resource Strategy

The resource strategy is not yet fully formulated but its aim is well understood in that the University wishes to ensure that there is at least adequate Learning Resource to support all enrolled students in their subject area and in the development of academic skills. The resources may be broadly classified as dealing with the physical environmental factors such as learning spaces and technology as well as the direct learning factors related to knowledge, understanding and skill development. It is hoped that when these factors combine for an individual student they will mean that learning is exciting, stimulating and self-rewarding. A preliminary strategy is being developed with the following four elements in mind.

- Values**
- we value student success at whatever level.
 - we value the notion that we should meet student needs in the curriculum.
 - we value our reputation with regard to student support in learning.
 - we value the knowledge, understanding and skill building process.
 - we value that notion that students should find fulfilment in scholarly activities.
 - we value the notion of adding value during study
 - we value the notion of giving value for money in learning

- Issues**
- Widening participation.
 - Generating income from the sale of a reliable learning products.
 - The University reputation.
 - Student support with an ever-widening student body: WP, disability etc
 - Meeting individual and personal learning needs.
 - Maintenance of standards.
 - Scholarship and ontological learning entities
 - Equal opportunities

- Strengths**
- Strong subject areas
 - Online provision for learning materials and communication
 - Lively and appealing programme portfolio
 - Supportive infrastructure
 - Committed staff
 - Strong research profile
 - Planning for Learning development

- Aims**
- Widening Participation
 - Raise student numbers through bidding and other means
 - Develop markets by portfolio branding
 - Distribute Learning resources
 - Further develop the communications infrastructure

Here is another example and in this case its about developing a Curriculum Strategy

The curriculum strategy is focused on satisfying the following needs:		
Need Area		Comment
1	Student Growth	How do we ensure student growth by managing the portfolio?
2	Stable Environment	How do we ensure that we have a stable University environment yet allow for curriculum change?
3	Retention	How do we ensure progression through the curriculum?
4	Portfolio Management	How do we manage the course portfolio so that we meet the needs of our customers economically?
5	New Course Ideas	How do we encourage the generation of viable course ideas?
6	Outside Agendas	How do we balance our portfolio against outside agendas?
7	Programme Needs	How do we establish a need for particular programmes?
8	Programme Demand	How do we balance a known programme need against a clear student demand?
9	Entry Conditions	How to manage our entry conditions to control demand, ensure retention and meet WP objectives?
	etc	

From these needs the following strategy has been derived.		
Need Area		Action Comment
1	Student Growth	To provide a mechanism whereby Faculties review their portfolios with regard to student growth.
2	Stable Environment	To focus University processes and structures onto the needs of the curriculum.
3	Retention	To ensure we have effective L&T strategies that are accompanied by workable action plans?
4	Portfolio Management	To provide a Faculty mechanism for reviewing the portfolio against University PIs with results being scrutinised centrally.
5	New Course Ideas	To create course development forums who are charged with defining new markets and their potential.
6	Outside Agendas	To create mechanisms whereby outside agendas are considered in order to assess their importance and suggest, where appropriate, modifications to action plans.
7	Programme Needs	To provide a marketing infrastructure that is tuned to predicting student needs and demand.
8	Programme Demand	To balance student demand within our portfolio by means of well-defined faculty and cross faculty targets.
9	Entry Conditions	To define and operate a flexible means whereby a student's prior learning and potential to benefit from a programme of study is assessed.
	Etc	

The other thing you should note here is that I have not listed the expected outcome or outcomes. It is very important that you do this and fully consider both positive and negative outcomes. Do not give up if you find negative outcomes; just reconsider your action or look at how you could resolve the negative outcome.

Don't forget logistics – that is how you will allocate the resources to make all the necessary actions possible. Finally, always be aware of the values (yours) implicit in your actions. The point here is that there will always be a motive behind any suggestion and it is wise to be aware of it.

Now this is a simple example just to illustrate the idea as to how strategies emerge. Strategic plans tend to be for the long term – perhaps something that will be developed over several years and so the results will only emerge over time. The implication is that forming strategic plans needs a lot of careful thought and evaluation of data.

2.4 Information Value and IS Investment – Some Discussion Questions

In your project you will be working on an IT scenario so we need to look at the idea of the value of information and how that value can be increased by appropriate use of IT and systems. This chapter is very important and for this reason I want you to find answers to the following questions – you MUST internalise this material if you hope to do well in the assessment and later in your project.

When we talk about costs – are they exclusively financial in nature? Discuss and explain your answer and hence form a simple definition of cost.

When we talk about benefits – are they exclusively financial in nature? Discuss and explain your answer and hence form a simple definition of benefit.

Explain why it is necessary to take a wide view of resources if they are to be used effectively?

Think about the notion of risk and explain it in terms of costs and benefits?

How can we measure the performance of a change to quantify benefits/costs?

Discuss why IS cost estimates are difficult to obtain and even more difficult to justify?

What is an asset and how do we put a value upon it?

Make a list of all the cost elements implicit in an IT investment that you can think of and what does the list tell you about cost estimating?

Why do IS budgets continue to rise if IT unit costs continue to fall?

Is it possible to calculate the cost/month of an IS investment over say a 10 year life cycle? Discuss and explain your answer.

2.5 Epistemology

Research is about the search for knowledge but the question is what is knowledge and can that knowledge be in any sense true or false. We have a term for this, which is called epistemology, and it is best understood as the science of obtaining knowledge and justification (evidence for the knowledge if you like). It is a branch of philosophy that deals with knowledge and tries to answer the question as to whether a given body of knowledge is adequate or inadequate. It is hard to define this notion of adequacy but it can be thought of as relating to whether there is good evidence for the knowledge, is the knowledge useful and whether ideas and theories are well understood, their limits are known, how the knowledge arose and has its area of application been mapped; or to put it another way, do we have a model or structure of a particular body of knowledge and its development (say desk furniture)?

Just to give a simple example, suppose I ask the question: are your friends trustworthy? Most of us would answer yes but how did we arrive at this knowledge and what evidence do we have for it? Epistemology is a major subject area and we cannot go into details here but suffice it to say any knowledge is based or grounded on perceptions, our memory, or it might be related to introspection, or we might arrive at it by induction and lastly by a form of *a priori* reasoning (by experience if you like). These ideas of justification are often spoken of as grounding one's knowledge.

The methods mentioned above imply that there are various (apparent) sources of knowledge: vision, hearing, touch, taste and smell all seem to furnish us with knowledge of how the world currently is. Memory also seems to help us with knowledge of how the world was, imagination gives us knowledge of how the world might have been or may be and experience tell us how the world works. If you want to explore this idea further see the paper at <http://pespmc1.vub.ac.be/EPISTEMI.html>. With these thoughts in mind it is as well to note the following stricture:

"It often does more harm than good to force definitions on things we don't understand. Besides, only in logic and mathematics do definitions ever capture concepts perfectly. The things we deal with in practical life are usually too complicated to be represented by neat, compact expressions. Especially when it comes to understanding minds, we still know so little that we can't be sure our ideas **about** psychology are even aimed in the right directions. In any case, one must not mistake defining things for knowing what they are."

Marvin Minsky, (1986), *The Society Of Mind*, Simon and Schuster

2.6 Ontology

This is the science, if you can call it that, of what a 'thing' is. In this context we are thinking of the 'thing' called 'knowledge' – to get an idea of what this means try to say what a body of knowledge is (define it if you like), imagine it just the way you would look at a say a car and try to get to its substance and essence. For example for a car we could describe its colour, top speed, engine size, seating capacity and so on. Can we do the same for a given body of knowledge (your Project for example), can we make a list of its features so as to have a description of it, can a knowledge take action, can a knowledge change into something else, does it link to other knowledge, does knowledge have substance and so on.

2.7 Research Questions

So this lesson just introduces you to the idea of exploration and how that might lead to strategic plans related to computing or IT. I hope it has encouraged you to think of a suitable research question for your own dissertation/project. Your research question will be related to the degree you are following: if you are involved in system development then the expectation is that your research question will relate to building some software artefact whereas if you are doing a more general IT strand then you may be allowed to build an artefact or a more general style of research project.

What I am looking for is that you formulate your project idea as a strategic intention. So you might formulate your research question as 'Computerised Asset Management systems lead to lower operating costs' or 'Computerised Asset Management

systems are a driver of better purchasing policies' and so on. So one style project might actually research and build an asset management system, whilst another might carryout research to show the relation of asset management to productivity. Therefore when formulating your research question consider:

Symmetry - try to make your research question balanced or symmetrical in the sense that you always get a worthwhile result. Read the worked example in Saunders page 15.

Attributes – choosing a research question is difficult for many reasons so it is useful to have a checklist of desirable attributes and a very good one can be found in Saunders page 16. This list is amplified below.

Refinement – it is very common for students to choose a huge topic with no hope of completing it. For this reason one needs to refine one's initial question until it is suitably formed for the time available. Read Saunders page 15 on refining a question and also page 20 on the Delphi technique which is essentially a group problem solving technique.

Specification – at some stage you must write a research proposal or specification. I urge you to really come to grips with the ideas in page Saunders page 23 to 38. In particular you must:

- Organise your idea
- Convince your tutors
- Contract with a client (if this is possible)

2.8 Criteria Used to Assess Research Proposals

Most research proposals are judged against more or less explicit criteria. The following checklist sets out typical criteria, which are used to assess research applications. Not all are applicable to every proposal, but it is worth deciding which are applicable to you, then checking your own proposals against those that are relevant.

Aim and objectives - are these stated clearly, are they consistent with the research methods proposed and can they be met within the time and costs being asked for?

Timeliness - is this an opportune time to carry out this piece of work, is there other current work to which it relates, does it continue a line of enquiry which is topical, is there an urgency to the work which makes it of high priority, is the research original, is it likely to lead to insights, results or outputs which are innovative, is the work relevant, is there a high likelihood of the results being applied by practitioners or to further research?

Wide Application - can the knowledge created be generalised to circumstances beyond those in which the phenomenon under investigation was originally observed?

Background - how does the work relate to current and past work both of the researcher and elsewhere, how does it develop current themes or extend present understanding and does it relate to identifiable gaps in current knowledge and seek to fill them?

Research Methods - are the right questions being asked, is the right data being gathered to enable these questions to be answered and will the proposed methods for analysing the data allow the research questions to be answered?

Competence - does the researcher have the expertise and experience of the subject matter and of the research methods proposed to be able to bring the research project to a successful conclusion?

Facilities and Staffing - are the required equipment and facilities adequate and available? Are any additional resources justified and realistic? If the work is multidisciplinary, does the team contain, or have access to, those with appropriate skills across each of the disciplines?

Programme - does a plan of work show achievable timescales and include interim deliverables?

Collaboration - are collaborative arrangements required and/or proposed, is the management of the cooperative aspects of the work defined and was adequate thought given to exploitation and intellectual property rights?

Deliverables and their Dissemination - in what form is the output expected for example, a published academic paper in a refereed journal, a software program, a piece of hardware. Is the significance of the expected findings understood, both within the field of enquiry and more widely. How is it planned to disseminate the work - to whom and through which channels and will the work be applied and exploited beneficially?

2.9 Discussion Question

You may have an idea for your dissertation/project – try to outline it in some of the ways discussed in this chapter and then informally test it using the above criteria. For example you might ask yourself what viewpoint can I take on my research question, what issues are there within each viewpoint, does my idea have a strategic element and finally can I build an adequate ontology for my research question?

3. EMERGING RESEARCH METHODS

There is a view that research into social issues, and there are many in computing, is better served by qualitative research methods. In an inductive, exploratory research design methods such as the case study or ethnography may be more appropriate. The Grounded Theory research method for instance, aims to uncover the problems/issues which people face and how they go about dealing with them. This is exploratory research since the result is unknown and may be unsuspected. It is a condition of a good Grounded Theory that a hypothesis is not formed, nor does the researcher have preconceptions or even opinions about the outcome. The Grounded Theory researcher listens and looks for patterns occurring in the data and from which a theory emerges. Grounded Theory for instance can use quantitative data as well as qualitative data and can also be thought of as inductive and deductive at the same time! But at least it is definitely exploratory and definitely concerned with social issues! In any event, your research design will depend on your research question(s). Have a look at your research idea, possible research questions and think about which research methods will best help you answer your questions.

3.1 Research Questions

One always starts with a question and research is about trying to answer it. To answer a question you need to learn all the necessary theories, conventions, technologies and so on – this will be covered later in detail when you do your Literature Review. For now we will assume that you have learned all you need to know and so we need to concentrate on ideas and how the question may be answered. Getting ideas is not algorithmic – there is no certain way to make sure you get them, there is no procedures that you can follow that will guarantee good ideas or answers. But if you are going to go beyond what is known you have to get ideas and you have to find answers! This is hard work but its really exiting and well worth the journey!

You may have read about Lucasian Professor Stephen Hawking and his ground-breaking work on theoretical Physics. When he submitted his PhD thesis, his tutor, Denis Sciama is reputed to have said of it 'first three chapters, nothing special ... chapter 4 – Mozart!' This is what your tutors want, they want to be pleased, startled even by your work – that is real research work because the Literature Review no matter how well done is 'old hat' – it is your answer to your research question which we are all waiting for.

3.2 What does it all mean?

You will find in research that this quite often happens – you come across material that upsets you, makes you think the unthinkable, stretches you and generally impacts strongly on the way you think. Sometimes it's just the title that excites you but more likely it's ideas, concepts, theories, policies or strategies.

Now ideas are very powerful things and a good researcher is 'hungry' for them – sometimes its other people's ideas and often it's your own idea, which you want to explore. When you get an idea you MUST test it, understand it, know it, ask where it can be used, ask how did it arise, ask what is its area of application, ask what are its limits, ask what are its links with other ideas – really 'have a go at it' until you either discard it or it becomes your own.

