



RESEARCH AND THE RESEARCH PROBLEM

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AIMS

- To explain what research is and what it is not, the criteria for research and the different types of research approach.
- To present some aspects of the debate about the nature of knowledge and the value of scientific method.
- To introduce the concept at the heart of any research project – the research problem – and to discuss what a researchable problem is.
- To warn of common mistakes.
- To describe how a research problem is found and stated.

The shortest way of describing the contents of this chapter is to say that it provides a starting point for your research efforts.

It introduces the concept of research as understood in the academic world, and contrasts it to the loose way the word ‘research’ is used in everyday speech. However, even in the academic world, the nature of research is the subject of a great deal of debate. The characteristics of scientific method are briefly explained, and some aspects of the debate are outlined. These are treated in much greater detail in Chapter 5.

An essential early step in the process of research is to find a research problem. What a research problem is, and how to find one, are explained. The nature of your problem will, in its turn, influence the form of your research. It is this quest for a problem which forms the task in the final section, where what you have learned in the earlier sections is applied to your own subject.

Key words are shown in bold and are repeated in the margin so you can scan through the chapter to check up on their meaning.

THE RESEARCH APPROACH

WHAT IS RESEARCH?

‘Research’ is a term loosely used in everyday speech to describe a multitude of activities, such as collecting masses of information, delving into esoteric theories, and producing wonderful new products. It is important that a student or practitioner embarking on a programme of academic or practical research has a clear idea of what the word ‘research’ really means, and clears away any misconceptions which might exist owing to its common use in other fields.

It is, therefore, worth looking at a few of the ways that the word is used in common language to describe activities, often called research, which are *not* research in its real meaning, and also at some of the emotive language that surrounds the term.

These are some of the ways in which the term ‘research’ is wrongly used:

- 1 *As a mere gathering of facts or information* ‘I’ll go and do a bit of research into the subject.’ This usually means quickly reading through a few books or magazines to become better informed about something. Such information can be collected in other ways too, e.g. by asking people questions in the street or by recording the number of vehicles driving along a road. This kind of activity may more accurately be called ‘collection of information’, and can be carried out in a systematic and thorough way. It certainly can be seen as an important *part* of research.

- 2 *Moving facts from one situation to another* ‘I have done my research, and come up with this information which I present in this paper.’ It is easy to collect information and reassemble it in a report or paper, duly annotated and referenced, and think of it as research. However, even if the work is meticulously carried out, and brings enlightenment about the subject to the author and the reader, one vital ingredient of the research process is missing – the interpretation of the information. One might call this form of activity ‘assembly of information’. This is, as with the collection of information, an important component of research, but not its entirety.
- 3 *As an esoteric activity, far removed from practical life* ‘He’s just gone back into his laboratory to bury himself in his research into the mysterious processes of bimolecular fragmentation.’ While many research projects deal with abstract and theoretical subjects, it is often forgotten that the activity of research has greatly influenced all aspects of our daily lives and created our understanding of the world. It is an activity which is prompted by our need to satisfy our natural curiosity and our wish to make sense of the world around us.
- 4 *As a word to get your product noticed* ‘Years of painstaking research have produced this revolutionary, labour-saving product!’ Very often the term ‘research’ is used in an emotive fashion in order to impress and build confidence. If you ask for evidence of the research process and methodology, you are likely to be faced with incomprehension, muddled thinking, and possibly even worse: the product may be the outcome of mere guesswork!

So how can true research be defined? The *Oxford Encyclopedic English Dictionary* defines it as:

- (a) the systematic investigation into the study of materials, sources etc. in order to establish facts and reach new conclusions
- (b) an endeavour to discover new or collate old facts etc. by the scientific study of a subject or by a course of critical investigation.

Leedy defines it from a more utilitarian point of view:

Research is a procedure by which we attempt to find systematically, and with the support of demonstrable fact, the answer to a question or the resolution of a problem. (1989, p. 5)

Dominowski is so terse in his definition that he seems to miss the point (see above):

Research is a fact-finding activity. (1980, p. 2)

Kerlinger uses more technical language to define it as:

the systematic, controlled, empirical and critical investigation of hypothetical propositions about presumed relations among natural phenomena. (1970, p. 8)

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You could go on finding definitions of research, which would, as in the above examples, differ in emphasis and scope. What is certain is that there are many different opinions about and approaches to research. However, as a means of achieving a greater comprehension of our world, research distinguishes itself from the two other basic and more ancient means, those of experience and reasoning.

Experience

Briefly, **experience** results in knowledge and understanding gained either individually or as a group or society, or shared by experts or leaders, through day-to-day living. Reflective awareness of the world around us, present to a degree even in other mammals, provides invaluable knowledge. The most immediate form of experience is personal experience, the body of knowledge gained individually through encountering situations and events in life. A child learns to walk by trial and error, and an adult gets adept at decorating jobs in the house after renovating several rooms. When solutions to problems are not to be found within the personal experience of an individual, then he or she may turn to those who have wider or more specialist experience for advice, for example a solicitor in legal matters. Beyond this are the ‘experts’ who have written books on particular subjects, e.g. health care or the finer points of playing golf.



Figure 1.1 Knowledge gained from experience forms an essential aid to our understanding and activities in everyday life

Knowledge gained from experience forms an essential aid to our understanding and activities in everyday life. However, it does have severe limitations as a means of methodically and reliably extending knowledge and understanding of the world. This is because learning from experience tends to be rather haphazard and uncontrolled. Conclusions are often quickly drawn and not exhaustively tested, ‘common sense’ is invoked as self-evident, and the advice of experts is frequently misplaced or seen as irrelevant. Despite these shortcomings, experience can be a valuable starting point for systematic research, and may provide a wealth of questions to be investigated and ideas to be tested.

Reasoning

Reasoning is a method of coming to conclusions by the use of logical argument. There are three basic forms of reasoning: deductive, inductive and a combination of both called inductive/deductive. Deductive reasoning was first developed by the Ancient Greeks, and was refined by Aristotle through his deductive syllogisms. An argument based on deduction begins with general statements and, through logical argument, comes to a specific conclusion. A syllogism is the simplest form of this kind of argument and consists of a major general premise (statement), followed by a minor, more specific premise, and a conclusion which follows logically. Here is a simple example:

All live mammals breathe.
This cow is a live mammal.
Therefore, this cows breathes.

Inductive reasoning works the other way round. It starts from specific observations and derives general conclusions therefrom. Its logical form cannot be so neatly encapsulated in a three-line format, but a simple example will demonstrate the line of reasoning:

All swans which have been observed are white in colour.
Therefore one can conclude that all swans are white.

The value of inductive reasoning was revealed by Bacon in the 1600s. By careful and systematic observation of the events in the world around us, many theories have been evolved to explain the rules of nature. Darwin's theory of evolution and Mendel's discovery of genetics are perhaps the most famous theories claimed (even by their authors) to be derived from inductive reasoning.

However, deductive reasoning was found to be limiting because it could only handle certain types of statement, and could become increasingly divorced from observation and experience. Purely inductive reasoning proved to be unwieldy and haphazard, and in practice was rarely applied to the letter. Medawar (1969, pp. 10–11) quoted Darwin himself in his sixth edition of *Origin of Species* where he wrote of himself that he 'worked on true Baconian principles, and without any theory collected facts on a wholesale scale', but later on admitted that he could not resist forming a hypothesis on every subject.

But when inductive and deductive reasoning were combined to form inductive/deductive reasoning, the to-and-fro process of developing hypotheses (testable theories) inductively from observations, charting their implications by deduction, and testing them to refine or reject them in the light of the results, formed a powerful basis for the progress of knowledge, especially of scientific knowledge.

It is the combination of experience with deductive and inductive reasoning which is the foundation of modern scientific research. Three characteristics of research can be seen to distinguish it from gaining knowledge purely by experience or reasoning:

- 1 Gaining experience is an uncontrolled and haphazard activity, while research is systematic and controlled.
- 2 Reasoning can operate in an abstract world, divorced from reality, while research is empirical and turns to experience and the world around us for validation.
- 3 Unlike experience and reason, research aims to be self-correcting. The process of research involves rigorously testing the results obtained, and methods and results are open to public scrutiny and criticism.

