



# Planning Your Research Study

# 7

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## 7.1 Introduction

One of the challenges of research, particularly for new researchers, is thinking about an area for research that is valid, worthwhile and researchable; this is the first step in research design. Exploration of predominantly peer-reviewed published and, to a lesser extent, unpublished literature is a good place to start. This helps you evaluate what research has already been carried out and give you an indication of any gaps in your current research area. Even if a study has been carried it may still be valid to repeat it if new research will add additional knowledge. Guidance on searching, evaluating and critiquing are covered in Chaps. 3 and 4, respectively. Once you have considered an appropriate area you then need to frame a specific question or questions. The process of developing and refining a research question is discussed in Chap. 2. A research question is fundamental to the research approach adopted, and throughout this book a number of research approaches are explored.

It is, however, important to learn the difference between a method and methodology. Method relates to the tools of data collection or analysis, such as questionnaires or interviews. Methodology refers to the approach or paradigm that underpins research. For example, an interview conducted within a qualitative approach, which seeks to explore, sayings, feelings or experiences, will have a very different underlying purpose and produce different data from that of an interview conducted within a quantitative design. For example, you may want to explore patients' experiences of a visit to a medical imaging or radiotherapy department. You could explore this

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qualitatively or quantitatively. However, a mixed-methods approach can be undertaken, which uses both qualitative and quantitative methods in the same study. This approach is growing in popularity in view of the range of data it can collect. It is however time-consuming to conduct.

First, we will look at a qualitative approach, and then a quantitative one. “Tell me about your recent visit to the medical imaging/radiotherapy department”. This open-ended question gives patients an opportunity to tell you about issues, concerns and experiences that are important to them. The narrative produced will be rich in data and may highlight issues, experiences or concerns that you had not considered. The data will be in a patient’s own words. The first stage is identifying some themes. After a first read through of the data you then have to compile a list of words or phrases for each issue or concept. For example, patient A may have stated the following. “They all seemed very busy, I was worried that I might have to wait a long time for my appointment, but I was only 5 min late. I was then taken to another waiting area, where I had to get changed and then I had to wait again. I wasn’t expecting that”.

When you look at this verbatim transcript there are possibly a few words that you could highlight: for example, “busy”, “worried”, “waiting”, “unexpected:”. When you have explored the other patients’ interviews, you may find there are similar identified that will enable you to develop categories and themes.

On the other hand should you use a quantitative approach, then you might ask 20 randomly selected patients to complete a questionnaire using a rating scale. An example of a question could be phrased as follows. “How would you rate the efficiency of your recent visit to the medical imaging/radiotherapy department?” You may want to distribute this to two different patient groups; for example, those who utilise an open access service and those with appointments (Table 7.1). You would give these patients one of five options from which they will be required to select their responses.

- 5. Excellent
- 4. Very good
- 3. Average
- 2. Poor
- 1. Very poor.

**Table 7.1** Data gathered using a quantitative approach

Efficiency rating	Open access patients	Patients with appointments
5	2	5
4	4	8
3	6	5
2	7	1
1	1	1
	<i>n</i> !420	<i>n</i> !420

The data produced will be in a very different form. The raw data could be as follows.

- Patients with appointments: 54333454454344342551.
- Open access patients: 33343224422522334521.

As you can see, these two different approaches result in very different data; the first highlights issues that are pertinent to a patient; the second gives you numerical data that illustrate how many patients rated the department as efficient.

In order for your project to be successful you need to have clear aims and objectives and a plan of action. Making changes, as you go along, could be a recipe for disaster. You therefore need to think about the research process and the actions that you will have to undertake in a systematic and structured way. Often the ideal is superseded by what is practicable; this needs to be taken into consideration at the beginning of your project. Ironing out potential issues at the beginning of a process will reap benefits later on in your project. It is during the planning process, and selection of the appropriate tools, that a researcher must acknowledge and recognise potential pitfalls that could arise. As you will be committing a great deal of time and effort to this endeavour, we think an important consideration of undertaking research is that of choosing a research topic, which has personal interest or is of professional significance, to help motivate you. It is suggested that you consider your own skills set and those you use to conduct your research. For example, if you like talking to people you might want to consider using interviews, focus groups or observing people to maximise your skills.