The philosopher, Wittgenstein likened knowledge and understanding to a building with many levels. He also imagined ladders from one level to the next – ladders that were difficult to climb and once you had climbed them they were taken away so you could not go back. His point was that when we learn something we ascend to a new level and as we come to understand it we as it were wander around at that level seeing the idea from different angles. But you can't go back down – that is you can't un-know something – once you have been exposed to an idea there's no turning back its part of your thinking world – you can go on upward to new things but you can't go backward and un-know something.

3.3 Serendipity

Unfortunately I cannot give you an algorithm to generate ideas around your research question – nothing worthwhile is easy. But I can give you some ideas to help you along the way – but remember good ideas just tend to pop up when you least expect it so be ready. Here are some things you can do:

Make Notes – ideas can occur at any time: random thoughts in your bath, riding bike, reading something, someone talking to you on a train – anytime, anywhere. When the idea occurs record it then and there – else it will be gone and lost perhaps forever. For example, I was researching problem solving paradigms and looking for a taxonomy – how did I get it, I was driving along the motorway and various ideas came together and I had it – pulled the car into the hard shoulder, got out my hand held recorder and recorded it straight away.

Read Widely – this means wide, not just textbooks but anything and everything. Often this reading will trigger a thought and that thought might be really useful. For example, when I wrote these notes I had difficulty expressing the idea of hermeneutics succinctly. As it happened I was reading a letter from a friend about new Theology degrees and one sentence triggered a thought and I had my succinct definition!

Discuss your Research Question - do this with anyone who will listen, when you do this listeners will often question you and these question can turn out to be useful direction to work on. For example, many, many years ago I came across the term *weltanschauung* and could not quite get it. I was talking this over with student band someone said 'is it the same as motive' and suddenly I saw it clearly – motive was not the whole answer but the idea told me where to look.

Reflective Reading – when you read try to be reflective and ask unconsciously what does this mean to what I know already? This is a very powerful weapon – it can often change your whole direction or even make you change your research question. For example, many years ago I was working on storage models for sorting algorithms (in those days 1k was a lot of memory) and I stumbled across a completely new way of sorting devised by Knuth and suddenly I solved the storage problem and increased the sort speed by about 1000%.

You must work hard to learn what you need – your mind must be prepared – a good slogan to use as a reminder for this is the short title from one of John Brown's books: 'Chance favours the prepared mind'

3.4 Heuristics

These are just 'rules of thumb', that is general directions in which to work. Heuristics are odd because there is a sense in which one understands what to do but cannot exactly explain it or turn it into a procedure. Think of riding a bike, its simple, we can almost all do it but we are not conscious of how we do it – it just seem to happen. Here are the five basic strategies (I think there are only five):

Trial and Error - where we imply that the process is akin to guessing and in essence chance is at work and therefore problem solving may or may not take place.

Top Down - which uses the classical idea of divide and conquer. This is a well-understood mechanism where a large problem is resolved into smaller and therefore simpler problems.

Generic Solutions - concentrates on ideas associated with previous experience. This is almost always the most productive mechanism for solving problems since we ask have we seen something like this before.

Different View Points - implies a deeper understanding since a clear idea of what view we have of the system is required. The point is, that solutions may come if we change our viewpoint so that we see the same problem in another light.

Look for Relationships - requires that we consider how elements affect and are affected by other elements.

3.5 Formal Problem Solving Methods

You might like to consider how these strategies must be embedded in many more formal methods such as Brainstorming, Kelly's constructs, Zwicky's Morphology and many others. Also note that the method can be used one after the other or they can be used together – interestingly that is why discussion as indicated above is powerful because you might be working with one strategy but you listeners may be working with others thus increasing the power. The methods discussed above are basic but they can be combined in different ways to give a more formal method or process. For example, there is brainstorming for example but we shall only look at one.

3.6 Kelly's Constructs

This is a very simple technique to use for gaining understanding of a given situation. A common use for the technique is to generate questions for a repertory grid or a checklist when one begins a systems study. The principal element used is that of looking for similarity between the area that you are investigating and some other unrelated area. Thus, the kind of similarities looked for could come from any category - the only justification for declaring a similarity is that you, personally, can see a similarity. Some typical generic kinds of similarity are as follows:

Organisational, Administrative, Physical, Functional (including lateral), Organic, Social, Cultural, Ethical, Ideological, etc

3.6.1 Application of the Method

The method of working for Kelly's constructs is quite straightforward though in practice some of the steps are difficult to complete. Basically one prepares seven cards with one marked with the letter P and the remainder with the letters A to F. The reason for the cards is so that the various entries on all the cards may be put into different orders when testing them against the matrix of questions shown below.

Construct Comparison Chart			
For each question in the following list write down as many answers as you can think of			
1	P is like A, but unlike B or C in these respects	7	P is like D, but unlike E or F in these respects
2	P is like B, but unlike A or C in these respects	8	P is like E, but unlike D or F in these respects
3	P is like C, but unlike A or B in these respects	9	P is like F, but unlike D or E in these respects
4	P is like A and B but unlike C in these respects	10	P is like D and E but unlike F in these respects
5	P is like A and C but unlike B in these respects	11	P is like D and E but unlike E in these respects
6	P is like B and C but unlike A in these respects	12	P is like E and F but unlike D in these respects

Prior to using the question grid the cards are completed as follows:

Card P - On this card you write down the problem setting.

Cards A, B and C - On these three cards you write down close comparisons (similarities) to the problem setting. It is up to you to decide whether a particular comparison is close or not.

Cards D, E and F - On these cards you write down remote comparisons to the problem setting. Again it is up to you to decide whether something is remote or not.

In practice one would also try to ensure that the similarities are different from each other. For example, if we were looking for similarities to a University we might write School, College and Open University and this may not be effective since all three are in a sense too similar to each other.

3.6.2 Processing the Construct Grid

Once you have decided on your comparisons the hard work begins and generally it is carried out in three phases.

Phase 1. Write on the cards the problem setting and the comparisons that you intend to use.

Phase 2. Work through the question matrix writing down as many responses as you can think of as well as any other thoughts that occur to you.

Phase 3. Turn each of your responses into a question of the form:

Is the difficulty with P anything to do with it being a

Does the notion of a ... suggest any important aspect of the difficulty with P

Example - Suppose the area of study is a computer advisory service in a large University and you are called in to carry out an investigation into the system and make recommendations that may lead to an improved service.

Phase 1. Here we define a set of similarities to the given problem setting.

Setting	Close	Remote
P Advisory	A Library	E TV Set
	B BR Enquiries	F Shirt
	C Prison	G Sweet Shop

From this we might define our similarities as:

Library - Functionally similar in that it contains information.

BR Enquiries - Administratively similar in that an expert or experts are on duty to answer questions.

Prison - Is socially similar?

It should be emphasised that only the analyst has to justify these choices on the simple basis that they perceive some similarity.

Phase 2. Working through the question matrix we might write down something like the following:

ADVISORY (P) is like a LIBRARY (A), but unlike BR ENQUIRIES (B) or a PRISON (C) because questions from users are often very vague.

Phase 3. Finally we take all the responses from working through the question matrix and turn them into questions. Thus, for the response indicated above we might ask:

Is the difficulty with ADVISORY (P) associated with the fact that users' questions are often vague and unformed?

At the end of this, possibly after doing it several times, you will have lots of questions to ask and avenues to explore. Don't ignore the question generation phase and I guarantee that if you use this method you will uncover things that you might never have thought of. **The classic book on this idea is by Kelly, G. A., A Theory of Personality, The Norton Library**

3.7 Persuasion, Assertion and Argument

In your research you will try to persuade your readers regarding some idea. Now that persuasion might be rational or non-rational. Essentially non-rational persuasion is a form of persuasion without evidence or at least a good reason to support it. For example I might say to you Emanuel Ax is a brilliant pianist – you can choose to take my word for it or you could ask why? I might then say he has sold 10M CDs (a reason) but you might be very sceptical and so I show you his bank account (evidence)! Notice in this case that the evidence is indirect (its about selling CDs not about his playing) and so you might still be sceptical so I then show you rave reviews of his playing by the critics.

So three things have happened here when I present an argument: first I assert something (brilliant pianist), then I gave a reason (10M CDs) and finally I gave evidence (bank account and reviews). In your own work and in the work you read you must be aware of these three elements – don't forget that there is an ethical dimension to all this as well! Arguments can range from a civilised exchange of views to anything short of actual fighting. However, in these notes argument means the attempt to persuade others. Argument is about presenting your various premises and then drawing conclusions. For example which of the following arguments make rational sense:

Argument 1: Fred is a bad person, Fred is a boy, and therefore all boys are bad.

Argument 2: Fred is a boy, all boys are bad, and therefore Fred is bad.

There is a very important principle here, in argument 1 we are trying to argue from a particular case to the universal and in argument 2 we are arguing from the universal to the particular. Thus in argument 1 it might be true but the conclusion does not naturally follow from the premises whilst in argument 2 the conclusion does follow from the premises. In general then one cannot argue from the particular to the universal. For example if you were able to prove that in your company IT led to competitive advantage would it follow that that was also true for EVERY company that used IT.

3.8 Sophistry

Sophistry means the art of persuasion and is named after the classical Greek teachers who taught this art. However, in modern times it has come to be understood as meaning clever but worthless argument. For example in the early part of the century 20th in Saudi Arabia cameras were seen for the first time. This generated debate because in Sunni Islam there is a stricture regarding the capture and display of images of living things. However, a clever Imam used the argument that a camera was like a mirror (an assumption) in that it held an image and the prophet did not forbid mirrors (which also hold images) therefore cameras were permitted. You must guard against these kinds of arguments in your own work and watch for it in the work of others because it is often based on a false rationality – that is finding a worthless argument to justify the obvious, hide the true motive, make false generalisation or convince the credulous. If you don't think this happens stop for a moment and think of incidents when you bought something expensive on the spur of the moment and how you set about justifying it when you got home!

3.9 Approaches to Research

Research if it is to be worthwhile must be rigorous – that is you must put in real effort to collect and present the evidence that supports (or possibly does not support) your research question – this is not an easy task. To do research well is a cause for praise, to do research badly is unforgivable and will make you a figure of ridicule. Broadly speaking there are two main sorts of research (or way of arguing if you like) but always it is exploratory.

Deductive – in the sense that we have a theory that we want to prove – in simple terms deduction amounts to a valid argument – that is if its premises are true then the conclusion automatically follows. Typically we form what is known as a null hypothesis. That is we set up our research question in the form that there is no effect of some parameter. For example, I might want to look at the significance of scripting languages on system development time. I could do this by setting up a null hypothesis that says 'I contend that the use of scripting languages have no effect on system development time'. If I then find that there is an effect I reject the hypothesis and conclude (called the alternative hypothesis) that scripting languages do have an effect on development time. In most cases we want to investigate a single variable (the dependant variable) and see how it is affected by changes in other variables (the independent variables) but always being aware that there may be extraneous variable at work that we are not aware of. In the case above the variable we want to control is 'development time' (independent variable) and we think it can be controlled (in this case) by usage of scripting languages – that is if the usage of scripting languages is increased we postulate that development time will reduce. However, great care is needed because it is obvious in this case that usage of scripting languages is not the only variable involved.

Inductive – in the sense that one hopes that the theory emerges from the data analysis as we go along. It follows that we don't have a hypothesis we just know that we want to explore a certain domain to see what emerges. For example, I might want to investigate the fact that students are not attending chat sessions but I have no idea why (I don't have a theory) so the whole point of doing the research is to explore the issue implied by the question and hope that something will emerges as I go along. So induction is a kind of grounded argument, the truth of whose individual premises would not *guarantee* the truth of its conclusion, yet one hopes that it would provide some evidence for it.

It may seem that these two ideas are quite distinct but it is all a matter of perspective. With deduction we have a clear idea, which we want to pursue, and with induction we are usually working from wider generalisations. For example if you were sitting in your garden at home with a cold drink it is likely that you could form a theory about what it was by using your perceptions, as a primary source of evidence and quickly conclude that it was iced tea. If you wanted more evidence one could send it to a laboratory with the question (your theory) is this liquid tea?

Now suppose you are in another country and in another garden and someone gives you a drink the task might be much more difficult and all you may have to work on is a generalisation that you have learned or been told about cold drinks. Now one could proceed by having a theory - is it tea? Then send it to the laboratory for confirmation. If it is not tea then send it again asking is it cola and so on. This is a hopeless strategy and this is where you need an inductive process that leads us hopefully to an answer.

Deductive is very common in say science where we might have a theory for example about how certain chemicals interact and we conduct experiments to try to prove our theory, which can then be used in further experiments and so on. In other cases we may have no idea what the theory is or even if there is one and we just start to gather data in the hope that we can come to some conclusion later on. For example, you might just feel that you want to explore some topic because you think there may be a relationship of importance to discover.

3.10 Styles of Research

Broadly speaking there are two main styles of research:

Quantitative – describes a style that represents information in numerical form. The numerical form might be graphs and statistics which can be used to show trends, comparison and similarities and the graphs themselves might lead to equations which link variables or allow one to make generalisations. Care is needed otherwise it is very easy to fall into the trap of making sweeping generalisations based on one's data only to find later that the data did not really support them. The advantage of quantitative data is that there is solid evidence that can be permuted in a variety of ways to support or not support a contention. In general one is counting the frequency of some event – say number of times the user selects the wrong icon but, and it's a big but, the data is only truly valid in the context in which it was collected so one needs extreme care if we want to generalise.