In short:

Research is a combination of both experience and reasoning and must be regarded as the most successful approach to the discovery of truth. (Cohen and Manion, 1994, p. 5)

When we talk about this type of systematic research, it is usually assumed that it makes use of the rigorous and questioning techniques of scientific enquiry. This form of enquiry is called scientific method.

SCIENTIFIC METHOD IN RESEARCH

Scientific method is the discipline which forms the foundation of modern scientific enquiry. It is therefore important to mention some of the main assumptions made in this method of enquiry, and to describe some of its major characteristics.

Scientific method has been applied, to a greater or lesser extent, to research in some areas not principally thought of as 'scientific', such as sociology, psychology and education, although some scientists question the appropriateness of doing this. For example, Medawar writes: 'I doubt very much whether a methodology based on the intellectual practices of physicists and biologists (supposing that methodology to be sound) would be of any great use to sociologists' (1969, p. 13).

Assumptions

According to Cohen and Manion (1994, pp. 12–16) there are five major assumptions underlying scientific method.

Order

The first major assumption is the belief that there is some kind of **order** in the universe, and that it is possible for us to gain some understanding of this order. This is linked with the idea of determinism, the assumption that events have causes, and that the links between events and causes can be revealed. This regularity enables some predictions to be made about future events (e.g. if gravity causes apples to fall today, it will also cause them to fall tomorrow). Scientists do admit, however, that owing to imperfect knowledge, predictions of varying levels of probability often result.

The second assumption is that, in order to enable us to gain this understanding of the world, there must be an agreement between people that

External reality	external reality exists, and that people recognize the same reality, a public or shared reality. It is hardly necessary to point out that much philosophic debate has been devoted to the nature of reality. Nevertheless, scientific enquiry relies on the acceptance of the reliability of knowledge gained by experience to provide empirical evidence (evidence which is verifiable by observation) to support or refute its theories.
Reliability	The third assumption is the reliability of human perception and intellect. Despite the many ways in which our senses can be tricked, researchers depend on their senses to record and measure their work reliably. Reasoning is an important method of organizing data and ideas, and is regarded, if used correctly, as a dependable tool of research. Human memory also plays a major role in research. To avoid questioning at every single stage, some credence must be given to the power of memory to provide reliable knowledge.
Parsimony	The fourth assumption is the principle of parsimony . Phenomena should be explained in as economic a manner as possible. Needless complexity is abhorred, and scientists aim to achieve the most elegant and simple theories.
Generality	The fifth assumption is that of generality . This is the assumption that there can be valid relationships between the particular cases investigated by the researcher and the general situation in the world at large. It is accepted that these relationships can be relatively unproblematical in some sciences (e.g. chemistry and physics) but that in others, with a larger number of unknown factors (e.g. sociology), there is a weaker chance of generality.

Characteristics of research which uses scientific method

Accepting these assumptions, research using the scientific method displays six characteristics which distinguish it from other methods of enquiry:

- 1 *It is generated by a question* We are surrounded by unanswered questions, unresolved problems, with conjecture and unproven beliefs. A questioning mind is the precondition for research. Why, how, when do things happen? What do events mean? What caused them? All these are questions which can generate research activity. Such a question is often referred to as the research problem.
- 2 *It necessitates clarification of a goal* Without a clear statement of the objectives and what is intended to be done, the research cannot be successful.
- 3 *It entails a specific programme of work* Research needs to be carefully planned in order to achieve its objectives and reach conclusions.
- 4 *It is aimed at increasing understanding by interpreting facts or ideas and reaching some conclusions about their meaning* The significance of facts or ideas depends on the way in which the intellect can extract meaning from them.
- 5 *It requires reasoned argument to support conclusions* In order to communicate an ordered sequence of ideas, a clear logical argument is required.
- 6 *It is reiterative in its activities* Advances in knowledge and interpretations

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of facts are based on previous knowledge, which, in turn, is expanded by the advances. Then resolution of research problems often gives rise to further problems which need resolving.

In addition, research often:

- divides the principal question or problem into more practicable sub-questions or problems. Problems are often too large or abstract to examine as a whole. Dividing them into component parts (sub-problems) enables them to be practically investigated.
- is tentatively guided by assertions called hypotheses (informed guesses or tentative assertions). Testing these hypotheses provides a direction for exploration.
- requires measurable data in attempting to answer the question which initiated the research.

EXERCISE 1.1

- 1 Without looking back in the text, can you list five major assumptions which underlie scientific method?
- 2 Examine the following texts, which were written by researchers to describe their research subjects, and decide whether they contain any of the characteristics of research using scientific method. If you can find them in the texts, summarize in a few words the following:
 - (a) the main question or problem
 - (b) the main goal or objectives of the research
 - (c) how the research work was done
 - (d) the main conclusion(s)
 - (e) the main argument followed.

Was the text clearly written, making the characteristics (a)–(e) easy to find, or did you have to search carefully to find them amongst all the words? Briefly describe the difficulties, if you experienced any.

Note: references in texts are not included in the reference list at the end of the book.

Text 1 (based on Mikellides, 1990, pp. 3–18)

We need light to see around us and colour to add beauty to our lives. The effect on us of light, however, goes beyond our everyday assumptions and expectations. Rikard Kuller, in his *Annotated Bibliography*, listed 1700 references on the psychophysiological effects of light. In both scientific and aesthetic accounts, colours have been classified according to their purported effects on humans. Hues such as orange, red and yellow are seen to be exciting and stimulating, while blue, turquoise and green are regarded as calming and relaxing.

To counter criticism of these views, Robert Gerard showed in his studies in 1958 that the different effects of blue and red on the organism could be measured by changes in the central and automatic nervous systems. Ali, in 1972, supported these findings by demonstrating differing levels of cortical arousal following the shining of blue and red light directly into the eyes of ten normal subjects for six minutes. A different approach taken by Lars Sivik (1970) demonstrated, using photo-simulation techniques, that chromatic strength rather than hue affects the exciting or calming properties of a colour. Kuller (1972) using full-scale spaces showed that strong and weak colours appeared exciting and calming respectively.

The approaches of these four studies were very different. The first and second used physiological measures using coloured light whilst the other two used semantic differential analysis using pigments as the colour stimulation. The first two showed pure coloured light in a laboratory setting, the second two colour in the context of indoor and outdoor settings. This study aims to bridge the gap between these sets of experiments. Surface pigments in real environments were used, with long exposure periods, using alpha rhythms recorded on EEG and EKG recordings to assess the level of arousal. The objective of the setting was to make a closer simulation of the real-life experience of the subjects.

Twenty-four subjects were exposed to four conditions in a room-sized environment: a completely red visual field, a completely blue visual field, a visual field with the left part blue and the right part red, and vice versa, each for twenty minutes. The measures of chromatic strength and lightness of the blue and red were identical. The data collected were analysed by means of several analyses of variance.

The most notable result of this study was that the central nervous system showed no significant differences when red and blue spaces were experienced. These results support, by the addition of confirming physiological data, Sivik's and Kuller's findings that, chromatic strength and lightness being controlled, colour hues do not affect excitement. This information will have important implications for design, as it contradicts the guidance given in design manuals.

Text 2 (based on Freese et al., 1999, p. 207)

The lasting influences of a person's position in the order of birth in a family have been the subject of an extended and heated discussion in sociology and other disciplines. In response to Sulloway's (1996) *Born to Rebel: Birth Order, Family Dynamics, and Creative Lives*, there has been an increase in interest in the likely influences of the order of birth on social attitudes. In comparison with the variables of gender, class or race, Sulloway found, through the use of quantitative and historical data, that birth order is a better predictor of social attitudes. His original theory attests that the influence of the order of birth is pervasive across time and society.

This study uses current data to test Sulloway's assertion that adults who were born the first in families are more authoritative and conservative and less subtle than those born later. Taking 24 measures of social attitudes from the General Social Survey (GSS), an examination of cases resulted in no evidence to support these assertions, neither in terms of significant effects nor even in terms of the direction of non-significant coefficients. As a result of further research, it was found that comparable results were obtained using all (202) relevant attitudinal items on the GSS yields.

As a result, it was concluded that variables rejected by Sulloway, such as family size, race, gender and social class, were all more strongly linked to social attitudes than was the order of birth. Therefore it can be inferred that theories relating to the

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order of birth in families might better be considered more modestly in terms of slight influences in limited areas and in specific societies.