Whether you realise it or not, as the researcher you have a powerful influence on your research project. What you have read in the past influences your thinking. How you phrase or ask questions influences the data collected [1], as discussed earlier. You do need to take a reflective approach to your project and should try and maintain a sceptical approach to the evidence provided by respondents and other data sources [2].

In order to plan your work, it is good practice to have a structure or a framework to work from. An example is presented below.

1. Orientation of the research
2. Review of the literature identified through a structured search
3. Research design and methodology
4. Data analysis
5. Reporting and writing up the research

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## 7.2 Orientation of the Research

The generation of a research idea, a specific research question, aim or hypothesis, is discussed in detail in Chap. 2. However, there are some practical issues that are worth considering during this initial phase.

Time is one of the key resources available to a researcher. However, as with all the best laid plans, things can and do go wrong. Therefore, it is imperative that time is assigned in the overall plan to account for any potential problems (see Chap. 20). This is particularly important if research is undertaken as part of undergraduate or postgraduate studies because the timeline is often very tight and is frequently the main factor in determining a research design. A longitudinal study will not be feasible if a project needs to be completed in a set number of weeks. For example, it would be unrealistic to try and undertake a research project exploring practitioners' attitudes to continued professional development activities and their career projection. Such research cannot be undertaken in only 20 weeks.

A timescale affects a research question and the way the data are collected. You may only be able to use one instrument, but would have ideally liked to validate your data further with the use of another data collection instrument. The number of researchers undertaking the project also influences the focus of a project and the research question.

You may be undertaking a project on your own or working as part of a research group. Careful planning and ground rules must be identified at the planning stage in a group research project. This is necessary to ensure all group members are aware of the timescale, targets and deadlines. You need to consider the amount of time needed to undertake the data collection: conducting interviews, for example, can be very time-consuming and this may constrain the number of interviews that an individual can undertake.

The cost of the project has to be considered at this early stage. If your research is being undertaken as part of your degree, one of your priorities will probably be to keep costs to a minimum. Therefore, if you would have travel to interview participants from diverse geographical areas, as part of a qualitative project, then this would likely preclude this type of question. This will impact on your time also. Similarly, if you are considering testing a hypothesis that requires the use of equipment not available at your university, this too may exclude a particular research focus.

Whether you are a first-time researcher or one with experience, the importance of regular meetings with your supervisor cannot be overemphasised (see Chap. 20). Your supervisor is also a key resource with experience in guiding other students in a research process [3]. These meetings will give you an opportunity to discuss or clarify each stage of your project and receive constructive feedback (see Chap. 20). This is especially useful when you have collected the data; you can then discuss the implications of your findings during meetings with your supervisor. If you are a pre-registration undergraduate or postgraduate then these meetings will also help you keep on schedule by ensuring you submit your work on time.

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### 7.3 Review of the Literature

It is important to undertake a literature review to gather information from a range of sources and to contextualise what is known about a subject. A review of literature should lead to you identifying any gaps in the literature so that you can motivate

why your research will be important to conduct. The first stage in a search process involves developing a focused research question to identify relevant literature. A focused question should ensure all relevant studies will be included and that a systematic and replicable process will be used in your project.

## 7.4 Research Design and Methodology

This is the stage where your idea or theory moves towards a proposed concrete project. Your proposed research's aims are translated into specific questions and what instrument is to be used to answer these questions. This entails deciding what research instruments will be used to gather the data. A detailed planning of a project should be written up in a document called the "research proposal", which may be submitted as part of the ethics approval process and should be presented to your supervisors (Box 7.1). It is prudent to keep referring to this document as your project progresses. At this stage your area of research will not have been fully fleshed out. Your research proposal thus serves as your guide to completion.

Research design is an essential consideration in any research project. There are two main paradigms employed in research studies: quantitative and qualitative research designs. Depending on the nature of your aims and objectives, your study would usually fall within one of these two types of research designs. See Chaps. 8, 15 and 16.

### Box 7.1 What Should You Include in Your Proposal?

The main headings in the proposal should include.