Qualitative – is typically used to analyse how certain actions occur not just how often they occur. The information is usually represented in textual form of some kind as a description of some observable event or events. The usefulness of this is that it exposes the thought processes or reasoning behind a particular behaviour – why a user clicked the wrong icon. However, it does make the analysis and representation of the data more complex.

Qualitative	Quantitative
Useful when trying to understand behaviours	Useful when looking for facts or causes
Uncontrolled observation – that is just observation without you controlling	Controlled measurements
Subjective	Objective (predictive)
Insider perspective on the data – that is you are often in the situation	Outside perspective
Discovery-orientated, explanatory and descriptive	Deductive and verification oriented
Process orientated – that is you drive the research	Outcome oriented – does your variable really control something
Holistic and open	Particular and closed
Assume a very dynamic reality	Assume a stable reality otherwise results are worthless

See Oakley, A. (1999), 'Peoples' way of knowing gender and methodology'. Open university Press, pp154-177

Now I don't want you to start thinking my research must be one or other of the above – it may be one of them but it also may be a hybrid. The point really is you understand these differences and their implications to what you are doing. Research in technology is often to do with developing an artifact (a bridge, software etc) and investigating it by for example testing with user whereas in science the intent often entails designing more experiments based on the conclusions of the previous one. Finally, don't get trapped into thinking your research must be inductive or deductive or qualitative or quantitative. These are only generalisations to help you think through your research question and how it might be tackled.

3.11 Definition of Research

Research may be defined as the *systematic search for knowledge* and this has two key elements. The first and most obvious element is the search for knowledge and the second is the purpose of that search for knowledge. Thus research should be:

Directed - towards a predetermined purpose through identifying a particular issue, topic or problem worthy and capable of investigation and exploration. The purpose is the research question, what you want answered.

Conducted from a Position of Awareness - of previous research results. Although it is possible to invent a theory without an awareness of previous work, it is also possible that you were not the first to think of it. Conducting a literature review develops an awareness of previous research. This involves a review of the secondary sources of information. If at the end of this stage the question is still unanswered then a more direct approach is needed. The point really is that to research a significant question you must become an expert in the area so you must immerse yourself in the existing literature.

Enquiry-based - in the sense that one is actively seeking knowledge. Methodical, planned and organised in a way that is calculated to cover the ground in an assured and efficient way.

Capable of Dissemination - the knowledge generated must be captured so it can be made accessible to others. Research must be capable of being reported in enough detail so that a specific study is replicable and hence publicly verifiable. The more independent researchers that publish similar results then the more support that is added to a theory. Thus providing enough information to allow someone else to recreate an empirical study is beneficial, if not vital. However, even if an empirical study is not conducted then a literature review on a particular topic may still be of interest as it saves researchers having to find and read all of the original sources.

Research must be sustained, rigorous and critical investigation, followed by dissemination in a permanent and publicly accessible form, contributes to a discipline's knowledge base. Such investigations enable others to rely on your results, to base strategic or operational decisions on them, and to use them as a foundation for further studies, confident in their validity. However, claims in research which cannot be justified by the evidence adduced in their support are likely to be dismissed simply as special pleading.

Most research takes place within a shared understanding, or paradigm, held by the researchers in that discipline. This comprises: an established terminology; a general theoretical overview; accepted subject boundaries; and a broad view of appropriate methods and priorities. Research applications, which convey a degree of familiarity with the discipline within which they will be conducted, are most likely to be successful.

3.12 The Research Purpose

There are many gaps in knowledge and as such many reasons for asking questions. A researcher may ask a question in order to:

Explore - Providing an initial familiarity with a topic. Discovering whether a phenomenon exists, i.e. Does something really happen. Ask someone.

Describe - Careful and deliberate, accurate and precise observation or inspection, i.e. concrete description. What type of behaviour is exhibited?

Understand - Wishing to know why something has happened, examining the cause and effect relationships between two or more phenomena. i.e. Why is a type of behaviour exhibited.

Predict - Identifying the relationships between two or more phenomena and being able to speculate about one phenomenon by knowing about some other, i.e. what happens to the behaviour exhibited when something is altered.

Control - Apply knowledge to find solutions to practical problems.

Reduce - Looking at variables and getting rid of those that are not significant.

Most studies have elements from more than one of these areas. Almost all types of research questions can be reduced to: who, what, where, when, how and why?

At a higher level of explanation, these research motivations can be classified according to the applicability of the results to a particular problem.

Basic Research (also known as fundamental research or blue skies research) is experimental or theoretical work, which is curiosity driven and undertaken primarily to acquire new knowledge of the underlying foundation of phenomena and observable facts, without any particular application or use in view.

Applied Research is a more focused form of research in a subject area where applications cannot as yet be clearly specified. It may be initiated at the suggestion of researchers undertaking basic research in a particular field.

Action Research is research undertaken to acquire new knowledge, but directed towards clear practical aims. Commissioned research is usually of this type.

Read Saunders (2003) Chapter 1, Section 1.1, page 1 which provides an introduction to business and management research and Section 1.2, page 2 which will outline the research processes we will look at within this unit. It is also a good idea to look at Section 1.4, page 5 which describes how the textbook will tackle this process.

3.13 Approaches to Research

The two basic approaches to research as discussed earlier are 'deductive' and 'inductive'. To undertake deductive research you must create a theory, which you can then go on to test with data collected for that purpose. On the other hand, inductive research means that the theory is compiled based on the data collected.

One does not agonise over whether it's inductive or deductive but whatever it is you need a research strategy to ensure that the programme of research is carried out in a reliable, systematic and valid manner. Typical research strategies include:

- Experiments (and quasi-experiments)
- Questionnaires (Unstructured, Semi-Structured and Structured)
- Case-Studies (In depth analysis of one individual or organisation)
- Observation Analysis (Unstructured, Semi-Structured and Structured)
- Interviews (Unstructured, Semi-Structured and Structured)
- Ethnogenics (Participant observation: Observing whilst being part of the process)
- Meta-Analysis (Reviewing results from a number of studies together)
- Narrative Review (Reviewing discussion from a number of studies together)

Notice that structured and unstructured are mentioned here and you might like to think about what that means – it is unfortunately true that we use these terms all the time but hardly anybody stops to think what distinguishes one from the other – I have never found a student who can make this distinction, see if you can be the first. In some instances the purpose of the research programme will dictate the approach adopted. There are two broad distinctions between research strategies, those that require a quantitative, numerical, response and those that require a qualitative, descriptive response.

Read Saunders (2003) Chapter 4, pages 82-105, which outlines in general approaches to research.

Read Saunders (2003) page 93 and pages 398-401 since this may be a method that would suit your research question.

Case Studies

1. The case study method focuses on just one, two or twenty examples – such as your place of work, or one element of your organization or several aspects of a problem area.
2. Case studies are typically used to illustrate or understand a problem or indicate good practice.
3. Case studies always have a context so make sure you are aware of it.
4. Notice that you are not studying the case(s) to make changes but to understand or illustrate some issue.

Action Research

1. The main purpose of action research is to improve identified practice in some way.
2. It is most often used to conduct research at the workplace with a strong desire to improving aspects of your own or colleagues' work.
3. Because of it's setting, it is obvious that the research design is linked closely to its context.
4. The whole point of doing action research is the research leads to change in practice.
5. The working strategy is: plan something, do something, observe the something and reflect on what has happened as a result of your actions.
6. Action research may be quantitative or qualitative

Experiments

1. This applies to research where there is a variable that you can control (the independent variable) that will produce a change in some other variable (the dependent variable). That is the whole idea implies that you can intervene by altering or controlling the independent variable.
2. In very simple terms one forms two groups: one which is exposed to the intervention and one which is not and then we observe if there is any difference because of the intervention.
3. The biggest risk as we discussed earlier is that there may be another variable involved which we are not aware of.
4. It is difficult to be sure that our sample is representative.

Surveys

1. Most often used when we want to ask a group of people a question or questions
2. One could of course also survey 'things' as well as people.
3. Surveys lend themselves to future replication. One often find that some questions are irrelevant and can be left out of retrials
4. Questions must be well designed and unbiased.
5. The results will be very dependant on having a big enough and representative sample

If you want to explore some of these further the following is a worthwhile book: Blaxter, L, Hughes, C and Tight M, (2003), How to do Research, 2e, OUP, ISBN 0-335-20903-3. In addition the Workbook pack contains a fuller listing

3.14 Which Method to Use?

This is never easy to decide on a method or perhaps use more than one method, but the following may help you to make up your mind:

What is your research question – what EXACTLY are you trying to do or find out? This will help you decide whether you need a qualitative or quantitative approach.

Are you interested in making comparisons or do you want to observe some situations
Is there a good literature base?

Is the research domain you are looking at changing very fast?

Practical issue: time, money, sampling, etc

Payoff – what strategy will give the biggest payoff?

Style – what method suits the subject or your personality better?

3.15 Research Process

Now there are plenty of other methods to look at and I would advise you to scan through them so that you are informed as to the range of possibilities. However, I will summarise them here. In research we are usually trying to do one or more of the following:

Exploration -exploring and providing an initial familiarity with a topic

Description -careful and deliberate, accurate and precise observation or inspection

Explanation -wishing to know why something has happened.

That is we set out to: Understand something, investigate something, explain something, improve something or prove something. Now there are lots of ways to do all of the above so let's just make a few notes on each – you can explore the ones you are interested in more detail later in your own private studies

3.15.1 Research Design

Finally, you must set out your research design. That is, explain how you will get your data – and this must be done in great detail. In summary, then, your research design is the blueprint of your research project which enables you to deal, systematically, with:

What questions to study?

What data is relevant?

What data to collect – you will need to work very hard here so that you can rely on your data

How to analyse the results – don't shirk this

How to decide in which contexts your findings are applicable or can be exploited.

The main purpose of your research design is to help you avoid a situation in which the evidence you eventually collect does not address your initial questions. In this sense, a research design deals with a logical and not just a logistical problem.

3.15.2 Research Evidence

Research is about exploration but when you write it up you must evidence what it is you have done – without a body of evidence your findings cannot be supported. So your literature review is evidence, data is evidence, your interview notes are evidence, and your research plan is evidence and so on.

3.15.3 Data Sources

There are a variety of research methods. Different methods should not be seen as mutually exclusive; it is often valuable to have different research methods to confirm the same conclusion. However, time and resource constraints mean that it is useful to be selective about your choice of method(s). You should consider using an appropriate mix of sources (both *primary* and *secondary* data), but it is unlikely that you will select a large variety of means of collecting data from each category.

Secondary Data are results produced from someone else's work. Make sure you quote the full reference (including page numbers) to any such data. It will need to be accredited in the report (see *Bibliographies and Referencing*). In their reference lists/bibliographies, these sources will provide further references, which can be pursued - read the reference list carefully and follow up any further publications that look interesting. The point about using someone else's data is that you usually you more or less have to take it on trust.

Read Saunders (2003) pages 188-220 - just scan this so you are aware of the various sources.

Primary Data this is data, which you define and collect or supervise the collection of yourself, it includes results of experiments, interviews, surveys, and case study data. Often the only way to obtain information is to go and ask and get it yourself. Always make detailed notes of the source of the information obtained. .

If you intend to conduct a survey or series of interviews, speak to your project tutor first about the content. Always consider how the information is to be analysed when you design the survey and the means of data collection. You will also need to be vigilant when collecting data that you do not distort or 'improve' it. This might sound impossible but unfortunately it is only too easy to do during activities such as preparing questionnaires, conducting interviews, viewing a situation and so on.

3.15.4 Triangulation

This is the use of two or more methods of data collection in your study of some aspects of human behaviour or a physical phenomenon. Several methods are used because a proposition that is confirmed by data collected by more than one method (e.g. through desk research, interviews and by direct observations) is more convincing than data collected by a single means (by desk research alone).

Or, less precisely, the term can mean collecting data about the same phenomenon (e.g. the usefulness of project management) from parties with differing perspectives (e.g. the client, the project manager, the design team, and the contractor) since this is deemed more convincing than data from just a single source (the project manager alone).

3.15.5 Outcome Reliability

Reliability is a measure of whether a particular technique, applied to the same object, would yield the same result every time. Hence reliability is about demonstrating that the operations of your study - such as your data collection procedures - can be repeated, with the same results, for example, when a disinterested third party uses them. To fulfill this requirement, you have to document how, when, where and why you acted and made decisions so that your research method is transparent and repeatable.

3.15.6 Time Horizons

This is about the time dimension of your work – is it a snapshot or is it more akin to a diary. In the literature these are respectively referred to as cross sectional studies or longitudinal studies.

Read Saunders (2003) pages 95-96.

3.15.7 Credibility of Research Findings

We normally want to publish our research findings either within a company setting or maybe at an academic conference. It is obvious that we should want our work to be credible and reliable. Saunders is excellent on this topic so don't shirk reading this topic else you might find yourself ridiculed because your work does not stand up to scrutiny by your peers.

Read Saunders (2003) pages 100-104 and note the warnings on generalisation.

3.15.8 Research Ethics

Ethics is about actions that are valid in all circumstances. Now you might not be aware of it but your work will have an ethic attached to it that says something about you and your attitude. For example, suppose you were a Christian then you might find it hard to work on a research topic that dealt with say gambling – if you did work on it your ethical standpoint could bias the work in unexpected ways and make it invalid. In general ethics is concerned with how you treat participants in your research, how you collect data from participants and maintain confidentiality, and lastly how you analyse and report your findings.

Read Saunders (2003) pages 104-105, 129-142. Don't skip this; it's a very serious issue.

3.15.9 Open Minds

Are you open minded? Are you willing to listen to what others have to say even though you might find it unpalatable? Have you got a favourite theory and are you going to use it whenever you can? If this is all true of you, you will have research difficulties.