Text 3 (based on Walliman, 1993, p. 5)

While the group self-build housing process is widely regarded as being an effective method of reducing the costs of acquiring accommodation, a review of literature indicated that the self-build option was not generally available to people in Britain who were most likely to be in housing need, i.e. those who had low incomes and low levels of building and managerial skills. Since 1980, this problem has been recognized in several pioneering group self-build housing projects, where innovations aimed at lowering the levels of income and skills required of the self-builders were introduced. However, no systematic analysis of the application and effectiveness of these innovations had been made. Necessary feedback for subsequent projects was therefore lacking.

An examination of the history and of the theoretical debate around self-help and self-build housing found a wide diversity of activities and interpretations and concluded that any analysis of a self-help housing project or movement must embrace an awareness of the context in which it operates and the motives underlying the methods used in order that a valid interpretation of the process and its outcomes can be made.

The context and motives behind recent self-build activities in Britain were investigated, and the analysis of recent innovations in group self-build housing in Britain was structured by the formulation of a general question about the effectiveness of the innovative methods, and of three derived questions which centred on the three fundamental procedures of the self-build process: funding, design and management. As a response to these questions, nine selected recent innovative group self-build projects were studied to provide a detailed comparative analysis of the characteristics of the innovations, and their effectiveness in lowering the income and skill thresholds of the self-build process.

It was concluded that innovations in the self-build process had succeeded in reducing, and in some cases virtually obviating, the levels of income and initial skills required of the self-builders. The procedures of funding, design and management were found to be highly interdependent, and that innovations in funding and design required a specific response in the management procedure in order to make them effective.

Though innovative techniques have enabled the group self-build process to be an effective method of producing social housing, the process was found to be complex and requiring government funding and support to make the projects viable, to protect the self-builders from the full effects of market forces and to guarantee their income levels. Because of the complexity of the process, extensive professional support was required to initiate projects and to guide the self-builders.

From these conclusions, recommendations were made about the sectors in which additional public support is required and how improvements in the availability of information about successful innovations in the group self-build housing process could be made.

You will find that this technique of analytical reading is a valuable skill which is worth developing to a high degree. You will have to sift through an

enormous quantity of written information in the course of your investigations, so the ability to identify quickly the crucial contents of a text will save you time in judging if it is relevant and of value to your research.

THE INTERPRETIVIST ALTERNATIVE

Although scientific method is widely used in many forms of research, it does not, and never has, enjoyed total hegemony in all subjects. Some of the world's greatest thinkers have disagreed with the tenets of positivism contained in scientific method. Positivism, a theory whose development was influenced by nineteenth century empiricist thinkers such as Bacon and Hume, holds that every rationally justifiable assertion can be scientifically verified or is capable of logical or mathematical proof. The alternative approach to research is based on the philosophical doctrine of idealism. It maintains that the view of the world that we see around us is the creation of the mind. This does not mean that the world is not real, but rather that we can only experience it personally through our perceptions which are influenced by our preconceptions and beliefs; we are not neutral, disembodied observers.

The German philosopher Immanuel Kant (1724–1804) even went so far as to claim that the objects of our experience, those things we see, hear and feel, are simply manifestations which have no existence of their own apart from in our thoughts. Although he was at the head of various scientific institutions, Goethe (1749–1832), the German philosopher and writer, shared with Blake (1757–1827), the English artist and poet, the belief that the universe was more like a living organism than a mechanism, and that, however exactly it could be measured, life could not be fully conceived of without 'inner experience'. The Danish philosopher Kierkegaard (1813–1855) rejected the dehumanization of the individual, which he believed resulted from scientific positivism. He regarded the capacity for subjectivity to be of greater value than that of objectivity, and that it could bring an individual nearer to the truth.

Steering a course away from the romanticism of these philosophical idealists, another German philosopher, Wilhelm Dilthey (1833–1911), agreed that although in the physical world we can only study the appearance of a thing rather than the thing itself, we are, because of our own humanity, in a position to know about human consciousness and its roles in society. The purpose here is not to search for causal explanations, but to find understanding. As a method, this presupposes that to gain understanding there must be at least some common ground between the researcher and the people who are being studied.

Max Weber (1864–1920), developing and refining Dilthey's ideas, believed that empathy is not necessary or even possible in some cases, and that it was feasible to understand the intentionality of conduct and to pursue objectivity in terms of cause and effect. He wished to bridge the divide between the traditions of positivism and interpretivism by being concerned to investigate both the meanings and the material conditions of action.

More recently, Thomas Kuhn cast doubt on whether science is capable of living up to its claims of being a purely rational pursuit of knowledge. In his book *The Structure of Scientific Revolutions* (1970) he argued that scientists rarely attempt to test existing knowledge by seeking alternatives to established theories, but prefer to find methods of substantiating existing beliefs. The established customs of science as a profession, he maintained, determine the acceptance of particular scientific theories rather than promoting the disinterested rational methods of enquiry. Just as argued by the French philosopher Foucault, the practice of science is shown to control what is permitted to count as knowledge. Thus there is no progress in science, only changing perspectives.

The basic assumptions of scientific method have been questioned by challenging the nature of facts and their rational foundation. Wittgenstein maintained that all our attempts to understand facts are fundamentally affected by the framework of our particular cultural and social background. Similarly, Quine detected a blurring of the scientific distinction between facts and ideas. It is worth, at this stage, looking back at the assumptions of scientific method mentioned earlier in this chapter, to find out which of them have been challenged. The existence of order, as present in the universe, which can be revealed by scientific study, is questioned. It is more likely that we are imposing our ordered understanding of the universe, rather than discovering an order that is already there. We also have an individual understanding of external reality, opened to our own interpretation and based on our view of the world. This reduces the feasibility of attaining reliability, as personal perceptions cannot be reliably shared. In any intellectual thought, parsimony is regarded as a virtue. Whilst understanding of a situation can lead to greater knowledge, it is not always possible or even desirable to ensure generality.

It hardly needs saying that scientists generally refute this challenge to the impartiality and rigour of scientific enquiry. Take for example the lively public debate about the rational foundation of science that was conducted at the annual meeting of the British Association for the Advancement of Science in September 1994 in Loughborough, UK. The debate – about the relationship between science and the sociology of science – was extraordinarily heated. The question, posed by sociologists, was whether science was a ‘social construct’, an activity inextricably bound up with human society and therefore subject to the vagaries of the social system, rather than an activity dedicated entirely to a dispassionate search for the truth, eliminating as far as possible all disturbing human influences.

A series of articles and comments by eminent researchers in the *Times Higher Educational Supplement* (30 September 1994) presented opposing views on the issues. Harry Collins, professor of sociology at the University of Bath, defended the assertions made by social scientists, and Peter Atkins, fellow of Lincoln College, Oxford, and lecturer in physical chemistry, replied and rejected their viewpoint. Exercise 1.2 contains summaries of their arguments to support the stances taken on the two sides of the dispute.

Anyone actively involved in serious research, in both natural science and the social sciences and in many other disciplines that cross subject boundaries,

should be aware of the debate concerning the ‘unbiased purity’ of the results of scientific method, and of its effectiveness in the search for ‘the truth’.

EXERCISE 1.2

Read the following summaries and:

- 1 Summarize the four or five main points of each argument. Try to summarize each point in one sentence.
- 2 Search within the arguments for any agreement with the points made on the opposing side. If you find any, what are they? Do you think that the arguments are part of a dialogue and form a direct response to each other?
- 3 Explain in two or three paragraphs what conclusions you have drawn from the arguments presented, and state whether you think that they have relevance to your own subject, and if so, how.

Note: references in these summaries are not included in the reference list.

Science is a social construct

The study of the sociology and history of scientific knowledge, which has been continuing for a quarter of a century, has revealed remarkable ambiguities in the results of scientific experiments and unexpected flexibilities in theory. It must be concluded that the progress of science depends on a necessary consensus in a society of what could be counted as believable. This reliance on social acceptability depends on the social context. It therefore follows that science must be seen as ‘a social construct’. This issue has only recently become an issue with natural scientists, most have reacted positively to the idea. However, the challenge to the unquestioned authority of science has increased uncertainty amongst scientists: resulting in some violent attacks on the findings of the sociology of science. It is particularly the issue of relativism that provokes lively debate.