- Aims and objectives—what are you going to do, broken down into measurable objectives?
- Background—why is this topic interesting or important?
- What is the clinical relevance of the study if taking a qualitative approach?
- Methods—you will need to justify your chosen methodology and approach. How will you carry the research out? This should include a detailed description of the data you will collect, including sample size, access and if applicable, statistical tests that will be applied. How are you going to ensure the validity and reliability of the study if undertaking a quantitative study? Have you thought about credibility, transferability and trustworthiness of the research if undertaking a qualitative approach?
- Literature review—this should be a brief outline of the current literature that relates to your study. This is essential to enable you to become familiar with and take account of research already undertaken in a specific area. This should include your key references.
- Ethical issues—those related specifically to your study should be identified in this protocol. Submission of this protocol is usually an integral aspect of your ethical approval process.

- Resources—costing of staff, travel, materials. This may have to be very explicit, especially if your project is funded and you are accountable for all the monies spent. Often new researchers underestimate the costs of staff time particularly. It is easy to underestimate how long tasks will actually take. Normally in an undergraduate project there are no significant cost implications and the materials and equipment required are usually supplied by the university.
- Pilot study—if applicable, a pilot study should always be undertaken and you will need to describe in this protocol how this will be conducted and what your sample size will be.
- Timescale—this should include the important milestones such as the start and completion of the data collection process; data analysis; chapter drafts and time allocated for amendments. It is always worthwhile to include some contingency time, as well as a completion date.
- Dissemination—how are you going to inform others, including participants, of the findings? [4].

Quantitative research is usually structured to test a hypothesis. It aligns with a positivist viewpoint: collecting precise, measureable “scientific” data results in high levels of data reliability. This requires a researcher to analyse the data in order to look at correlation or possible cause and effect. It is deemed less subjective than qualitative research. A hypothesis consists of a suggested explanation for a phenomenon or a reasoned proposal suggesting a possible correlation between multiple phenomena. It is a methodology that aims to determine a relationship between one thing (independent variable) and another (dependent variable) in a specific population. Quantitative research is often described as being reductionist [4]. It is used to collect a range of numerical data in an effort to answer a research question. Though this may not always be the case, you may be seeking to describe a specific set of circumstances or characteristics of a study sample or target population [5]. The designs used in this paradigm are experimental and non-experimental: surveys, epidemiology and quasi-experimental designs, for example.

### 7.4.1 Experimental Designs

In experimental design investigators deliberately control and manipulate the conditions that determine the events in which they are interested [6]. An experiment involves making a change in the value of one variable, and is often undertaken in a laboratory. Healthcare experiments often need to be undertaken in a hospital or clinical setting; this then allows for a randomised controlled trial (RCT) to be undertaken. A RCT is an experimental design that aims at assessing clinical effectiveness (see Chap. 12). It is quite often used to ascertain the effectiveness of new drugs. RCTs provide strong evidence for efficacy of healthcare treatments or interventions

due to their low probability of bias. A population in a RCT is defined by the researchers. A population, for example, could be men over the age of 60 with prostatic disease, in a RCT pertaining to this pathology. A RCT sample would then be selected from this population. A randomised assignment procedure is used to allocate participants to a group. After the RCT intervention, the outcomes are then measured.

### 7.4.2 Non-experimental Designs

In non-experimental designs surveys are often used. In medical imaging and radiotherapy practice they can be employed to ascertain the attitudes, opinions and beliefs of people using the services we provide. The participants could be patients; doctors, dentists or other healthcare practitioners who refer patients; or radiographers. A questionnaire is often used to collect data. A survey questionnaire could be undertaken, for example, to give us an overview of the use of imaging services or radiotherapy in a given community.

Epidemiology is an approach used particularly in public health. It is concerned with a population as a whole or a particular group within it. This approach can use comparison studies, comparing responses of different cultural groups to an intervention, for example. This approach can be used to undertake correlation studies, which are used to identify interrelationships. Epidemiological methods are discussed in Chap. 9. Quasi-experimental designs resemble experiments, but the participants are not randomly assigned. Also, such research may include time-series designs. These are when a sample may have an intervention allocated and then observed over a period of time. For example, some patients may be recruited to this type of experiment and have radiotherapy while another group may have radiotherapy in addition to a new drug.