You MUST be willing to listen to what others have to say since it will broaden your understanding – you must listen objectively and weigh up what is said – never accept things blindly, ask what does it mean, what are its implications, what is the evidence, what are its underlying ethics and so on. As far as I am concerned anything else smells of arrogance and such arrogant thinking most often leads to poor research – so listen, evaluate and absorb.

Now we are all biased one way or another, we have all been conditioned to think as we do. In fact there is a German word that is commonly used to describe this and it is “Weltanschauung”. Ask yourself ‘why did I do that in that situation?’ It’s hard to answer this question and it is also true that another person in the same situation might well have done something different to you or even the opposite to you. So “Weltanschauung” is a bit like asking what your motive was for doing something but with the added dimension that everyone’s motive, even for doing the same thing, might well be different because of what, in a given situation, we take for granted and what we take for granted is all about who we are.

The important thing here is not that we are all different but that we are aware of ourselves, our motives, what we take for granted and what we believe and how those things might colour the way we react and think.

3.16 Discussion Questions

I want you to think about your research question and outline what you might do if you chose a deductive approach (that is you have an hypothesis) or an inductive approach (you have a vague idea but you are not sure what data to look at).

4. RESEARCH TOOLS AND TECHNIQUES

By now you will be familiar with the nature of scientific enquiry and that it is not the only mode of research enquiry. That's a good start but now we want to explore the research process – it's all very well to know what research is but doing it is what is exciting. We will concentrate on the scientific method because that seems the most suitable for your courses – so what is the process?

Well in some ways the process is simple – we start with a question and with an intention to answer it positively or negatively or sometimes we end up only knowing that we need more data. Once we have a worthwhile question we try to formulate an hypothesis and then go on to decide what the variables are.

Simple? Unfortunately it is not so simple, for one thing there are usually a lot more variables than we know what to do with – some will be more important than others, some will be dependent on others and so begins the process of getting to the real focus of your research question and deciding how it might be answered.

Of course you may have an idea for research but you don't really know what the question is so that you will be unable to formulate any kind of hypothesis – for example you may want to look at the role of eLearning in IT infrastructures but to what end? In such cases you should gather information as you go along and using your own experience and knowledge you might eventually reach some conclusion.

4.1 Measurements and Scales

You will be processing the above data so it is important that you understand what it is you are dealing with. The concept of measurement requires some scale along which different values can be placed. Three types of scale are possible.

Nominal - a scale used to represent unordered variables. For example we might collect statistics on colour preference. Clearly there is no sense in which a preference for BLUE is greater than RED so in this case any convenient ordering arrangement will do.

Ordinal - a scale used to represent an ordered series of positional relationships. That is where values only indicate position in a series. e.g. examination marks.

Interval & Ratio - a scale where a particular interval is the same anywhere on the scale and it is meaningful to refer to zero or say that one value is a certain multiple of another. e.g. distance measurements in meters.

So in processing repertory grid data the best we can hope for is that it is ordinal – this is fine so long as you understand what that means and don't try to process it as if it was interval and ratio.

4.2 Requirement Gathering

This is a form of primary data collection but it is normally associated with building an artefact of some sort. Requirements gathering for a computer project can be conveniently divided into the following sections.

4.2.1 System Requirements

Requirements are simply a statement of a systems service (what it must do) or constraints (what it does not necessarily do). In practice saying what a system must do is often extended to how it will do it.

4.2.2 The Requirements Document

The system and software requirements are usually documented in a formal manner so that ones understanding may be communicated to customers and system builders. The requirement document describes the following:

The services and functions the system must deliver.

The constraints under which the system must operate.

Overall properties of the system in the sense that it may have unplanned additional functionality.
Definition of other systems with which the system must integrate.

Information about the application domain of the system - for example how to carry out certain tasks.

Constraints on the process used to develop the system.

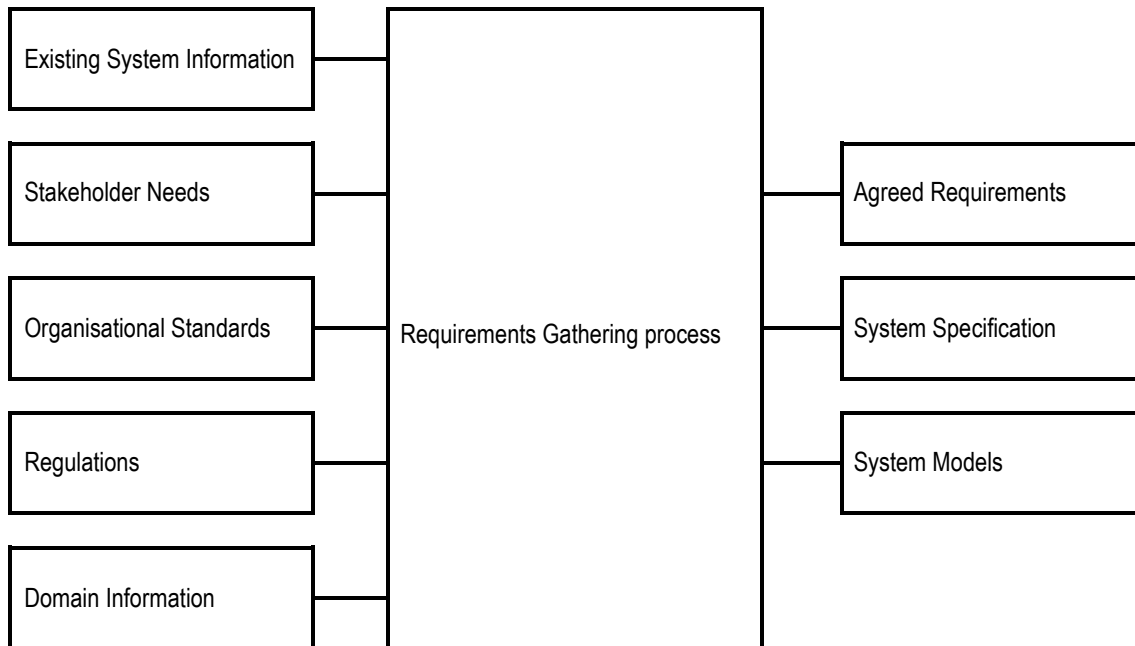
Definitions of any acronyms or abbreviations.

4.2.3 Stakeholders

These are people who will be affected by the system and therefore should have a direct or indirect influence on the system requirements.

4.2.4 A Process Model

As a process model we might define the requirement process as follows.



4.2.5 Requirement General Questions

There are perhaps four general questions we might ask.

What are the problems with the current processes?

What are the improvement goals?

How can we introduce improvement to achieve the goals?

How should improvements be controlled and managed.

4.3 Types of Requirements

There are several ways to view the collection of user requirements.

4.3.1 Functional Requirements

These are requirements that say what a system does or is expected to do. Typically this would involve or include most of the following.

Process descriptions, which the system must carry out.

Details of all inputs/outputs which may be in the form of printed documents or forms but also on-screen elements.

Details of all the data that must be held in the system.

4.3.2 Non-functional Requirements

This is usually understood to mean requirements that describe aspects of the system that are concerned with how well it provides the main functional requirements. For example:

Performance criteria such as response times or how long it takes to print a report.

Data throughput and storage needs

Security considerations.

4.3.3 Technical Requirements

Requirements that are related to the physical architecture of any proposed system and this might include software, hardware and methodological aspects.

4.3.4 Usability Requirements

Requirements that ensure that there is a good match between the system and its users. In most cases usability is expressed in terms of measurable objectives.

Reference. Kotonya, G. and Sommerville, I, (1997), Requirement Engineering, Wiley, ISBN 0-471-97208-8. This book is useful because it also contains excellent reading and reference lists.

4.4 Questionnaires Function

This section provides students with broad guidelines on how to design a questionnaire and it should prove useful for other students who are faced with conducting a research project, including postgraduates, where primary data collection is necessary. Collect any questionnaires you come across, in magazines or through the post, and build up your own collection for future reference. Questionnaires are broadly speaking of two types:

Factual – here all the questions ask for simple facts that the respondents should know. The problem with these is that one has to define everything and that usually means we have to have a lot more questions. Where possible try to choose factual questions.

Opinion - here all the questions ask for expressions of opinion. One has to be careful here with regard to equal opportunities, race, cultures and ethics.

It is sometimes easy to convert opinion questions into factual questions, for example

'I love shopping' and ask for a response on some scale of agreement, we convert to
'How often do you shop?' on a scale of once a week, three times a week or every day.

Opinioned ones are easier to construct in some ways but the questions tend to be loose. For example suppose I were doing a student satisfaction survey I might write the following question.

Did you enjoy the unit? – using a 1 to 5 scale with 5 being strongly agreed with the sentiment in the question.

Now we have a problem here because we have not defined 'enjoy' so we cannot be certain of the way a student may answer but we would normally allow it because overall the results would we hope be valid. Alternatively we could go for a factual way of assessing enjoyment and we might do it as follows where this group of questions amounts to my definition of enjoyment:

Were you given printed course notes?
Where you given practice examples?
Did the lecturer interact with the class?

4.4.1 Preserving Anonymity

Whenever you ask questions there is always the difficulty of feeling sure that the respondents are answering truthfully and not telling you what they think you want to hear because they want to please you or perhaps because they are worried that you will tell someone else what they have said. One way of being sure that you can rely on the answers is to preserve anonymity. Therefore:

Anonymity can be lost at the point of collection – for example if I as your tutor send out a questionnaire at the end of Research Methods asking for your opinion of the unit and ask you to send it back to me then the way you fill in the questionnaire might be biased because you know I will know who it came from.

Anonymity can be lost by the method of collection – for example if we collect the data by online means we would give you a password so that a given student cannot submit a questionnaire twice but that means we can or have recorded who you are on the system.

Anonymity can be lost at presentation of results – when the results are presented to interested parties we have to be careful to remove all identification. For example, suppose I send out a paper questionnaire and on it ask for written comments. It now only makes sense if I send the comments to interested parties and I might very well do that by sending them copies of the questionnaire. If I have not thought about it I might do that without removing any identification marks or codes.

Anonymity can be lost by classifications – suppose I decide to classify my questionnaire by ethnic origin (or any other thing or things), then I might effectively tell whoever looks at the questionnaires who the respondent was

4.4.2 When to Use a Questionnaire?

A questionnaire should help you to acquire information that has not already been collected elsewhere and cannot be collected more efficiently or effectively by other means. Make sure that a questionnaire is the best means of obtaining the information you need:

4.4.3 Completion Environment

A questionnaire might be posted to respondents or completed during a face-to-face interview. You must decide which is preferable for the purposes of your exercise. Postal questionnaires are likely to receive a much lower response rate, but may be cheaper and easier to administer. However, the questionnaire is less likely to be completed free of errors due to misunderstandings on the part of the respondent.

4.4.4 Appearance and Layout

A well-drafted set of questions will lose impact if they are poorly laid out. Recipients of the questionnaire need to be encouraged to read and respond to the questions easily.

4.4.5 Piloting the Questionnaire

The purpose of piloting the questionnaire is to remove any bugs. There is always a temptation in a small study to skip this stage - never give in to such a temptation. Piloting the questionnaire may save you valuable time at a later date.

Choose people similar to your intended audience for the pilot study.

Ask them for feedback on the time it took to complete and how straightforward it was.

Remove any questions that provide unwanted/irrelevant information.

Rewrite any questions that are ambiguous/offensive/etc.

Redesign any questions that provide information in an unhelpful manner (e.g. not precise enough).

4.4.6 Distributing the Questionnaire

Personal distribution will provide the best response rate for the questionnaire. It will also give you the opportunity to explain the purpose of the study. Postal distribution is more expensive and, because less personal, unlikely to make recipients feel as conscientious about completing the questionnaire. A short explanatory letter must accompany a postal questionnaire. You will probably need to use follow up telephone calls to gain a sufficient response rate. You may wish to consider offering entry to a prize draw for completed returns. If you are claiming to assure confidentiality, make sure that you can fulfill this promise.

State the last return date for questionnaires (around 3 weeks is realistic).

Give a precise day, date and place for return.

Provide a stamped addressed envelope.

Follow up any questionnaires that have been returned incomplete or where the information provided is unclear.

If you are going to use a questionnaire don't avoid this material and arrogantly assume you know how to do this – even the best of us find questionnaires very difficult. My final word to you is don't ever forget the person who has to fill in your questionnaire!

Read Saunders pages 280-326 paying particular attention to designing questions and layout.

4.5 Questionnaire Structure

There is a process to designing and conducting a questionnaire survey so once you have decided that a questionnaire is your best means of collecting data, you must ensure that the questionnaire: provides you with the information you require, is acceptable to interviewees and provides data in a format which aids analysis and interpretation. After this the design stages are:

Design - selecting the question type, writing the questions and deciding upon the design and layout.

Implementation - piloting the questionnaire, rewriting, redesign and reformatting, distribution and return of questionnaires.

Data processing and analysis - processing of data, analysis of data and (the hard part) interpretation of data.

What Do You Need to Find Out - What is your hypothesis or what are your objectives for the study? What information do you need to help you prove/disprove this hypothesis or formulate a theory? Which questions do you need to ask to achieve your objectives?