In this context, relativism can be explained in the following way. A sociologist must examine the course of a scientific development from the perspectives of the scientists involved and not be unduly influenced by the consequences of the development, e.g. the production of a new scientific proof. For example, the special theory of relativity was said to have been proved by the Michelson–Morley experiment of 1887, which showed that light travelled at the same speed in all directions. This ‘proof’ might deflect the sociologist from the realization that Michelson was never satisfied with the reliability of his experiment. Additionally, an attempt to repeat the experiment by Miller in 1924 showed significant variations in the speed of light, a finding which resulted in Miller being awarded the physics prize of the American Association for the Advancement of Science in 1925. Despite there being no resolution to the problem up to the 1950s, the belief that the special theory of relativity had been proved was not dislodged. The sociologist or historian must therefore ignore whether the speed of light is constant, and rather find an explanation of why the result of one experiment was believed rather than another. This is methodological relativism.

The attacks levelled by some natural scientists on the sociology and history of scientific knowledge are based, not on a rebuttal of the theories and findings contained

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in reports, but on the accusation that studies are not serious and are a form of pseudo-science. This can be detected in the journal *Nature's* satirical attack on Jacques Benveniste's study of the homeopathic potency of water. Similarly, Wolpert, at the Loughborough conference, accused social scientists of being hostile to science, obscurantist, and considering only fringe scientific events and presenting no evidence for their views. These accusations are not justified.

Take, for example, the book *The Golem* by Collins and Pinch, which shows how relativism works in practice – a book that Wolpert has read and reviewed. Eight case studies of outstanding achievements in science are examined, amongst them experiments to do with special and general relativity, the origins of life, and the solar neutrino problem – all carried out by foremost scientists. These were definitely not fringe scientific events. As for obscurantism, the book was hailed by a reviewer in *Nature* for its deft and entertaining writing. The tenor of the book was also sympathetic to scientific endeavour, admiring the expertise and craftsmanship of the scientists. These facts all refute Wolpert's attempt to marginalize the work of writers in the sociology and history of science.

It is in the nature of this sociological and historical approach that the results cannot be 'proven' and are therefore open to dispute. It is right that this should be so. The methodologies have slowly developed over 25 years, and case studies have been gradually collected and studied. This is a slow process as these events cannot be set up in a laboratory like those in natural science, but must be waited for till they occur naturally.

Researchers in this field nearly all admit to be lovers of science. They are looking at science in a new way, one that appreciates the valuable work being done but questions the claims that all uncertainty and doubt are being dispelled. In fact, scientific enquiry is akin to study in the arts and social sciences: exciting, down-to-earth and argumentative rather than conforming to its reputation for being steely, impersonal and machine-like in its precision.

Science is not a social construct

It is the responsibility of science to reveal the truth that lies buried deeply in nature's wondrous complexity. The best way to do this is through the use of scientific method, to inch forward with theoretical development refined and inspired by experimentation. Scientific method is probably the only reliable way forward, though other methods are still being undertaken.

One example is religion, definitely conditioned by social forces through its reliance on meditation, personal revelation and social coercion. The dangers of 'socially constructed' methods of discovery are indicated by its enormous capacity to confuse and total failure to clarify.

The universality of science is one indication of its independence from society. Its substantiated laws and theories apply and are accepted worldwide, unaffected by the local historical, religious, political and social circumstances. There is no evidence that Western science has destroyed alternative methods of scientific enquiry, and those that dispute this are probably aroused either by jealousy or by a wish to impede the progress of science. Some reputed areas of knowledge that conflict with the current paradigms, such as the paranormal, are all based on evidence that cannot be tested by verifiable observations. Their theories cannot be meshed into globally coherent theoretical structures.

A second indication is the fact that science evolves and progresses smoothly, despite

the turmoils and revolutions in society. The so-called scientific revolutions, such as the development of relativity and quantum mechanics, can now be seen to be elaborations of classical physics, preserving many of its concepts and procedures. Although theories are refined or rejected during the process, science always progresses and expands its power of explanation through rigorous experimentation and theory building, and not through politicking and social manipulation. The truth is exposed despite surrounding social conditions.

A third indication is the compatibility of scientific knowledge gained from highly disparate sources. Despite the social and intellectual variety of sources, e.g. the study of particles at the CERN laboratories and the monitoring of sea slugs in Peru, the implications of the results never conflict as one would expect them to if science were based on social differences – a social construct.

The fourth indication is science's reliance on mathematics to explain most of the fundamental aspects of nature (e.g. elementary particles, motion, space–time, cosmogenesis), which removes it totally from the social sphere. Mathematics is a totally logical form of expression with an internal consistency unaffected by time and surrounding conditions. So how can knowledge gained in this way be regarded as a social construct?

This independence from social, political, racial and religious influences indicated by science's universal character contradicts the belief that it is a social construct. Any deliberate effort to distort the truth by a powerful social group would soon be exposed, because scientists depend totally on their efforts to uncover the truth, both for their livelihood and professional advancement and perhaps for a share of posterity.

It would be difficult to understand how modern technology, based as it is on the profound postulates of conventional science, would be able to operate if science was a social construct. It is ridiculous to maintain that the development of technology is part of a sinister plot by an exclusive group, even with regard to the emerging industry based on genetic engineering. Science is remarkable for its characteristic of uniting minds across the world, rather than dividing and segregating them as in the social constructs of religion and politics. There are no social barriers to anyone who wants to take part in scientific endeavour, as long as they are willing to conform to the high standards of integrity and the principle of open experimentation that is the ultimate path to greater knowledge.

It seems clear that, if eminent academics disagree on the most fundamental aspects of research, there is little scope for you to discuss these issues at great length in your thesis or research report in order to try to arrive at a definitive answer. It will be necessary to personally decide (and if relevant, explain) your position in the debate, and take your argument from there.

It would be impossible, within the scope of this book, to investigate in detail all the different approaches used in academic research. As scientific method is used, if only partially, in many forms of modern research, this book sets out to explain the theory and techniques of scientific method, and how it can be applied to various research topics. However, there is also explanation about a range of other research approaches, particularly those that have been developed to produce a more holistic or discursive examination of situations and phenomena, mostly focusing on humans and human activities in society.

While a more detailed examination of forms of enquiry is made in Chapter 5, it is worthwhile at this stage to point out some of the ways of categorizing the different types of approach to systematic research. One way of broadly distinguishing different approaches to research is by looking at the way in which the collected information is appraised:

- 1 by counting and assessing numbers – quantitative research
- 2 by measuring and evaluating qualities – qualitative research.

Yet another way is to examine what are the general aims of the research. A popular view is that research is dedicated to increasing knowledge in a particular subject and to systematizing our knowledge of the world. A more dynamic view holds that the role of the researcher is to make new discoveries, to change our perception of the world, and to point to ways of improving life. These two aims are not mutually exclusive. Medawar (1984, p. 40) quotes Bacon as urging a combination of both these approaches.

Types of research can be distinguished by the settings in which they take place – natural or contrived. Natural settings are those where nothing (or as little as possible) of the subject of study is changed by the researcher, in order to gain information about things as they are in their undisturbed state. An example of this is observing the movements of people across an open square. In contrived settings, the researcher determines the surrounding situation in order to control conditions: for example, the movement of people in different arrangements of an exhibition may be studied. There is a range of the extent to which a natural setting can be controlled to produce a contrived setting.

More will be said about different types of research in Chapter 3.

STARTING YOUR OWN RESEARCH

It should be evident from what you have read so far that in order to carry out research, you need to start by identifying a question which demands an answer, or a need which requires a resolution, or a riddle which seeks a solution, which can be developed into a research problem: the heart of the research project.

Students starting their research degree course, and practitioners wishing to become involved in research, tend to come from widely different backgrounds, and are equipped with varied amounts of knowledge and degrees of experience in their chosen field of study. While most are fairly sure of the subject into which they want to research, many are uncertain of the exact problem they wish to address.

THE RESEARCH PROBLEM

One of the first tasks, therefore, on the way to deciding on the detailed topic of research is to find a question, an unresolved controversy, a gap in knowledge or an unrequited need within the chosen subject. This search

requires an awareness of current issues in the subject and an inquisitive and questioning mind. Although you will find that the world is teeming with questions and unresolved problems, not every one of these is a suitable subject for research. So what features should you look for which could lead you to a suitable research problem? Here is a list of the most important:

- 1 *It should be of great interest to you* You will have to spend many months investigating the problem. A lively interest in the subject will be an invaluable incentive to persevere.
- 2 *The problem should be significant* It is not worth time and effort investigating a trivial problem or repeating work which has already been done elsewhere.
- 3 *It should be delineated* Consider the time you have to complete the work, and the depth to which the problem will be addressed. You can cover a wide field only superficially, and the more you restrict the field, the more detailed the study can be. You should also consider the cost of necessary travel and other expenses.