Qualitative research is used to study human behaviour and to interpret how people conceptualise the world and find meaning in their experiences. The use of this type of research does not usually test hypotheses. It is concerned with understanding personal meaning through specific questions that aim to guide an investigation. This method is used to seek to make sense of, or interpret, phenomena in terms of the meanings people bring to them. Qualitative research is used to help us understand how people feel and why is it that they feel as they do (see also Chap. 8). Samples tend to be much smaller compared to quantitative projects. The latter tend to include larger samples. A good qualitative study addresses a clinical problem through a clearly formulated question and often uses more than one research method, known as triangulation. Analysis of qualitative data can and should be done using explicit, systematic methods and should be reproducible [7]. Interviews, focus groups and observations are common techniques used in qualitative research. These are discussed in Chap. 16. Qualitative methodology is a useful method to assess individual feelings, experiences and knowledge. Some examples are presented below.

- How do student practitioners perceive the role of a personal tutor?
- What do students feel about distance learning while on clinical placement?

- What are patients' experiences of imaging/interventions/treatments?
- What are radiographer's experiences of imaging patients with a hearing impairment, or who do not have English as their first language?

An interview is defined as a two-person conversation initiated by an interviewer with the specific purpose of gathering information relevant to a research objective. Interviews allow for rapport to be developed between an interviewer (researcher) and interviewee (respondent). This allows a researcher to probe and explore complex issues. Interviews can be conducted face-to-face or telephonically. The former allows a researcher to observe respondents' body language and emotions thus providing additional information. Telephone interviews reach respondents over a wide geographical area. They are cost-effective and a more accessible approach to consider. The success of an interview depends upon the skill of an interviewer and how articulate a respondent is. Some interviews may be quite formal and a series of questions are asked. The responses to the questions are recorded; a researcher is quite directive during a formal interview. Interviews could be less formal, where a researcher raises a number of issues in a conversational way and is less directive.

Focus groups can be used to generate data from a wider range of responses compared to those of individual interviews. A researcher uses a focus group to deliberately select participants to discuss a particular area of interest. A focus group facilitates a trusting relationship between participants and a researcher. A focus group is unique in that participants build on the answers of others in the group. This allows for the production of rich data through social interaction. A focus group discussion can produce new thoughts that a researcher may not have thought of; participants encourage a collective group discussion of a topic. A focus group is often quicker to use, but it does not really allow personal matters to emerge or to be explored in any great depth. Individual interviews would be appropriate to find out how diagnostic and therapeutic practitioners cope with death and dying, whereas a focus group would be useful to ascertain what support diagnostic and therapeutic practitioners need for continued professional development.

Observations allow for gathering of data from live situations and enable a researcher to look at what is happening in situ rather than second-hand. A researcher uses a structured observation to specifically know what to look at: hand washing technique undertaken by practitioners or manual handling techniques of student radiographers, for example. An unstructured observation, on the other hand, means that a researcher is less clear what to look for and has to go to a situation and observe what is taking place in order to determine what is significant. For example, you could provide some patient information in your waiting room, and then you could observe whether and how patients engage with it over a period of time.

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## **7.5 Advantages and Disadvantages of Quantitative and Qualitative Research**

The advantages and disadvantages of both these approaches are listed in Table 7.2. Let us look in more detail at each approach.



**Table 7.2** Advantages and disadvantages of quantitative and qualitative approaches

Quantitative approach	Qualitative approach
<i>Advantages</i>	
Objectivity—the elimination or reduction of subjectivity of judgement or interpretation	Interviews yield much richer data than a questionnaire might
Independent and dependent variables clearly and precisely specified	Can handle complex topics
Data reliability high—due to controlled observations, laboratory experiments, mass surveys or other forms of research techniques	Interviews help where the topic is new or unfamiliar
Representative—often more representative of a wider population and can compare similar studies more easily	
Results are usually statistically reliable	
<i>Disadvantages</i>	
Not appropriate for learning why people act or think as they do	Inconsistency: It is very possible to be inconsistent in the way you ask questions, what questions you ask and how you interpret answers
Questions must be direct and easily quantified	Generalisability—difficult to generalise from interviews
Participants may answer differently in a structured survey than they would in a real-life situation	Low validity/reliability—the data-gathering measure may not measure what you want it to, or may not give the same results if repeated
Very difficult to prevent or detect researcher-induced bias in quantitative research	Experience—conducting interview or managing focus groups effectively does require a high level of experience from the researcher to obtain the required information from the respondent
	It is time-consuming to immerse yourself in the wealth and volume of data generated