Different Types of Questions - As a general rule of thumb, the more structured a question (the answer is predictable), the easier it is to analyse. However, a good way to think about your questions is to think that each one explores a different dimension of the research question. There are seven different types of question:

Type	Expected Response and Advantages/Disadvantages
Open	Sets of general comments. May produce useful information, but difficult to analyse.
List	List of items offered; respondent ticks/rings chosen responses. Easier to analyse, but provides less detailed information.
Category	Given sets of information, e.g. age: under 20; 20-29; 30-39; etc. More acceptable to interviewees (especially when used for financial data). Easier to group respondents when analysing data.
Ranking	Respondent places given sets of data in order of performance. Particularly useful when one objective of the survey is to evaluate the respondents' perception of different scenarios.
Response	Excellent; Very good; Good; Average; Below average; Poor. Scale Broad categories of evaluation are sufficient.
Scale	Broad categories of evaluation are sufficient.
Quantity	Respondents are asked to score an issue on a numeric scale/ provide estimates or data in a quantitative manner. Provides more precise quantitative data.
Grid	Used to provide a response to two or more questions at the same time. Saves space, speeds up questionnaire completion and aids analysis.

4.5.1 Choosing Appropriate Wording

In choosing appropriate wording or questions, you must avoid: ambiguity, imprecision, assumption, presumption or leading the respondent.

Imprecision arises when the question or responses may mean different things to different people. Example: How much time do you spend studying? A great deal, a little or none at all? Does this mean in classes, working on your own, doing research on the Internet or in the library or all three. Similarly the response 'great deal' may mean quite different things to different people

Ambiguity arises when the question is too vague to be understood. Example: How do you feel about the state of the economy? It is unclear whether the respondent is supposed to answer with respect to the current state of the economy and their perception, evaluation or concern about it, or whether they are being asked for their opinion of whether the economy is an important issue.

Assumption - arises when the wording chosen assumes a specific situation, e.g.: Which type of school does your child attend – Infant, Primary, Comprehensive, Grammar or Other. This question appears straight forward, but it assumes that the respondent has one child - what if he/she has no children or more than one child?

Presumption - arises when the question makes a presumption about the subject, which makes the question invalid. For example 'Does your organisation make adequate provision for training its employees in political affairs?' The above question makes the presumption that training employees in political affairs is necessary.

Leading - It is easy to lead respondents when wording questions. For example: 'Do you think that violent and inhumane sports like fox hunting should be banned?'

Be Realistic - You should put yourself in the place of the respondent when designing questionnaires. Are you sure that the questions you have posed can realistically be answered without the respondent being forced to do a lot of work or research themselves. For example: what is your average percentage increase in income over the past five years? It is also easy to ask hypothetical questions that may be founded on such unrealistic scenarios that they are likely to provide information, which is useless. For example: If you had plenty of money and no family responsibilities, what would you do with your life?

Dimension – try to think what variable or dimension you are asking about. For example what variable are we looking for when we ask "Which subjects did you study at University?"

Dimensionality - Make sure that your questions do not ask for double answers or offer more than one dimension. For example: Did you study construction and economics at University?

Values – be sensitive about a respondent's privacy and values. Questions about age, gender, race and income can often cause offence, particularly if worded in a way that suggests you are prejudging the respondent. Most people are reluctant to provide exact information about age or income, and it is better to provide category type questions rather than ask direct questions.

Overlapping Categories - Make sure that when you provide categories, they do not overlap (this will make data entry and analysis very difficult). For example: What is your annual income? - Less than £10,000, £10,000-£20,000, £20,000-£40,000 or Over £40,000

Number of Questions – this is a matter of judgment but as a rule you should try to explore all the dimensions (variables). This need great care, if you miss out an important variable your results will be flawed.

Question Value – make sure every question is worth answering. Unfortunately it is only too easy to ask worthless questions. For example I once saw a question on buying habits that said – ‘would you prefer a BMW or Ford Cortina’. The researcher was trying to find out, in a round about way, if the respondent was interested in quality – of course they are, so it’s not worth asking that question.

4.5.2 Coding Results

The reason for coding is to aid in the analysis of data. In the past this was often done manually, working with coding sheets (see below) and producing frequency tables (ie a simple table which shows a count of the occurrence of each code for a particular question). Now it is more usual to use the coded information as the raw data to be input into a computer for analysis using one of the many statistical software packages available. However, the following notes are added if you need to use a manual approach or for some reason you need to code results

The paragraphs below illustrate how coding takes place. A short postal questionnaire, designed for illustration purposes, is used to discuss the methods involved - the format of this questionnaire is given below and will be used to generate the example codes. The questionnaire has been designed to investigate whether satisfaction with policing is related to the status of individuals in terms of whether they have been victims of crime. Obviously many more returns would be needed for results to be considered valid. Furthermore, the explanation and instructions, which would accompany the questionnaire, have also been omitted here.

CODING EXAMPLE QUESTIONNAIRE			
1.	Gender	Male	Answer yes or no
		Female	Answer yes or no
	Please indicate your age	16-18 years	Please tick the appropriate range
		19-30 years	
		31-40 years	
		41-50 years	
		51-60 years	
	Older than 60 years		
3.	Have you been a victim of any type of crime in the last twelve months?		Answer yes or no
4.	If you answered 'yes' to the question above, how many times have you been a victim of crime in the last twelve months?		
5.	Please indicate below how satisfied, or unsatisfied, you are with the amount of policing in your local neighborhood:		Please tick the appropriate box
		Very satisfied	
		Satisfied	
		Neither satisfied or dissatisfied	
		Not at all satisfied	
6	If you indicated that you 'are not satisfied' or 'not at all satisfied', please give your reasons below:		

Question 1 and 2 are to contextualise the research findings. Question 3, which, determines whether the respondent has been a victim of crime is an important factual question and would be used to compare with the results gathered from Questions 5 and 6 relating to satisfaction with local policing. Similarly, Question 4 would also be used to compare with the results of the last two questions on the schedule. Although both questions 5 and 6 are qualitative in nature, the last question will be more difficult to code because a subjective assessment and categorisation of the text will be required.

4.5.3 Coding the results

Coding can begin as soon as the initial returns are in. Do not wait until they are all returned or until after the 'cut-off' date for accepting replies. Coding can be a time-consuming process and it is easier to code in batches rather than attempting to do all of

the returns in one go. Of course, if the questionnaire contains one or more open questions, which are to be coded, then a number of returns will have to be studied before possible categories can be decided.

For the example given, the coding of Question 1 is quite straightforward. A code of '1' can be allocated if the respondent is male, '2' if female – but remember if you are doing this by computer you may not have to code at all. Remember to allow a code for no response. Here an asterisk (*) is used because this is the code recognised by the statistical software package to represent 'missing data'. (NE With other types of questions, a code for 'don't know' may also have to be used).

Again, the coding of Question 2 is similar: a '1' is allocated for those 'under 18', a '2' for those aged between 18 and 30; a '3' for the next age category etc. Again an asterisk is used when the data has not been supplied. In this question, the age categories have already been pre-determined on the assumption that interviewees will be more willing to 'tick a box' rather than supply their actual age in years. If an actual age had been supplied, however, this could have been used as the code. So if a respondent had indicated that she/he was 25 then this value would be recorded on the coding sheet. There would be no need to categorise the data as this may be done later with computer software.

Question 3 again involves a simple coding system; '1' for yes, '2' for no, '*' for no response. In Question 4, the actual amount of times that the respondent had been a victim of crime can be recorded on the coding sheet and classified later with the aid of a computer. For this question, however, a distinction has to be made between those respondents who failed to answer and those to whom the question was not directed. Here they were only required to answer the question if they were a crime victim. An asterisk could be used to indicate 'no reply' for crime victims who did not respond and '99' for those respondents who were not meant to answer the question. NB '99' is used because it is unlikely that a respondent has been a victim of crime 99 times in the last year.

Questions 5 and 6 deal with the qualitative elements of the research. Question 5, however, is straightforward and can be coded easily. Before the classifications can be made for Question 6, several returns must be studied to determine the classifications - a read through will give the researcher a general idea of the common reasons being given. A simple classification into (say) 5 or 6 'types' would probably be satisfactory here. A code can also be used to encapsulate all uncommon 'other' reasons. Remember to note any particularly useful or interesting 'quotes to illustrate these types in the write-up of the analysis. Similarly make a note of some of the reasons categorised as 'other'. In this way, the qualitative nature of the original material has not been lost totally and some elements can be included in the summary or discussion of results.

4.5.4 Using coding sheets

Some of the textbooks may refer to coding sheets when discussing coding. These are special pieces of stationery designed to record codes on – or you can modify your questionnaire to include space for you to code. They basically comprise of a grid of cells. Each cell or array of cells is used to record a particular code. It is usual to keep all of the codes for one question in the same column. The codes for any one questionnaire are therefore arranged in one row across the coding sheet. If the coding sheet is not wide or long enough, then obviously extra sheets can be used.

In the coding sheet is shown below note the first column refers to the questionnaire reference number. When questionnaires are returned they should be numbered so that if an error occurs in the coding process the original questionnaire can be located.

	QUESTION NUMBER					
Ref	1	2	3	4	5	6
1	1	2	1	1	4	2
2	1	3	2	99	2	99
3	2	2	1	1	4	1
4	*	4	1	2	4	2
5	1	4	2	99	3	99
6	2	3	1	1	4	2

Where question 6 can be coded as follows:

- 1 = Reasons related to the general assumption that 'police presence' is lacking locally.
- 2 = Reasons related to the general opinion that the police are unhelpful in 'solving crime'.
- 99 = Respondent was not required to answer.

Obviously with more returns, other reasons and further classifications would be made but these examples illustrate the process involved.

4.6 Repertory Grids

The repertory grid is a special form of questionnaire often used in knowledge elicitation. However, it turns out to be a powerful technique for looking at situations where both the issues and solutions to problem themes are unclear even to experts within the area under study.

For example, if we were looking at lecturing and we wanted to find out what the underlying dimensions of this activity are in order, say, to replace lecturers with CAL machines we might formulate the following constructs that are believed to affect learning during lectures: Quality of lecture, Tutorial assistance, Availability of books or Classroom environment

Notice that all the above constructs are bi-polar - that is if each construct was turned into a question there could be a range of possible answers. For example the quality of a lecture might be perceived as in a range of poor to excellent. Further, we might introduce a scale as follows:

Quality of lecture	1	2	3	4	5
	Poor			Excellent	

4.6.1 Repertory Grid Terminology

The grid is a representation of one or sometimes a group view of a particular problem setting. As such it can be examined for similarity of responses and therefore some idea as to the relative weighting or importance of the constructs. Formally a grid has three parts:

Object - The problem area of interest.

Construct - A bi-polar question related to the problem setting. In essence the question is a possible, and single dimension (variable) of the space under examination.

Rating - Usually a nominally scaled variable expressing the bi-polar nature of the construct. The actual values are unimportant and the type of variable used should not be used in simple arithmetic.

4.6.2 Use of Repertory Grids

Repertory grids can be used in many ways but most experts agree that they can be most useful in two major areas.

Knowledge Acquisition - In this form analysts use the technique to elicit facts about a problem area, typically getting an expert in the problem domain to complete a grid does this. For example, you might find knowledge engineers using the technique when formulating rules for an expert system.

Deepen Understanding - In many cases a more appropriate use is that of testing ideas thought to be important by experts in a particular area in order to see if there is a measure of agreement amongst them. An interesting feature here is that the method often highlights areas of disagreement and this can turn out to be a major route to greater understanding.

4.6.3 Interpretation of Results

Repertory grids will often yield large amounts of data and it is not a simple task to process this data in order to obtain useful and universal facts. In practice we would look for three major characteristics:

Which constructs account for most of the variation between respondents?

Which constructs are related to each other?

What are the underlying dimensions of the object space?

None of the above are easy to obtain and relatively sophisticated statistical processing is needed to gain any clarity in a particular setting. In broad terms we find that respondents in the object space will often agree closely when rating certain constructs but differ widely on perhaps a small number of others. With this in mind we need to ask ourselves what meaning we can attribute when experts agree and what it might mean when one or two experts in the object space differ from all others.

Example - Suppose we were examining a particular course of study with a view to deciding what were the really important variables (dimensions) that lead to a successful course. Then we might proceed as follows:

Setting - A particular learning course.

Objects - Students on the course

Constructs - Maturity (mature to immature), Qualifications (suitable to unsuitable), etc.

Rating - A nominal scale of 1 to 5

4.6.4 Construct Formation

In practice it is quite difficult to derive unbiased constructs (questions) which clearly identify a dimension of the domain and at the same time are meaningful. Some possible weaknesses to look for are:

- Non-bipolar
- Non-scaled bipolar (questions leading to Y/N answers)
- Question has more than one dimension
- Questions have temporal characteristics
- Questions have inappropriate global elements
- Avoid the 'halo' effect or impressions carrying over from one question
- Use of suggestive words such as positive, suitable etc.
- Vague or unclear dimensions
- Inappropriate questions for the object of study
- Constructs do not apply to all objects
- Can or will the respondent be able to answer honestly
- Is the construct in the form of a leading question?
- Can the respondent in fairness be expected to give a reasoned answer?
- Does the grid have directional stability?
- etc.


4.6.5 Synthetic Repertory Grids

In the cases we have looked at so far the grid questions have all been on an identical scale (say 1 to 5). However, it is possible for the scales to be different in each question since we already know that the data is at best ordinal. In most cases when this happens it is because the question is a summary count of some aspect of the situation being investigated.

In practice what this means is that instead of asking respondents a question with a graded answer we go and count (measure if you like) something related to the question. For example, if the bi-polar question was 'do you agree that classes are too large' then instead of asking an opinion we go and count the number of students in classes and calculate say an average.

4.6.6 Processing The Grid

The grid may be processed in several ways depending on the use to which it is made and on the available technology and software to process the results. Briefly:

Construct	Agree  Disagree					or respondents add a score: 1 for strongly agree and 5 for strongly disagree
Construct 1				X		4
Construct 2	X					1
Etc		X				2

The data obtained is nominal so it makes no sense to find such things as average response. In general when processing these grids *by hand* the best one can do is to find the number of respondents in each scale position. If more sophisticated processing is needed then we must use the notion of difference between respondents. See the next section of planar similarity.