Figure 1.2 The world is teeming with questions and unresolved problems

- 4 *You should be able to obtain the information required* You cannot carry out research if you fail to collect the relevant information needed to tackle your problem, either because you lack access to documents or other sources, and/or because you have not obtained the co-operation of individuals or organizations essential to your research.
- 5 *You should be able to draw conclusions related to the problem* The point of asking a question is to find an answer. The problem should be one to which the research can offer some solution, or at least the elimination of some false 'solutions'.
- 6 *You should be able to state the problem clearly and concisely* A precise, well thought out and fully articulated sentence, understandable by anyone, should normally clearly be able to explain just what the problem is.

It is not easy to decide on and define a research problem, and you will not be expected to do so immediately. The important thing, at this stage, is to know what you are looking for, and to explore your subject for suitable possibilities.

The problem can be generated either by an initiating idea, or by a perceived problem area. For example, investigation of ‘rhythmic patterns in settlement planning’ is the product of an idea that there are such things as rhythmic patterns in settlement plans, even if no-one had detected them before. This kind of idea will then need to be formulated more precisely in order to develop it into a researchable problem. We are surrounded by problems connected with society, the built environment, education etc., many of which can readily be perceived. Take for example social problems such as poverty, crime, unsuitable housing and uncomfortable workplaces, technical problems such as design deficiencies, organizational problems such as business failures and bureaucratic bungles, and many subjects where there may be a lack of knowledge which prevents improvements being made, for example, the influence of parents on a child’s progress at school, the relationship between designers and clients. Obviously, it is not difficult to find problem areas. The difficulty lies in choosing an area which contains possible specific research problems suitable for the subject of a research project or degree.

SOME COMMON MISTAKES

It is worth warning you at this stage of some common mistakes made when a research problem is chosen. These mistakes arise mainly from the failure to grasp the necessity for the *interpretation* of data in the research project. Here are four common mistakes:

- 1 *Making the choice of a problem an excuse to fill in gaps in your own knowledge* We all welcome the chance to learn more for ourselves, but the point of research is not just personal enlightenment, but making a contribution to public knowledge. Anyone can find a problem which involves the gathering and duplication of information, but it requires an additional effort to find one which requires data to be analysed and conclusions to be drawn which are of wider interest.
- 2 *Formulating a problem which involves merely a comparison of two or more sets of data* A comparison of sets of data or records might fill up many pages (e.g. the average age of marriage through the centuries), but without any effort to reveal something new from the information, there is no research activity. The problem should clearly state the objectives behind making the comparison.
- 3 *Setting a problem in terms of finding the degree of correlation between two sets of data* Comparing two sets of data to reveal an apparent link between them (e.g. the average age of marriage and the size of families) might be interesting, but the result is only a number, and does not reveal a causal connection. This number, or coefficient of correlation, reveals nothing about the nature of the link, and invites the question – so what?

- 4 *Devising a problem to which the answer can be only yes or no* In order to improve on our knowledge of the world we need to know why things are as they are and how they work. A yes–no solution to a problem skirts the issues by avoiding the search for the reasons why yes or no is the answer, and the implications which the answer has.

EXERCISE 1.3

Consider the following short sentences claiming to be research problems and decide whether they are researchable, and are a feasible proposition for an individual student, like yourself, to undertake for a research degree or as a research project. Respond first with the answers ‘yes’, ‘no’ or ‘possibly’. Then, if you think that the research problem is not viable or will present difficulties, briefly give your reasons.

- 1 An enquiry into the history of the building of the Channel Tunnel.
 - 2 A study to compare the results in school history exams for 16-year-olds throughout Europe between 1970 and 1980.
 - 3 The effects of parent unemployment on their children’s attitude to schoolwork.
 - 4 The relationship between temperature, humidity and air movement in the cooling effect of sweating on the human skin.
 - 5 The effects of using glass of different thickness and qualities in single, double and triple glazing.
 - 6 What factors must be evaluated and what is their relative importance in constructing a formula for allotting grants to university students in Scotland.
 - 7 An analysis of the influence of Palladio’s villa designs on large country houses built in Britain in the eighteenth century.
 - 8 Whether the advantages of foreign borrowing by Third World countries outweigh the disadvantages.
 - 9 The composition of prefabricated elements of buildings in the construction of multi-storey car parks in tight urban situations in large conurbations of the United States of America during the 1970s.
 - 10 A study of how hospital patients’ recovery is affected by the colour of their surroundings and of how they react to the effects of different light levels after major operations.
 - 11 An enquiry to identify and evaluate the causes of ‘sick building syndrome’ in order to indicate possible methods of avoiding the occurrence of this ‘syndrome’ in new buildings.
 - 12 The impact of local tax and exaction policies on the London commercial office sector.
 - 13 Economic implications of the programme of rental increases and housing sales in China.
 - 14 How the career plans of school leavers compare with their subsequent careers in terms of self-satisfaction and self-adjustment, and what information the analysis of the difference between planned and realized careers provides to assist in career planning.
-

As you can see, it requires a good deal of thought and knowledge of your chosen topic of study in order to isolate a suitable research problem. Unless you have come to do your research with a particular detailed problem already identified (probably following on from some previous research which you have done), you will need to narrow down to a specific problem from a wider problem area.

AIDS TO LOCATING AND ANALYSING PROBLEMS

Booth et al. (1995, p. 36) suggest that the process for focusing on the formulation of your research problem looks like this:

- 1 Find an interest in a broad subject area (problem area).
- 2 Narrow the interest to a plausible topic.
- 3 Question the topic from several points of view.
- 4 Define a rationale for your project.

Problem area

Initially, it is useful to define no more than a **problem area**, rather than a specific research problem, within the general body of knowledge which interests you, e.g. housing and homelessness, parks in cities, building regulations and historic conservation. Your aim should be to subsequently narrow down the scope of the idea or problem until it becomes a highly specific research problem. This narrowing process will require a lot of background reading in order to discover what has been written about the subject already, what research has been carried out, where further work needs to be done and where controversial issues still remain.

You should keep in mind three questions when engaged in the preliminary exploratory work. The first is, *what is your motivation for doing the research?* A major motivation should be a curiosity about the research results. Another will undoubtedly be the fulfilment of the requirements of a research degree. Learning about the process of research – practical knowledge which can be used in the future – is also likely to be a motivation. The choice of problem is likely to be influenced by these motivational factors.

The second question is, *what relevant interest, experience or expertise do you bring to bear on the subject?* Obviously, interest in a subject is essential if you are to concentrate happily on it for a year or more. Although experience or expertise in a subject is not a prerequisite to doing research in that field, it does have an effect on the preliminary and information gathering stage of the work, as you will be familiar with the literature and the potential problem areas. However, a ‘new light’ may be cast on a subject by someone looking at it with ‘fresh eyes’.

The third question is, *what are you going to produce?* As a researcher, your priority will be to produce a defensible thesis or useful research report within your time limit. If you are a research student, you should check the requirements of your university or college in the regulations issued about the nature of suitable research topics. (It might be a good idea to do that now.



Figure 1.3 What are you going to produce?

You will find the information in the latest university research degree regulations kept in the library. You should also be issued with your own copy.) If you are doing a dissertation as part of a course, check the course notes for guidance. If you are doing a funded research project, then you will need to know the requirements of the likely funders or of the policy of the organization for which you work.

Initial literature review, and defining the problem area

The objective of the initial review of the literature is to discover relevant material published in the chosen field of study and to search for a suitable problem area. Fox (1969) mentions two kinds of literature which should be reviewed. The first is 'conceptual literature'. This is written by authorities on the subject you have in mind, giving opinions, ideas, theories or experiences, and published in the form of books, articles and papers. The second is 'research literature' which gives accounts and results of research which has been undertaken in the subject, often presented in the form of papers and reports. Chapter 2 in this book tells you how you can effectively carry out this search through the literature.