### 7.5.1 Advantages of a Quantitative Approach

- Subjectivity of judgement or interpretation is eliminated or reduced. Subjectivity affects all research to some extent. Even before a study begins it is already influenced by factors and constraints such as a researcher's desires, interests and pre-occupations. Quantitative research eliminates some of these factors because it requires a clear statement of a research problem in specific and well-defined terms in order to obtain numerical data that can be statistically analysed [8].
- The independent and dependent variables under investigation are clearly and precisely specified. An independent variable can be changed or manipulated by a researcher. A dependent variable is a response that is measured. An independent variable is the presumed cause; a dependent variable is the presumed effect.
- High levels of data reliability can be achieved due to controlled observations, laboratory experiments, mass surveys or other forms of research technique.
- A more representative sample of a wider population is usually obtained. A comparison of similar studies can be made more easily because of the larger sample sizes.
- Results are usually statistically reliable.

Consider the above-mentioned example of a questionnaire which was distributed to patients for them to rate the efficiency of the department. They had to choose from one of the five categories. The numerical data collected from this question could then be analysed statistically. The example used in this illustration is a small sample, but a questionnaire could be distributed to a much larger sample comprising several 100 patients. You might collect demographic information and, providing that the participants completed this information correctly, then the number of men and women who completed the questionnaire would then be clearly defined. If you use interview data from a few participants, you will not be able to apply statistical tests.

### **7.5.2 Disadvantages of a Quantitative Approach**

- It is not appropriate for learning why people act or think as they do.
- Questions must be direct and easily quantified. It is vital that the questions are unambiguous, or the responses would detract from the focus of a research and will reduce the validity of a study.
- Participants may answer differently in a structured survey than they would in a real-life situation. There is no opportunity to probe respondents' answers.
- It is very difficult to detect researcher-induced bias in quantitative research.

### **7.5.3 Advantages of a Qualitative Approach**

- Rich data are collected in interviews compared to questionnaires (see Chap. 16). An in-depth analysis of phenomena may be done as there is no rigid parameters of definable variables. The example above of patients talking about their experiences allows you to think about how a patient's meaning of the issues alluded to can be explored further.
- Complex subjects sometimes make it difficult to construct a questionnaire. The issues could be too complex to encapsulate in a series of relatively closed questions. Interviews allow a comprehensive exploration of such issues.
- Unknown territory, in which a researcher/interviewer may not have a good grasp of a particular phenomenon, requires an instrument to obtain data: interviews are excellent as a way in. For example, many years ago an interview was personally used by one author of this chapter to undertake a study of the (then) new phenomenon of the world wide web, and its impact on journalistic practices.

### **7.5.4 Disadvantages of a Qualitative Approach**

- Inconsistency is a disadvantage. It is very possible to be inconsistent in the way you ask questions, what questions you ask and how you interpret answers. Of course, if your brief is wide, and you are exploring people's wider views and experiences, then an interviewee leads to an extent, so you may not always ask the same questions, but you must try and adopt the same (disinterested) approach.

- Generalisability of interview results may be difficult if a study aimed to do so. If not then it may be possible to do so. A study, by Davies and Bath [9] of Somali women in the UK regarding interpersonal sources of health and maternity information, comprised eight participants in an exploratory focus group and five who participated in semi-structured interviews. They did not attempt to generalise beyond postnatal Somali mothers receiving maternity care in a particular city in the UK, or beyond the specific (maternity information) topic examined.
- Low validity/reliability is a disadvantage. Validity according to Hammersley [10] is “truth: interpreted as the extent to which an account accurately represents the social phenomena to which it refers”. In other words, does the data-gathering measure what you want it to measure? As for reliability, this is, also according to Hammersley [11], “the degree of consistency, with which instances are assigned to the same category by different observers or by the same observer on different occasions”. For example, does the data-gathering produce the same results if a study was repeated? These are consistency issues which you must be aware of when planning and delivering your interviews (see Chaps. 10 and 16).
- Being time-consuming is factor to consider when undertaking qualitative research. In order to immerse yourself in the wealth and volume of data that are generated you need a great deal of time. Trawling through the data can be labour-intensive.
- Experience is a prerequisite when conducting interviews or managing focus groups effectively in order for a researcher to obtain the required information from respondents.