4.7 Interviews

Let us now turn our attention to collecting primary data through the use of personal interviews. In a personal interview, the interviewer(s) (who may or may not be the researcher) derives research-relevant information through face-to-face questioning of the respondent or the interview is carried out via the telephone.

With interviews the researcher can be sure that the person for whom the questions were intended actually provided the information. Interviews, however, are more time-consuming to carry out and may be extremely expensive if respondents are scattered over a wide geographical area and of course, for sensitive issues, the loss of anonymity may lead respondents to give false answers or comments.

Interviews can either be structured, semi-structured or totally unstructured. Remember that structured implies a well-established protocol with predictable outcomes.

Totally Structured - interview may be regarded as delivering a questionnaire in person. To ensure non-bias, the question content and ordering remains the same for all interviewees. It is assumed therefore that response differences are true and not an artifact of interview variation.

Semi-structured - interviews, the responses to some of the questions may be probed by the interviewer and, in this sense; the interview schedule becomes less predictable than a fully-structured interview (although it may also contain some formal, structured questions). The main advantage of this method is the ability to collect more in-depth information regarding certain issues during the interview itself. There is however, greater danger of the interviewer influencing the responses and bias may be introduced because questions are not asked or posed in the same way in each schedule. The largest practical difficulty in using semi-structured interviews, however, is the collation and analysis of results.

Unstructured - interviews, there is no formal question base. The interviewer knows topics for exploration but the order in which they are posed may differ from interview to interview. There is usually very little direction given by the interviewer. Instead respondents are invited to describe their experiences, opinions or attitudes and give accounts of events, which they themselves think significant – this often results in a wealth of information being produced. The most effective way of recording the information from this type of interview is through the use of a tape recording but there is a chance that the respondent's comments may be influenced by its presence. Finally, there is still a risk of the interviewer influencing the responses or sub-consciously guiding the conversation to the areas where he/she is most interested.

Structured	On the whole, are you satisfied with the day-to-day policing of your locality? 1. Very satisfied 2. Satisfied 3. Neither satisfied/ dissatisfied 4. Not satisfied 5. Not at all satisfied
Semi-Structured	What are your opinions of the policing of your locality? Instruction to interviewer - possible probes: Do you think that they are doing all that they can to fight crime? Do you feel that they are receptive to the policing needs of the local community?
Unstructured	Instructions to the interviewer - Discover the attitudes of interviewees to their local police. Record attitudes which include opinions on their effectiveness, efficiency and integration with the local community.

Interviewing is difficult and you need lots of practice if you are to do it well – that being able to get the questions you need, then to ask them, then to follow interesting lines of enquiry, recording answers and finally to analyse what it is you have gained. Finally do not forget the general rules outlined earlier about ensuring anonymity else you might find that your interview results become biased

Read Saunders chapter 9 starting at page 245. Pay particular attention to quality issues on page 253 and the themes idea on page 255. Finally be sure you or anyone you employ is competent to carry out the interviews so read pages 262-264.

4.7.1 Interviews and Questionnaires - A Note on Sampling Methods

If it has been decided to use interviews or questionnaires as a method of collecting primary research data, then some thought must be given to choosing a representative number of respondents to be included in the research survey exercise.

In general, sampling techniques can be divided into either probability or non-probability samples. With probability samples, the researcher is able to calculate the likelihood of selecting each element. Furthermore, each element has an equal chance of being selected. Probability samples include: random sampling, systematic sampling, stratified sampling and cluster or multi-stage sampling. Non-probability sampling techniques are those, which violate the rule of each element in the sample having an equal chance of selection. In most cases non-probability sampling is used because there is no viable alternative or because time is limited. For example suppose I want to do a survey of student attitudes and the students are about to leave the University in two weeks time – so I decide to place the survey at various places around the university and hope that students will pick them up – not very scientific is it? If this happens to you must qualify your findings.

4.8 Sample Sizes and Methods

Getting the right sample size is quite a difficult business and there is even debate about whether a sample can ever be representative at all. However, a sample size might be determined by consideration of one or more of the following: your project purpose, project type, amount of error you are willing to tolerate in your results, complexity of your research question or the sample you need and how much is known about the area you are studying. You should also consider whether your study is preliminary in that you are just looking for general indications of what variables are important or if you intend to answer a significant research question.

4.8.1 Random Sampling

In a random sample, each member of the population has an equal chance of being selected. To produce such a sample, each member of the population must first be allocated a unique identifying number. Tables of random numbers can then be used to derive the required number of respondents from the population. These tables can be generated automatically with the aid of a computer or found in most statistical table books.

If for example, there were 500 people in the population and a random sample of 40 individuals was required, 40 sets of appropriate three digit numbers are needed from the table to produce the necessary random sample. To use the tables, any place is taken as a starting point and then the user continues reading three digit numbers consistently in the same direction. In this example, three digits must be used to give all numbers between 1 and 500 equal chance of being chosen - some numbers will be too large and will be discarded. Computer-generated random samples, however, can overcome this problem by selecting the required number of identification digits within the population limit given.

The main disadvantage with this method of sampling is that it can be very time consuming to allocate each member of the population a unique identifying number. Furthermore, it may not always be possible to do so. Very often, the extent of the population is unknown.

4.8.2 Systematic Sampling

With systematic sampling, the population is sampled by fixed intervals and so the disadvantage of identifying the population still applies. The use of a fixed interval, however, makes it less time consuming to carry out than true random sampling. If the population size was 70,000 and a sample of 350 was required, then the respondents could be selected by choosing every 200th (this is obtained by dividing 350 by 70,000) individual on the list. The main disadvantage with this method is that it dangerously assumes that position on a list does not influence randomness. By pure chance, for example, every 20th house on a list could be the end of terrace house which is likely to be of a higher value than the majority of the houses. A survey which used such a systematic sample might be biased towards people of higher socio-economic status.

4.8.3 Stratified Sampling

Here the population is divided into homogenous sub-groups or strata. The grouping may be based on any relevant characteristic and the main argument assumes that there is more variation between the groups than within them. Due to this restriction on variability, a much smaller sample size is needed to gain a representative number of respondents. The number of survey participants derived randomly from each of the groups is proportional to the size of the group. If a researcher, for example, was interested in probing the extent of racism within the local community, then she/he may want to divide the population into upper, middle and lower class white groups and upper, middle and lower class black groups. If a sample size of 500 is required and the proportions found in each of the groups is as shown below then the numbers sampled from each of the groups is as shown in the table.

Example: racism within the community - choosing a stratified sample		
Population Sub-group	% of total population	Sample Size (n% of 500)
Upper class whites	10%	50
Middle class whites	15%	75
Lower class whites	25%	125
Upper class blacks	7%	35
Middle class blacks	15%	75
Lower class blacks	28%	140

4.8.4 Cluster or Multi-stage Sampling

With this method there are at least two levels to deriving the sample but there may be as many levels as appropriate. If, for example, a national survey of police workers was sought, then the spatially based organisational hierarchy could be used to choose the sample. Rather than include all police areas, a random sample of (say) four is made (first stage). Then within each of these, a random sample of the divisions is taken (second stage). Similarly, rather than survey all headquarters within each of these divisions, a sample is again taken (third stage). The end product of such a multi-stage process is several clusters of samples.

4.8.5 Quota Sampling

With quota sampling the choice of interviewee is left to the researcher. This choice is relatively open, except that certain 'quotas' must be filled. It may have been determined in advance, for example, that 40 men and 30 women must be sampled and that 50% of each group must be below the age of 40. With this method, bias may creep in because the researcher is allowed to choose the participant and may opt sub-consciously for a person who appears 'approachable', 'intelligent', 'well-dressed' and 'well-mannered'. Quota sampling is quick, easy and cheap and these advantages often out-weigh the disadvantages associated with potential bias. Read Saunders chapter 6 stating at page 150 paying particular attention to selecting the sampling technique as described on page 159 and making sure the sample is representative on page 169.

4.9 Metrics

Often in your research design you will want to define a measure – such as productivity. How do you do that? Quite often for the variables or variables you are interested in there is no accepted measure so you will have to define one of your own. We call such a measure a metric, this is a very common term that is derived from mathematics. Unfortunately it is often misunderstood. A metric is any count or value derived from that counts (synthetic) that is thought to be useful in terms of one or more indicators. For example suppose we were measuring morale then we might use absenteeism and employee resignations as appropriate metrics. In general then a metric must be:

- Easy to define
- Easy to obtain
- Have some relation to the element being measured

4.10 The Factor, Criteria and Metric Model

A possible model that can be used when trying to derive indicators is to decompose the factor into its elements:

Factor - The system element or feature that is being measured

Criteria - Elements that make up the factor

Metric - Counts of items identified as having some relationship to the factor being evaluated.

For example suppose we were measuring Motivation then we might define this as:

Factor - Motivation being the desire to achieve a stated end

Criteria - Reward, training effectiveness and managerial section

Metrics - number of training places, absenteeism, etc.

We combine all these metric counts to get a value for the criteria and then combine the criteria values to give a value for the factor. Finally we must interpret the meaning of these values. I cannot give you general rules for combining the metrics and the criteria since it's up to you to find a way of combining them in a given situation that is rational.

4.11 Discussion

1. Use Kelly's constructs to generate some ideas for question themes related to your research question. Hence develop an interview plan, a simple questionnaire in both simple and repertory grid formats. Finally think through how you might get a representative sample.

2. Write a description of how you would conduct a survey into 'why students fail examinations'? With the intention of explaining the various dimension involved. Pay particular attention to what data you want, how you will get it, how you will preserve anonymity and how you will process the data.

3. Define a factor, criteria, metric model for your course.

Robson, W., (1997), Strategic Management and Information Systems, FT Prentice Hall, ISBN: 0 273 61591 2 Saunders, M. et al., (2002), Research Methods for Business Students, 3e, FT Prentice Hall. ISBN: 0 270 6580 4 2

5. SELECT A RESEARCH PROBLEM AND LITERATURE REVIEWS

How are you feeling? Excited? Bewildered? Depressed? Don't worry; learning to do good research can be hard going but the rewards are well worth the journey.

Now we come to the bit where you really get involved – how should you select a research problem? How can you sort out one idea from another until you get to one that really excites, and interests and one perhaps in which you have some personal experience. Let me tease you a bit – we are not looking for problems like 'Developing a video library' – what we want is for you to take a much wider view and look at some strategic or significant issue within your company or the wider computing community. Does this mean you can't write some software? – no it does not, but if that is all you do then your project is probably not at Master's level.

What we want is something where you can review the literature, use journals, abstract and indices, know the difference between primary and secondary sources and by putting all this together gain mastery of some subject area – if you then end up writing software it will be really good and you will be an acknowledged expert in the area that the software covers.

5.1 Introduction

To start off let's assume you have a research idea – the first step is to explore it and become expert in that area. This is not easy and will require considerable time and effort for you. If you don't want to put in the effort then you are wasting your money on this course as well as my time.

5.1.1 Choosing the Subject Area and Defining the Topic

Before you are ready to properly define the topic of your research project, you must choose a specialist subject area within the confines of the broad subject area of your course.

5.1.2 Choosing the Subject Area

Subject areas are broad and usually involve the study of a particular type of property, activity, organisation or system. Examples of chosen subject areas might be:

- Life Cycle Logistics for computer systems
- The utility of computer systems in large organisations (or small ones)
- IS policies and objectives in large organisations (or small ones)
- IS implementation plans and policies
- The role of project management in successful implementation of IS systems
- Outsourcing of IS resources
- Training policies and how they relate to operational cost reduction

The main thing is that you have a strategic dimension to it, which relates in some way to IT/IS provision or facilities. Clearly, once you have chosen your broad subject area, you need to define a specific topic for research. First, here are some *Do's* and *Don'ts* for choosing your subject area:

DO

Choose a subject area that interests you. Consider your personal interests as well as your interests on the course.

Discuss your proposed subject area with staff who have expertise in that subject before defining the topic.

Choose a subject area with sufficient scope to allow you to develop your own expertise.

DON'T

Choose a subject area in which information will be difficult to obtain (e.g. from overseas or from obscure or inaccessible sources -such as the Ministry of Defence).

Choose a subject which sounds very interesting and topical but which you are ill equipped to tackle, through lack of knowledge and/or understanding.

The project specification form has been designed to help you choose your broad subject area. You should complete as soon as possible and discuss it at the first session with your project tutor.

5.2 Literature Reviews - Defining the Topic

Your research project should not consist of "all anyone might want to know on this topic and a couple of other things as well!" You need to define in a really focused manner what particular aspect of the topic you wish to examine and what it is that you seek to demonstrate, that is, the objectives of the study. In general, a research project is *problem* driven. One of the greatest dangers is failing to identify and clearly specify the nature of the problem to be investigated.

This is a very difficult issue to grasp when embarking on a research project, particularly if it is for the first time. Your tutor will refer to: finding the angle of your research, scoping your research, specifying the hypotheses (if there is one), clarifying the objectives and finally dealing with logistics (assembling the resources). What they are trying to get you to do is narrow down your broad subject area into a feasible research topic. The point is you are trying to do two things:

Preparing Your Mind - learn all is necessary to understand and work on your research question

Carryout research - to add to then available knowledge pool

5.2.1 What is a Literature Review?

It is clear that the literature review is for you to find out all that you need to know in order to do the research and add reflectively and evaluatively to the available knowledge pool. That is theories, principles, technology, assumptions and so on that underpins your chosen subject area. You can think of it as being like a lecturer preparing notes on a certain subject, there is a need to be:

Exploratory – looks for all the information you need.