As every piece of research contributes only a small part to a greater body of knowledge or understanding, researchers must be aware of the context within which their research work is to be carried out. At this stage it is important to get an overview of the subject, rather than knowledge in depth. This will provide you with an understanding of the principal issues and problems or controversies, and the opportunity to select a problem area within a frame of reference. Within this problem area, it is important that you familiarize yourself with those aspects which have already been well established by previous research, and are generally accepted as true. These 'truths' can then be assumed to need no further proof, and the research problem simply uses them. It is not possible for a researcher to question absolutely everything in his/her investigations. Alternatively the research

problem can be in the form of a challenge to veracity of one or more of these 'truths'. Advances in wisdom are only made by building on the solid foundations of previous knowledge. Obviously, someone who is already familiar with the subject investigated will tend to be quicker to advance through this stage.

At this early stage in your research programme you are exploring your subject field only to identify a problem area, and do not need to try to define your research problem in any detail. All the same, I think it is useful to know what the next steps will be so that you can see the direction in which you will be moving. This might well help you to choose a problem area. The knowledge and techniques which you will require for defining your specific research problem in detail are explained in Chapters 2–7 of this book.

Research problem definition

Research problem

From the interest in the wider issues of the chosen subject, and after the selection of a problem area, the next step is to define the research problem more closely so that it becomes a specific **research problem**, with all the characteristics already discussed. This stage requires an enquiring mind, an eye for inconsistencies and inadequacies in current theory and a measure of imagination. It is often useful in identifying a specific problem to pose a simple question, for example, 'Does the presence of indoor plants affect people's frame of mind?' or 'How can prevention measures reduce vandalism?' or 'Can planning and building regulations prevent the destruction of indigenous architecture?'

Such a question can provide a starting point for the formulation of a specific research problem, whose conclusion should aim to answer the question. At this stage, the nature of the question will give some indication of the type of research approach (or approaches) which could be appropriate. Will it be a historical study, or a descriptive inquiry, an analysis of correlations or an experimental exercise, or a combination of more than one of them? (More about this in Chapter 3.)

Seemingly simple questions are riddled with ambiguities, which must be cleared up by careful definition: for example, in the above questions, what does 'frame of mind' mean, what sort of 'prevention measures' are envisaged, and does the question embrace all types of 'indigenous architecture' everywhere? It is likely that the problem is too broad if you can state it in less than half a dozen words. A few additional questions posed against each word can help to delineate the problem – where, who, what, which, when? Break the problem down into short sentences, not worrying at this stage about the overall length of the problem statement. It is a useful trick to put each sentence on a separate slip of paper, so that they can be put into order in different sequences. When the best logical progression from sentence to sentence is achieved, the statement can be edited into a more elegant form (Chapter 4 deals in more detail with the techniques of problem statement).

While developing a specific research problem, keep in mind the skills which you will require to carry out the research posed by the problem. Fox (1969,

p. 39) defines five types of skill which are essential: research design, instrument development, data collection, data analysis and research writing.

Designing research can be learned, in consultation with your tutor or supervisor (just wait till Chapters 5 and 6). Instrument development is, however, a highly specialized skill, so it is advisable to formulate the problem so that you can use standardized or previously developed instruments. The skills required by data collection techniques are generally readily acquired (introduced in Chapter 7), though consideration must be given to the extent of data needed. Data analysis does require specialist skills, which can be of a highly sophisticated nature (specialist help is on hand when you get that far). It will definitely be worth your while to consult your tutor or supervisor on the implications for data analysis that the research problem might have. Skills in research writing will be developed in Chapter 8, and by consultation with your tutors or supervisors over the next months (or years). Careful consideration of these points will ensure that the planned research is practicable and has a good chance of success.

The sub-problems

Sub-problems

Most research problems are difficult, or even impossible, to solve without breaking them down into smaller problems. The short sentences devised during the problem formulation period can give a clue to presence of **sub-problems**. Does one aspect have to be researched before another aspect can be begun? For example, in one of the research questions asked above, the kinds of prevention measures that can be used against vandalism, how they can be employed and for what types of vandalism they are suitable, will have to be examined. The sub-problems should delineate the scope of the work and, taken together, should define the entire problem to be tackled as summarized in the main problem.

According to Booth et al. (1995, p. 40) you can organize your questions to define the sub-problems by looking at your topic from these four perspectives:

- 1 What are the parts of your topic and what larger whole is it a part of?
- 2 What is its history and what larger history is it a part of?
- 3 What kind of categories can you find in it, and to what larger categories of things does it belong?
- 4 What good is it? What can you use it for?

Second review of literature

A more focused review of literature follows the formulation of the research problem. The purpose of this review is to learn about research already carried out into one or more of the aspects of the research problem, in order to:

- 1 summarize the results of previous research to form a foundation on which to build your own research
- 2 collect ideas on how to gather data
- 3 investigate methods of data analysis

- 4 study instrumentation which has been used
- 5 assess the success of the various research designs of the studies already undertaken.

A full introduction to the techniques of literature review, information storage and information retrieval are given in Chapter 2.

EXERCISE 1.4

In order to exercise what you have learned about the characteristics of the research problem and how it should be presented, here is part of a research proposal written by a postgraduate research student. It aimed to describe accurately and succinctly the relevant background, the problem to be researched and its importance. Obviously, you are not required at this stage to write anything as detailed as this yourself. The point of this exercise is for you to examine this text to see how a research problem can be extracted out of a context and defined and described in such a way as to convince the reader that the project is both worthwhile and possible to carry out.

After reading the following short research proposal, check the report against the following criteria:

- 1 Is the research problem clearly stated? What is it? Write it out. If it is not clear, try to detect what it probably is and then summarize it.
- 2 Does the problem seem to arise naturally from the background information and questions? Summarize the main points of the argument which lead up to the problem. If you have difficulty finding the relevant background information and argument, explain where you see the gaps.
- 3 Are any sub-problems stated? If so, what are they? Write them out. Do they really form parts of the main problem?
- 4 Is the proposed research limited in scope? What are the limitations? (It will help you if you think of different aspects of the research, e.g. time, place etc.)
- 5 Did the researcher state what type of research approach would be used? If so, write a summary of the research activities to be undertaken.
- 6 Is there any indication of the importance of the study? Describe how, if at all, this is conveyed.
- 7 Is there any reference to, or discussion of, related literature or studies by other researchers? If so, which?

Research proposal

A study of group-living accommodation for young physically disabled people

The aims of this study are to investigate different forms of group-living accommodation designed for people with physical disabilities; and to evaluate their effectiveness in meeting requirements for independent living, particularly for young severely disabled people.

The ethos behind segregation of disabled people has been that those who are incapable of managing their own lives might reasonably be placed in institutions that can take over those responsibilities. Admission into such institutions has for a long time implied, by circumstance or design, a relinquishment of certain rights, most particularly that of independent living.

As distinctions between those who are dependent on others have become more clear – the poor, sick, old and abandoned – so institutions and buildings, such as workhouses, orphanages and asylums, have evolved to provide for them. Their common ethos was segregation. After World War II, that acceptability of segregated institutions was called into question and alternatives to institutional living were sought for those dependent on others for their care. The response of the caring institutions was to shift away from segregation and towards the integration of people with disabilities into mainstream society. The underlying problem for architects was how buildings would need to change to accommodate this shift. Architects needed to devise a diversified range of buildings that widened the options for independent living for people with differing degrees of disability.

In the 1950s and 1960s new building forms such as sheltered and special needs housing were developed, but these were predominantly for the elderly. For younger disabled people there continued to be few alternatives between admission to an institution or staying at home. However, by 1970 new concepts were developed; most striking were young disabled units (YDUs) for severely disabled people of working age who had to leave home.

Over 320 YDUs and similar buildings have been built in the last two decades, providing places for 10,500 people. Some are built in the grounds of hospitals and some in the community; they generally accommodate 30 residents with their own bedroom and shared common facilities. Their objective has been to meet requirements for independent living, across the age range of residents, from school leaving age to retirement. However, research on the effectiveness of these schemes is sparse. Investigation so far suggests that their design has been more successful at accommodating the needs of older residents and less successful at accommodating the requirements for independent living of younger disabled people.

The focus of this study will therefore be to investigate the influences on different YDU built forms, and evaluate their effectiveness in meeting the independent-living needs and aspirations of the young people with severe disabilities who live in them.

Indicators of independent living established early in the study will be used to measure the effectiveness of independent living attained in the different building types, all purpose-designed to wheelchair parameters. Data will be collected by undertaking detailed multi-method surveys of different YDU-type group-living schemes. The surveys will include detailed appraisal of plans and measurements of buildings, observation of the building in use and structured interviews with residents across the age range.

The findings of the study are intended to make an original contribution to research in this area, and provide recommendations of practical value for the design of independent-living schemes which set out to optimize the independence of young people with severe physical disabilities.

(Proposal by David Bonnett – who successfully completed his PhD three years later.)

Are you finding it quicker to analyse a given text now? The example given above is the first part of a research proposal for an MPhil with intention to

transfer to a PhD. What has been left out in this example is the detailed methodology, explaining exactly how the research will be carried out. As already mentioned, you are not expected to be able to write anything as detailed as that at this stage. However, after Chapter 8, you should be able to write something comparable and this extract gives you some idea of what you are aiming at. Of course, your subject may be completely different, but the criteria listed above will be the same.

CONCLUSIONS

This chapter has aimed to provide an introduction to what academic research is about, and also to indicate that there is no generally accepted single correct approach to enquiry. It is clear, however, that the principles of scientific method do provide a reliable framework for carrying out an academic research project aimed at achieving a research degree. You will now have a basic idea of the attributes of academic research; you can use them to help you to assess the quality of the background literature you are reading in your subject, as well as to provide you with a starting point for your own thoughts about a possible suitable research approach.

As a principal purpose of a research thesis or dissertation is to provide a vehicle for learning about the theory of research and for correctly putting into practice relevant research techniques, it is generally inappropriate to stray far from the mainstream of research methods. That can come later! However, it may be that you are planning a research project within a specialized field in which you work. You will then need to make yourself familiar with the appropriate approaches and methods relevant to this field.

You are probably still not certain about what exactly you wish to research. That is why it is important to explain the nature of a research problem as a first step. Knowing about the attributes of a suitable problem, and keeping them in mind, will help you to explore the literature with more purpose than reading out of general interest. In order to launch you in the direction of problem finding, in the next section you are asked to apply what you have just learned to your own subject.

THE NEXT STEP: FIND YOUR RESEARCH PROBLEM AREA

The aims of this section are:

- to explore your own subject for problem areas
- to assess the practicality and suitability of possible research into those areas, in order to narrow down your choice
- to decide what further information you require.

On the basis of what you already know about your subject, and your understanding of the nature of research, examine your field of interest and identify three or four problem areas which might be researchable.

Problem areas might be found by detecting systems or organizations which do not seem to perform satisfactorily, either theoretically or practically. Larger scale issues, for example energy conservation related to the environment, might interest you. Have you read of any widely held beliefs in your subject which you think are misleading or quite wrong, or is there a significant lack of information about a topic you consider to be of importance?

When you have selected the problem areas, explore the issues involved by devising a number of questions which highlight the nature of the problem or reveal different aspects of it.

Consider what further information you might need to obtain to clarify and delineate the problems. Do not try to be too specific at first. It is a good idea to make a list of your key interests in your subject, so that you can look at problems which contain some or all of your interests. Remember you will be spending months or years researching the chosen problem, so you may as well make it fascinating for yourself.

As a guide to your investigations you may find it useful to answer the following questions in each of your problem areas:

- 1 Has anyone else done research into the same problem area?
- 2 Can you imagine how a methodical and scientific approach could be adopted to research into that particular problem area?
- 3 What issues would need to be explored?
- 4 How important do you think that research into this problem area is?
- 5 Do you think it might be possible to narrow down (delineate) the problem to make it a practical subject for your thesis? If so, can you suggest some simple examples.

Prepare a set of notes so that you can discuss these issues with your tutor or supervisor; it is best to give it to him/her to read before your discussion. This is an exploratory exercise, so do not try to formulate your detailed research problem at this stage. This will come later. Having studied this chapter of the book, at least you will know what sort of problems you are looking for!

This exercise should lead to the identification of promising problem areas and to a preliminary analysis of the issues involved in each. This will help you to define the type of background information which you need to explore and to delineate what issues might be of importance in narrowing down and clarifying a researchable problem.

When you are prepared, you should arrange a tutorial with your tutor or supervisor and hand over your notes for him/her to read. Your tutor or supervisor should discuss with you the potential for research in your suggested problem areas, and will also suggest what you need to do next in your background investigations. You will now be able to demonstrate an understanding of the basic characteristics of academic research, and you may want to discuss with your tutor some of the issues about research raised in this chapter.

KEY WORDS

Experience
Reasoning
Order
External reality
Reliability

Parsimony
Generality
Problem area
Research problem
Sub-problems

ANSWERS TO EXERCISES**EXERCISE 1.1**

- 1 Assumptions: there is order in the universe; agreement on external reality; human perception and intellect are reliable; simple explanations are better; it is possible to generalize.
- 2 Examination of texts.

Text 1

- (a) The question, though not stated as such, was whether the different techniques used in the described studies had a significant effect on the outcomes.
- (b) The main objectives were to bridge this gap in methodology and to get nearer to real-life experiences of the subjects. Also to test the results of the previous experiments by using the latest measuring devices such as EEG.
- (c) A brief but clear description of the experiment is given, and the methods of measurement using EEG and EKG recordings are mentioned. The data analysis by analysis of variance is also mentioned.
- (d) The main conclusion demonstrated support for one aspect of the previous research by Sivik and Kuller, made more significant by the use of different measuring techniques and settings.
- (e) The main argument runs like this. There have been studies which show that colour experienced by subjects affects their levels of excitement. The studies were carried out using different experimental techniques and different methods of data collection and analysis, and came to different conclusions. By combining features of the different approaches and getting nearer to a real setting, it is possible to produce results which test the previous results and give useful information for designers.

Text 2

- (a) The problem, though not specifically mentioned as such, is the controversial nature of the claims made by Sulloway about the importance of the order of birth in determining an adults social attitudes.
- (b) The main goal of this research is to test these claims.
- (c) This was done by using information on social attitudes already collected from the General Social Survey, from which, no doubt, the order of birth could also be obtained. No mention is made of the number of cases examined. The correlation between the order of birth and the social attitudes held was then examined.
- (d) These consisted of a rejection of Sulloway's claim that the order of birth was the paramount influence on social attitudes, and that, although this may have an influence, numerous other factors should also be taken into account.
- (e) If Sulloway's claims were to be true, then further research into the subject should produce additional evidence to support them. As this evidence was not forthcoming, his assertions should be either rejected or modified.

Text 3

- (a) The first mention of a problem is that the people in Britain most likely to be in housing need, i.e. those with low incomes and low levels of building and managerial skills, cannot use the group self-build housing process to reduce the costs of acquiring their accommodation. This is not, however, the research problem. It is the lack of systematic analysis and feedback of the application and effectiveness of the innovations aimed at lowering the levels of income and skills required by self-builders which is the problem. Could it be more clearly stated? Probably.
- (b) The main goal or objectives of the research are not clearly spelt out. They can be deduced from the implications of the problem, i.e. to make a systematic analysis of the application and effectiveness of the innovations, but there is no clear statement to this effect.
- (c) Much better this time! The third paragraph is all about method, i.e. one general and three derived questions were formulated and a comparative study of nine cases was made to investigate the effectiveness of the three fundamental procedures.
- (d) 'It was concluded that' – an obvious way to introduce the conclusions, but simply effective, as shown in paragraph four. Innovations were successful in reducing the necessary levels of income and skills, but the procedures were highly interdependent and required specific management procedure to make them successful. The next paragraph elaborates further.
- (e) The main argument followed seems to go as follows. The cost reductions of the group self-build process have only been made available to those who need economic housing most by innovations which reduce the required levels of income and skills. The effectiveness of innovations needs to be appraised; this can only be usefully carried out with an awareness of their context. By an analysis of the theory of self-build and an investigation of this process in several case studies, conclusions could be drawn about the success of the innovations and the intricacies of the process. This allowed recommendations to be made.

EXERCISE 1.2

- 1 I have extracted these points which I think are the main ones. What is important is that they follow each other in the form of an argument. You might have picked on other points. If you have, does the argument differ very radically? In the second report, you will notice that the main points are helpfully numbered!

Science is a social construct

The sociology and history of scientific knowledge has shown that the results of scientific experiments are ambiguous, and theories are more flexible than generally believed. Therefore science depends on the consensus within society on what is plausible: hence, science is a 'social construct'.