Focus – most subject areas will be too big to know everything in one attempt so we focus on one or two aspects.

Scholarly – where was the information obtained? No one wants to be labeled as a plagiarizer.

Correct – that is you need to make sure that one has validated information supported by evidence.

Systematic – there should be some structural logics to the way you build up the information base.

Comprehensive – that is there is a need to be sure we have left out nothing that is important.

Questioning – think about what questions still need answering or equivalently try to be clear about any gaps.

Reflective - as each new point is added we feel the need to review all that has gone before. That is, does the new information forces us to consider critically whether we need to change or add to what we already know.

Credible – there is a need to feel that ones listeners will find both you and your knowledge base as credible.

4.2.1 Hermeneutics

This is a term that is used to mean the theory of how one finds meaning in a text. There are schools of hermeneutic thought such as finding meaning through orthodoxy, allegory, literalism and so on. However, for us the important thing to remember is that all human expression may contain meaningful components and that you as the listener have to recognize them and then transpose them into your own system of knowledge, values and meanings.

This is not at all a simple process and it is easy to see that we may misinterpret meaning and our view of it may be faulty but we may not be aware of it. Much of what we read will be subjective and we may fit it into our *weltanschauungen* in a way that the author did not intend. In the same way you need to be aware that your readers may: not understand what you are saying, misunderstand what you are saying, add spin to what you say, try to 'improve' what you have said or modify what you have said to fit in with what they are saying.

5.2.2 Literature Elements

General reading around the subject is crucial to help you discover whether supporting material for the study is available and to increase your understanding of the scope of the subject. Wide reading may help you to identify particular aspects that help you to identify specific problems, which warrant further research.

Do not **underestimate** how much broad subject area reading you will have to do in order to identify a suitable topic. In short, you need to become an expert in your chosen subject area before you will be familiar enough with the subject to be able to identify any specific problems and, therefore, define a *topic*.

Sometimes students express great difficulty in getting past this stage of the research project and seek to defer it until after they have done the research. Clearly this is ridiculous; the setting of terms of reference/objectives has to be done at the start of the project because it provides the focus for the whole of the study. Unless you have decided what it is you are going to do, you cannot do it satisfactorily. You will collect information aimlessly and you will find it impossible to use the material because there will be no sense of direction by which you can organise it.

A well-defined project with a clear set of objectives will indicate the research that needs to be undertaken and will provide the framework for structuring the material into a report. However, it may well be an evolutionary process and you may need several attempts, each time becoming clearer and more specific about your intentions. Defining a topic is an iterative process: be prepared

to define, redefine and, if necessary, redefine again your research topic, as you become more familiar with the subject area and find new information. You should appreciate that undergraduate research projects do not often *break new ground*. By focusing on a specific problem, you will find it easier to:

Identify a general aim for the project.

Draw up a set of achievable objectives to help you to fulfill that aim and identify an appropriate approach to tackle the problem.

Decide upon appropriate methodology for gathering and analysing information.

Identify how the results of the research will contribute to a more generalised understanding of the topic or an extension of existing/understanding.

In this respect, research does not consist of simply collecting data and reassembling it in a written format. It is the analysis and interpretation of data and the subsequent drawing of conclusions that highlight the exercise of doing research. If you grasp this, then you will understand how important it is to have a problem to focus on - otherwise it is virtually impossible to focus your analysis or conclusions.

Read Saunders chapter 2 starting on page 13 and remember that you are finding the angle of your research, specifying the hypotheses (if there is one), clarifying the objectives and finally dealing with logistics (assembling the resources).

5.2.3 Some Checks and Balances

It is often true that different groups would come to different conclusions. On the issue of different conclusion let me give you an example. Suppose there are two books on subject X - Book A and Book B. Broadly speaking Book A was for the topic and book B against it but they both used evidence to support their view so how would we know which one to trust? Let me give you a few guidelines - this is VERY important

Read other authors on the same topic to see what they have said.

Read other authors because a single author may be biased.

Ask was the context in which the two conclusion were reached different

Look at the sources yourself - that is you could do some primary research

Check on the authors themselves - are they known to be reliable or not

Ask was book A or book B scholarly

Ask did the authors act selectively with the evidence

Never accept anything because someone said so - YOU must look at the evidence

Make sure that when you do all of the above you don't let your own bias or prejudice get in the way - at least if you can stop it getting in the way be aware of it. The point is that usually there is a huge amount of data and you have to be selective, and the problem with being selective is that it might introduce bias. Some final points:

Don't be put off by arguments like: you have not understood the context - that is you would think as I do if you only knew the context. This argument is very common and one has to watch for it. I am not saying that context is not important but how wide should it be? The point to go for is to say is there sufficient evidence for me to be convinced, and that might involve looking at contrary evidence and a detailed consideration of context.

Watch out for spin. That is being aware that an authors bias might have crept into their work or you may introduce bias by the way you use such sources. Additionally, you may put spin on your own work to such an extent that you distort the facts.

Argue from the weight of evidence, not from isolated examples

Be careful of authors that have a point to make. Unfortunately there have been many instances where books or groups of books have been made to agree because a 'party line' was made uncomfortable by variant readings introducing new evidence.

5.2.4 Critical Reflection

As you gather your knowledge pool you need to reflect on each new element and ask yourself how does this affect what I already know - do I need to modify what I know, do I need to collect more information and does it affect my basic research Question. Remember you are building an ontological model of the knowledge that is needed to understand and work with your Research Question

5.2.5 What to Look for in the Literature

When doing your literature review you must look for all or most of the following and thoroughly research them, so that they are clearly understood by you, and their implication for your research question are known within your focused area of study

- What is the background to your research?
- What other studies have been conducted in this area?
- What methodologies did other researchers use?
- What gaps have you uncovered in the existing literature?
- How does your research fit into and contribute to the area?
- What are the main ideas, concepts (worked up ideas) and main theories?
- What are the main sources?
- What are the origins of this topic?
- What is the main technology?
- How is knowledge on the topic structured and organised?
- What are the epistemological grounds for this discipline?
- Do you have an ontological map of the discipline and one of your understanding of it?

5.2.6 Assessing Arguments

Whenever you look at a source there will be arguments and ideas and your task is to critically assess them to see if there is sufficient evidence for you to make rational sense of them. Here are some general points that you might like to consider:

Conclusion Indicators – that is look for words that suggest a major point is being made (hence, because, for etc)

Belief – ask what is the writer trying to get you to believe.

Evidence – what reasons or evidence is used – if the evidence is weak can you get additional support from other sources?

Assumptions – what are the assumptions underlying the basic argument or idea?

Reliability – are you convinced as to the authority of the authors cited?

Conclusions – what conclusions can you draw from the passage?

Generality – is there a general principle involved?

Reasoning – can you follow the reasoning and are you convinced by it?

5.2.7 Information Sources And Searches, Bibliographies And References

This section is about developing the following skills – don't think you will develop the skills by just reading these notes – you will not – you must practice, practice, practice:

- Finding information sources in a variety of media using a range of sources
- Evaluating information in relation to the task in hand
- Using information efficiently
- Referring effectively and accurately to the information you have used
- Organising and presenting information

Portsmouth has an Information Skills website: <http://www.envf.port.ac.uk/fac/olc/infoskills>

You will need to use a range of sources – if you just rely on internet sources it is likely that your work will be viewed as weak since there is no independent refereeing process for internet sites.

5.2.8 Basic Literature Searching and Using Plan

This topic will be covered more fully in the following notes but for now the following points should be noted. Under discipline research you are expected to use a library, the internet or other information sources to fully research your topic area. Basically there are four steps:

Find – the first step is to use keywords to search various library or on-line catalogues for potentially useful information and ideas. For example, in an Inventory Management scheme one might use the following key words to search sequentially: Inventory Management, Inventory Control or Asset Management.

As the search progresses you will find useful information and this in turn will give you further keywords and allow you to get deeper into the subject area. It is very important that as you do this you are selective and that you **carefully record where each piece of information came from**.

Evaluate – here you need to look at three elements:

Sources – where did the information come from and how reliable is that source? As a rule journal articles and books are a good source since experts usually vet them whilst web sites, newspaper articles, magazine articles must be treated with caution because there is often no control over content.

Content – essentially one is trying to decide whether the material is sound technically and academically.

Useful – lastly, it is a matter of asking is the material useful in your project? The point here is that it could be quite sound material that interests you but does not have particular relevance to your project.

Cite – here you actually use the material in your project and cite the author(s). In general you use the material to illustrate a point of view or support an argument you are making. It is very important that you use the material you find and that you cite it correctly. If you do not cite your research it will be assumed that you did not do any and you will lose marks.

Discuss - once you have found and evaluated the material you want you need to include it in your project documentation by discussing it in context. That is you show how it applies to and supports (or does not support), illustrates or clarifies your project theme or idea.

Now one needs to be careful here as you do not want to be charged with plagiarism. You can use source material in your work but the most common way is to cite an idea and then discuss it in the context of your own research question. What you must not do is copy work and pretend it is your own – that is cheating and such cheating is regarded as disgraceful and will be treated very severely by the University.

Students often ask me 'how long should a quotation be?' This is a meaningless question as the great German poet Goethe once said to a friend who was worried about plagiarism - 'what there is is mine, and whether I got it from books or life is of no consequence. The only point is, whether I have made a right use of it'. This is liberating because the emphasis is on use and not on rules and limitations.

Now I don't want you filling up your work with quotes because I will then say I can't see what **you** have done with them – it's your work and you are supporting it with other peoples' ideas – so your work must be to the fore.

Try to introduce a quote with some introductory words, use the quote and then comment on it. If you want a rule then it might be that each quote should have just one main idea and that main idea is why you have introduced it.

5.2.9 Discussing and Using what you Find

The important this as we have seen is what you do with the source material that you find. Now we must avoid plagiarism but in general we can do at least four things with what we find. But keep in mind that what you end up with must be clear your work.

Copy – this just means we quote the exact words using quotation marks and to do this properly one needs to be sure that the quote holds a single main idea, which you want to use and then you must introduce it and then follow it up with discussion.

Paraphrase – this just means expressing something that you find in your own words. Now there is little point in just doing this and passing it off as your own words or even using a citation. You have to do it with the intention of making something clear. In most cases one does it to simplify, explain or interpret a complicated idea. The usual way to do this is to introduce the idea, citing the author and then paraphrase. But take care there is a very fine line between simplifying, explaining and translating something and just being lazy.

Summarise – here we are producing a précis or abridgment of a part of the source we have found. Essentially one is trying to capture the main points in an argument. For example, suppose a journal described a new method of doing something, then it is likely that the article will explain how and why the method arose – but you may just want to use it so you abridge the argument and anyone who wants to follow it up has the citation.

Analyse – here the idea is that you are taking something apart in order to fully understand it. The main purpose here therefore is a detailed examination of some whole by scrutiny of its parts. For example you may have a given situation with all its parts and interconnections and you set out to simply understand how it all works.

Synthesise – here the idea is to take parts and put the together into a new whole for some purpose. This will often happen in research where you may well have several ideas on a particular topic and you want to fuse them into some new whole.

I copy in order to discuss
I paraphrase to simplify, explain or interpret
I summarise to capture the main points
I analyse understand
! synthesise to build something new

5.2.10 Primary and Secondary Sources

It is important that we identify the authenticity of a source – that is we seek to get as close to the original sources as we can because we don't want to make any mistake in what is being said. In fact there are two elements we need to be aware of:

Author – who is saying what you are interested in? This might seem simple but often with say internet sources we have no idea who the author is supposed to be.

Content – what is being said? Now one needs to be very careful that you can distinguish between:

Opinion – such material can be used and discussed freely.

Assumption – one needs to be careful here but as long as the assumptions are stated at least one knows the limits of the knowledge

Unstated Assumption – pay careful attention as this element as it is often hard to detect.

Fact – here one needs much more care that you have the original source. Remember, facts can be quantitative data, theories and explanation.

It is fair to say that what is being said is the most important thing for a researcher but that content will always be coloured by the reliability we attribute to the source. Therefore we will define:

Primary Sources – that is the first published documents. One can be really pedantic and say the real primary sources are the author's manuscript or autograph but these days we are satisfied with published sources. It will often be difficult to establish what is a primary source

Secondary Sources – in almost every document you see, there will be elements attributed to other authors – these are then secondary sources.

In general one always wants the primary source, however, you will often find interesting secondary material in books and articles – if you want to use such material you must track it down yourself. Occasionally, you will not be able to track down the sources so you will have to be honest in how you use that material. This is not new since most ancient literature such as the Bible or Koran have no original source, similarly there are no originals for the famous Greek writers and finally there are wonderful collections of Arabic poetry from the 6 and 7th Century where we have no autographs at all.

If you have only secondary sources then you have to resort to other methods to authenticate what you have found – typically one looks for the same material in other sources that corroborates what you have found. In ancient times it is easy to understand that verbal transmission and laborious hand copying would or could lead to variant readings or over zealous copyists 'improving' or 'correcting' the text. You might think that that sort of thing does not happen in modern times but you would be wrong – just spend a few hours on the Internet or read two different newspapers on the same day! For example one of my students in his project quoted the following: "relevant systems are not a good way to investigate a given issue" – sounds ok? It sound fine but it was misquoted, and it should have read - "relevant systems are a good way to investigate a given issue".

5.2.11 Critical Reading

In your researching you will read many things from many sources. You must do this critically – that is not a criticality that looks for errors but a criticality that looks for truth. We might summarise this as follows where reading critically means:

Going beyond mere description and forcing you to respond.
Working hard to understand what an author is saying whether it is argument, assertion or statement.
Regarding research writings as part of a wider debate on some issue or other.
Not taking what you read at its face value but maintain a respectable skepticism.
Relating different writings to one another and consideration of contrary opinion.
Being explicit about your values and theories.