Because of this new awareness, experienced by most scientists, natural scientists are becoming less secure in their role and feel that the unquestioned authority of science is being undermined.

In his attack on the idea of 'science as a social construct', Wolpert rejected the sociology and history of scientific knowledge because he regarded the justifications for its ideas as outside the body of what is normally considered to be scientific work.

Collins replied that, far from undermining the value of science, researchers in the social aspects of science value its expertise, while removing the false impression of impersonality and precision which is associated with scientific enquiry. Science is a 'warmer' subject than commonly supposed.

Science is not a social construct

Scientific enquiry has proved to be the most powerful and reliable method of getting towards the 'truth' which underlies nature.

Scientific laws and theories are accepted worldwide and transcend sociological differences.

Scientific progress has been built up incrementally and smoothly over time, and independently of the social milieu.

Science is made up of a huge network of ideas from a wide range of sources, which, far from clashing as they would if science was a social construct, slot together in a complementary fashion.

The pre-eminence of mathematics in scientific theories distances science and scientists from any dependence on, or influence by, social forces.

All these observations lead to a rejection of the idea of science as a 'social construct'.

- 2 Nothing in the second argument agreed with anything in the first. Is this symptomatic of the steely, cold convictions reputed to be the result of scientific knowledge? In the case supporting science as a social construct, the argument seems to be a pleading that the sociology of scientific knowledge is being misunderstood or misconstrued, and that its investigations have been carried out in a genuinely 'scientific' fashion. It does not disagree with the 'correctness' of science, but states that 'correctness' is based as much on agreement within society as on a reflection of the truths of nature. These two arguments do not engage in a direct discussion, but rather present opposing views. The points made in each argument are not directly confronted by the other. They therefore should be seen as part of a wider debate.
- 3 There cannot be a model answer for this question, as, of course, any answer will depend on your own views and your subject. However, an important issue is raised, which is of significance whatever the direction of your research.

The evidence given in the first argument about the 'proof' of the special theory of relativity tends to show that scientific work and beliefs, in the short term, are subject to social pressures. However, in the long run, socially accepted 'working' theories must be reliably supported by scientific evidence in order to survive, or eventually be replaced or improved by some other theories, which themselves, though 'socially' regarded as superior, might need to wait some time for substantial proof or replacement. It is unlikely that, through social pressure, a false theory can survive as true for ever. Societies change too much over time to allow this.

The points made in the second argument tend to show that, in the long run, science has been built on firm foundations established through repeated questioning from all sides, regardless of culture and time. Science can therefore be regarded as one of the most powerful 'social unifiers' and a colossal reservoir of human understanding which evolves and improves over time.

Whatever the subject of your research, a distinction should be made between the object of scientific investigation and the scientific knowledge which you will acquire. It is one of the assumptions of scientific method that there is a real world which can be studied (i.e. as the object of scientific investigation), even though we are inextricably entangled in it. How we interpret the knowledge which we derive from these studies must, however, be influenced by the society of which we form a part. 'The knowledge that is constructed is independent of reality but the aim of science is to adequately represent this reality' (Godwin, 1994, p.18).

EXERCISE 1.3

- 1 No. Plenty of information may be collected on this subject, but there is no indication of any planned analysis. The sentence needs to continue: 'in order to . . . '.
- 2 No. There are two main defects. What will be done with the comparison? No indication is given of why the comparison is made and what is to be learned from it. The scope of the study is enormous. How can ten years of exam information from all the schools in Europe be collected by one person in about six months?
- 3 Possibly. This is better, but still rather vague. Is this a worldwide study, or will only a sample of families be investigated?
- 4 Possibly. This has probably already been investigated, and the form of the problem is too simplistic. A short study would probably reveal a set of relevant equations showing the correlation coefficient between the sets of data.
- 5 No. A seemingly straightforward technical study. But what are the 'effects' which will be studied? They could be on anything – on the environment, on glass production, on individual temperature. More precision about which 'effects' are to be studied is required.
- 6 Yes. This has the vital ingredients of a researchable problem. You should know by now what the ingredients are!
- 7 Possibly. Although this has probably been investigated several times over, the feasibility of the research problem depends on the number of large country houses built in Britain in the eighteenth century, or on a selection of representative case studies.
- 8 No. The solution to the research problem could be a simple yes or no. So what? Advantages to whom? Over what time-span?
- 9 No. Nicely delineated, but where is the problem? This is pure information collection.
- 10 Possibly. The difficulty is that this is two problems, involving two areas of study.
- 11 Possibly. Well formulated, but a large scale undertaking. A lot of research into this subject has already been undertaken, and some aspect which has not yet been investigated or some conflicts in existing research would have to be identified.
- 12 Possibly. This is too general as it stands. Is this a historical study or is it investigating the current situation? More delineation is needed. Does it require sociological as well as financial data?
- 13 Possibly. There is no indication of which programme is meant. You would need good Chinese contacts for this one. 'Economic implications', a very general term, could do with some delineation.
- 14 Yes. Quite usefully formulated.

EXERCISE 1.4

- 1 Though the research problem is not labelled as such (e.g. this research project addresses the following problem etc.), it is clearly and succinctly stated in the fifth paragraph. The

main research problem is the lack of knowledge of the effectiveness of YDUs, particularly in meeting the requirements for independent living of young disabled people. The 'aims of the study' in the first paragraph describe what the researcher aims to do in response to the problem.

- 2 There is a clear progression from paragraph two, culminating in the problem in paragraph five and a statement of the focus of the study in paragraph six. This is achieved in the following way. The general structure of the argument is based on a historical account of the development of socially provided care for people with disabilities, with particular emphasis on the concepts of segregation and independence. The account shows a progression from provision which segregated disabled people from society to forms of accommodation and care which were intended to allow more integration of residents, culminating in the YDUs. The point is added that, despite a shortage of research, existing evidence shows that the requirements of younger disabled people are not adequately met.
- 3 The sub-problems are implied rather than stated. It is possible to detect from the text that the researcher has identified two unknowns which require examination in order to investigate the main research problem:
 - (a) The influences on different YDU built forms. This is rather too general a statement to mean very much. Which influences need to be studied in order to investigate the main problem – economic, political, design, managerial etc.? This vagueness is possibly a result of not defining this aspect as a specific sub-problem.
 - (b) The way that independent living can be measured (hence the need to establish indicators). This is important to the main problem. Independent living is an abstract concept, and it is not initially obvious how it can be measured.
- 4 There are many limitations which narrow down the scope of the research, including the following:
 - (a) Country: implied, but rather surprisingly not stated in the text, limitation of the study to conditions in the UK or probably England.
 - (b) Time: current, i.e. not a historical study.
 - (c) People: young physically disabled in YDUs.
 - (d) Place: YDUs, purpose designed to wheelchair parameters. Though there are over 320 of these, the study is limited to survey different types or built forms of YDU group-living schemes. This implies that only a sample of the 320 will be surveyed.
 - (e) Subjects: independent living, aspirations and needs of young people with severe disabilities.
 - (f) Scope of surveys: detailed multi-method surveys are listed including appraisal of plans, measurement of buildings, observation of buildings in use, structured interviews with residents. Providing a list like this implies that these are the principal survey methods to be used, but does not preclude other types of survey activity, e.g. study of the history of the building, interviews with officials and designers etc.
 - (g) Criteria: to measure the effectiveness in meeting the independent-living needs and aspirations of young people with severe disabilities. 'Effectiveness' is a very general term, but it is stated in paragraph seven that the study will be limited to the indicators of independent living devised early in the research.
- 5 By investigating different YDU built forms, a comparative type of research will be carried out. It is pretty obvious that it will be a qualitative rather than a quantitative study. The research will also take place in a natural setting – investigating what the situation is as it exists. There is a specific intention expressed in the last paragraph that the research should increase knowledge of the subject.
- 6 In the last paragraph, the text stresses the originality of the contribution to research, and

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the practical value of the recommendations. The importance of the study lies in how it will help to improve the design of independent-living schemes to the benefit of the young disabled occupants.

- 7 As you see, no-one's particular theory or study is referred to in the text. The main point of the proposal is to stress the point that there is a lack of research in the subject. This paucity is the reason for proposing the study. In the original version of this proposal, each major statement was backed up by a numbered reference to the relevant literature, listed at the end.