5.3 Introduction to Literature Searching

This section introduces some basic principles and outlines procedures involved in the preliminary stage of literature searching, when a broad overview of the topic area is being undertaken. At the end of this section you should be able to:

- Identify different types of literature search and their purpose
- Outline the procedures involved in literature searching
- Identify key types of tools for literature searching

5.3.1 Important 'Do's and Don'ts'

Before explaining search procedures and tools, it is worth making two very important points which should be borne in mind at the outset.

Recording Information - It is extremely important that when you search for information you make clear and complete records of what you have found. Many hours are wasted by researchers (academic staff as well as students!) who have neglected to write down the full details of books or articles and consequently have to try to re-trace their steps in order to complete references. It will save you time in the long run if you take full details first time round.

It is also important to try to be orderly in organising the information. This can sometimes be difficult when you have information from different sources (for example, some written references taken from printed indexes and others that are downloaded from databases). Some people prefer to record each reference on a card, or you might even use a bibliographic database manager such as Pro-Cite, this is by no means crucial, however, so long as you have a system for organising your material with which you are happy.

Seeking Help From Specialists - A common first step when starting a dissertation is to send off a series of letters to individuals or, more probably, organisations which the student thinks might be able to help. Letters asking the recipient to 'send me everything you've got' on a particular topic may reflect badly on the student and the University, and are unlikely to get a sympathetic response. Requests for help from specialists should never be a first step; they should be used, if at all, only after a literature search has been undertaken and should be carefully thought through and consist of a clear expression of a precisely identified need. Requests which are carefully focused and clearly articulated are far more likely to be successful.

5.3.2 Defining the Subject

The first step in literature searching is to think carefully about the subject you are researching. What do you know about it? Equally important, what don't you know: are there any aspects of the subject about which you are uncertain and which you need to research to fill in gaps in your understanding? On the other hand, are there aspects of it, which you specifically want to exclude?

5.3.3 Search Terms

When starting out, you will have certain words and phrases in your mind which define the subject you are researching. As you begin to read think more about the subject and to read introductory material of the kind referred to above, ask yourself whether the terminology in your mind is reflected in what you read: note any new terms which are used in relation to the topic and what they mean. Try to build a picture in your mind of the various aspects of the subject and how they relate to one another, and make a list of the terms you will want to use in searching for material on the topic.

Books are generally wider in content than journal articles and are therefore likely to have more general titles, so you may need to use more general terms when searching library catalogues than you do when searching more specialised sources.

Let's assume that you are searching for information on housing provision for older persons. A quick brainstorm could raise the following search terms: housing, property, accommodation, local government, voluntary sector, statutory sector, the elderly, pensioners, old people or retirement homes.

5.3.4 Encyclopedias and Dictionaries

Encyclopaedias can often be useful for providing an overview of a topic, and may also give references which guide you towards key texts or other reading. In some subject areas specialist encyclopaedias may be useful but bear in mind that for broad topic areas general encyclopaedias such as Encyclopaedia Britannica may also give valuable information. Specialist dictionaries can also be useful in defining the topic and giving guidance as to its terminology.

5.3.5 Use of Textbooks

When researching a topic for the first time, it will be useful if you can find textbooks which cover the topic in a general way or which deal with a major aspect of it. You may identify such works from encyclopaedia articles or other background material, in which case you would need to check whether the library has these by doing an author or title search in the library catalogue. Alternatively, you should use the search terms which you have noted to perform searches in the library catalogue using the subject index or keyword search facilities.

5.3.6 Book Databases

If you wish to undertake a comprehensive review of your topic, it may be appropriate to search beyond the library catalogue to try to identify books on the topic, which may not be in the library. There *are* tools available which enable you to search for books available in the UK and more widely. One such database is: abebooks.com.

5.3.7 Bibliographies and Reviews

A bibliography is a list of books and articles on a given topic. If there is a bibliography on the topic in which you are interested, this will obviously be useful and could save you a considerable amount of time. You will find bibliographies on the topic in encyclopedia articles and also in textbooks. However, bibliographies are sometimes published as separate works in their own right:

A review article, or literature review, is a special kind of journal article which, rather than describing the work of a particular individual or group, presents an overview of a range of work undertaken on a particular topic. Reviews usually include lengthy bibliographies, but are more useful than bibliographies since they also feature critical evaluation of the key papers listed, and so serve to enhance understanding of the development of a subject and its key topic areas. Reviews may be published in ordinary journals; or they may appear in specialist review journals.

If you find a bibliography or a review on the topic in which you are interested, remember to check when it was published; in most cases it will be necessary to search for later material in order to bring the list up to date.

5.4 Advanced Literature Searching

By the end of this section you should be able to:

- Re-define your topic for advanced searching
- Identify sources of further assistance
- Identify a wide range of information sources and search tools
- Be aware of the interlibrary loans service

5.4.1 Re-defining the Topic

For a detailed search on a specific topic, the process of thinking about the subject and its terminology should be continuous: as the background search evolves and you begin to move towards identifying a specific area for further research, so your understanding of the subject and its language will develop in parallel. At some point however, before embarking on your detailed search using specialised search tools, it may be worth making a special point of reviewing your search terms. You need to try to define a clear picture of the terms used to describe the subject and how they relate to one another:

- Are there any alternative words, which mean the same, or similar, as those I have in mind?
- Are there any terms which describe different, but related aspects of the topic?
- What broader terms might describe the wider context?
- Are there any broader expressions, which describe more specialised aspects of the topic?

In some subject areas there are printed thesauri, which list the terminology of the subject, giving, for each term, any synonyms (SN), related terms (RT), broader terms (BT) and narrower terms (NT).

It is helpful to compile a thesaurus entry of this kind for the subject you are researching. It need not be elaborate, or be structured as shown above; what is important is that you have clear idea in your mind of the terminology you want to use. This may be a mental list, though many people will find it useful to have a written note of key terms to serve as an aide-memoir.

5.4.2 Searching for Articles and Papers

A vast proportion of the literature on a given topic will be found in journal articles and conference papers. It is important to realise that much of the material found in books will usually have been published at an earlier date as articles or papers. Material found in journals is therefore, generally speaking, both more up to date and more specific than that in books published in the same period. There is a range of specialist tools available for identifying material on a particular topic within this very important category of published information.

5.4.3 Abstracts and Indexes

Some journals have their own indexes, usually published annually, which provide a means of access to the contents of the journal in question. Beyond this, however, there are also specialist journals whose sole purpose is to index a range of journals (and sometimes other material too). These are known as abstracts and indexes. An indexing journal will normally contain subject and author indexes to a specified range of publications, giving bibliographic references to the material indexed. Abstracting journals are similar, but include also a summary, or abstract, of each item indexed. In some cases, the function of an indexing journal is combined with that of a review journal:

In recent years, the importance of abstracts and indexes has declined as their contents have increasingly been made available as databases. However, there remain some abstracts and indexes which are not yet available in electronic form.

5.4.4 Bibliographic Databases

These are essentially the electronic equivalent of abstracts and indexes and many are still available both as databases and as the printed publications which preceded these. Databases are much more powerful search tools than indexes, since they can be used to specify a topic much more precisely, including the ability to combine search topics in a variety of ways.

In many cases, the search software used by such databases belongs to one of a small number of leading software suppliers. This means that to a considerable extent, search techniques used in one database can be used or adapted in another from the same stable. Two of the main software suppliers are Bowker Saur and Silver Platter.

5.4.5 Full-text Databases

A growing range of databases is available which give access to the full text of articles and other documents rather than simply the bibliographic references. The best known (and best used) of these are probably the newspapers.

5.4.6 Electronic Journals

Another development of growing importance is the increasing availability of journals in electronic form, made available usually via the World Wide Web. The picture here is somewhat muddled and fast-changing: as well as an ever-growing number of individual journals available via the web in full text, there are also collections of journals offered by means of deals.

5.4.7 Citation Indexes

Citation indexes offer an entirely different approach to searching for information, based on the reference within published works to previous works on the same subject. For example, if a paper by Jones refers to a previous one by Smith, it can be assumed that the subject of the two papers is in some way related. Using a citation index, it is possible to search for later citations of a given work. Starting with a key paper, therefore, it is possible to trace the development of later work on the subject by identifying works that refer to this.

5.4.8 Internet Resources

As we have seen, documents are increasingly published in electronic form and a comprehensive literature search should now include a search for internet based resources. This might encompass the use of the web to identify published documents.

Additionally, though, an internet search may identify sources of information which do not take the form of traditional publications, and it will become increasingly common for bibliographies - in academic work and elsewhere - to include references to internet sites as well as books and articles.

5.5 Referencing Conventions

The convention we expect you to use is the Harvard APA format. This is fully described in Saunders appendix 2 on page 459. The account managers can also let you have a copy of the University guidelines on Harvard APA. Be warned, if you do not reference correctly you will lose marks or your work may be rejected entirely.

Read Saunders chapter 3 starting on page 43. DO NOT ignore this material – considerable emphasis is placed on the quality of your review and if it is done badly you will almost certainly fail this unit and the project one. Pay particular attention to pages 47 to 49.

5.6 Discussion

1. For your research question write down 5 keywords and their synonyms and use them to search for journals and books dealing with your topic.

2. Earlier we quoted the aphorism 'chance favours the prepared mind'. Think about this and the explain why the literature review prepares you mind so that you can 'pounce' on new idea.

6. WINDING UP AND REPORTING

You now have all the tools and I expect you have got several ideas buzzing round in your head, or perhaps your employer wants you to do something. Well let's get to it and write it up professionally in a form that can be viewed and approved by a competent authority – in this case that will be a University committee.

A good proposal is above all clear and well focused – that is you write it so there is no doubt in a reviewer's mind what it is you want to do. Does this mean the proposal has to be long and complex – no it means that what you write down has to be clear, concise and focused. No one will be interested in what is in your mind – it is what you write down that counts.

So together we shall look at the proposal structure, the role of presentation, neatness, what resources you will need and the quality of research you put into the proposal. I want you to be sure about this – just stating the idea will not be enough, you must research thoroughly in order to justify your idea.

There we have it – the learning part is over and you are ready to be let loose on your idea. Best wishes and I look forward to seeing your finished work.

6.1 Conducting a Research Project

This chapter provides broad guidelines on how to plan, prepare and present a research project. It has been written principally for the final year students on the undergraduate courses offered by this School. However, it should also prove useful for other students who are faced with conducting a research project, including postgraduates.

Presentation of the findings of a research project normally involves a written paper or report, though other forms of presentation may be appropriate (with or without written support) in particular circumstances. If you are considering a study where the results will be presented in a non traditional form, you must discuss it with your supervisor. This chapter covers:

- The purpose of conducting a research project
- The role of the dissertation coordinator and project tutor
- Choosing a subject and defining a topic
- Planning the work schedule
- Writing the research report
- Assessment

6.2 Why should you do a research project?

Here are some reasons for you to think over:

- To offer an alternative to the course book/lecture type of study.
- To cultivate independence of thought and to encourage systematic study.
- To develop your skills in planning and executing a programme of work to a deadline.
- To develop your skills in investigating, analysing and synthesising data.
- To develop your skills in clear communication and effective presentation.
- To allow you to examine the practical application of theoretical principles.
- To provide you with experience of organising material on a large scale.
- To provide you with the opportunity to create a substantial piece of work, which you can then show to prospective employers.

6.3 Research Project Coordinator/Tutor

The research project coordinator is responsible for coordinating the unit and providing overall supervision of the execution of all projects. They are responsible for providing the academic administrative framework for the planning, preparation, presentation, supervision and assessment of projects.

The research project coordinator is also responsible for providing students with general guidance on conducting a research project.

6.4 Project Tutor

Each student is allocated a project tutor. Students should make sure that they are in contact with their project tutor on a regular basis (at least once a fortnight). Your project tutor will agree a specific time during the week when you can meet. You must make sure that you are available at that time - the project tutor may not be available to you at other times, unless specifically agreed because of changes to his/her schedule. It is important to appreciate that this is your project and not that of your project tutor. It is crucial, therefore, that you take responsibility for the completion of your project. You must seek help and advice as soon as it is needed.

Inform your project tutor at the earliest possible opportunity if you have any problems with your project.

In choosing your topic, your project tutor can provide invaluable advice. Careful selection of your topic is vital for the successful completion of a project, and should not be treated lightly. Often your tutor will be able to provide useful insights into the feasibility of a project and the potential problems that you might face in conducting the project. For example, your tutor might be able to guide you to the relevant literature in your chosen topic and/or warn you of the problems of not being able to obtain sufficient information.

See your project tutor as soon as possible to agree the topic of your project. In reviewing your work, your project tutor will provide guidance about the way in which you might present material. In order for you to improve your written style throughout the year, it is vital that you submit drafts to your project tutor on a regular basis (see the suggested schedule).

Submit work to your project tutor on a regular basis for critical comment. Once you have chosen your topic, it is unlikely that it will be within the specialist field of expertise of the project tutor. Their role is to evaluate and monitor your progress. They may suggest that you seek specialist advice, either within or outside the School, during the course of your project.

Listen to your project tutor and seek specialist advice when she/he recommends it. Ask for guidance about the source of this advice. Your project tutor will review the first draft of your written submission. A critical review is essential before you get the project typed and bound. You must appreciate, however, that the project tutor has his/her own work to contend with and several other drafts to read. Give your project tutor plenty of time to read your written material (see suggested schedule).

6.5 Explicit Content

The Workbook pack give extensive details guidance on what you should or should not include in your project write up.