Let us go back to the interview example of patients about their recent visit to the medical imaging department; patients said they were worried. It is not clear from this initial response why they were worried. An open interview would allow you to explore this further with them. They also stated there were aspects of their experience they did not expect. You might want to find out more about this. If you used a questionnaire, then the reason for a patient being worried might not be captured or explored any further.

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## 7.6 Instrumentation

This refers to how the data will be collected. These may be questionnaires, interviews, accounts, observation and tests. Research could be based on an observation made with instruments; recording electrodes, microscopes, and standardised clinical tests, weighing scales, for example. It could however not require the use of instruments to collect the data. You should think about the practicalities of using instruments, which may include the cost to use them; time and also their reliability. You should use standardised tools. If you decide to use a new tool, then you have to establish its reliability and validity. If your study includes weighing patients before a radiographic test or therapeutic intervention, for example, then you have to ensure that the scales are calibrated and checked regularly. A feature of scientific observation is the accuracy and reliability of the equipment employed. Instrumentation

relates to a situation when the instrument changes over the period of the study thus invalidating comparison of measured results [5], and this may compromise the internal validity of a study.

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## 7.7 Selecting Your Sample

As part of the process you have to select your sample from the subject population. Sampling is the process of selecting a representative group of participants from a population and must be justified and fulfil an explicit purpose. Sample size is determined by the methodology of a study: effective sampling ensures the external validity of quantitative research and the trustworthiness of qualitative research. Generally, a sample in a qualitative study tends to be small, whereas it tends to be larger for quantitative data collection. As discussed earlier, if you were to interview patients about their experiences you may only have the resources and opportunity to interview five or six participants, but they need to be representative of the population. If the focus of your study is the experience of adolescents, you have to define adolescent and ensure you interview participants who meet the criteria. If your design is quantitative and your instrument is a questionnaire, and you are looking at an over 60s population, then there is a potential to distribute this to much larger numbers. You want to ensure your sample size is sufficient for the purpose of the analysis you intend to perform. You must ensure your sample is representative of a population you are studying.

Before selecting your sample, it is important to find out as much as possible about your study population. Population refers to a larger group from which a sample is taken. You need to know some of the overall demographics of the selected population, such as age, gender, etc., before commencing sampling. To some extent, when undertaking a project as part of a degree, your sample size will be determined by your available population and the time frame of your study. You also have to consider how much it might cost to interview a large sample or distribute a large number of questionnaires. The context of a sample should be considered. If a sample were to be selected from a population of practitioners working within a rural setting, how applicable would it be to generalise the findings to those practitioners who work in large urban environments? A sample is a subset of a population. You could consider all practitioners registered with the Health and Care Professions Council (HCPC) in the UK and select 50 therapeutic radiographers as your sample. But the sample should be representative of the population; a biased sample does not adequately represent the key groups.

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## 7.8 Validity and Reliability

Cohen et al. [6] describe validity as an important aspect of effective research. It is a requirement of any research paradigm (see Chap. 10). Reliability refers to the ability of a research to be replicated over time and different samples. A reliable instrument should produce similar data when similar respondents are used. Validity and

reliability of a study can be maintained by careful sampling, using the correct instruments, and the application of correct statistical tests (see Chap. 15). Conversely, using qualitative data, validity might be addressed through honesty, depth, the participants and the extent of triangulation. So it is important that a researcher has confidence in the elements of research planning, data collection, processing and analysis, interpretation and judgement.

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## 7.9 Mixed Method Designs

This is the combination of at least one qualitative and one quantitative method in a single research project. This approach should be used if you think it will give you greater objectivity; it could help you reduce bias in your data collection [12]. It is often used when conducting social research. For example, you may wish to use a questionnaire as the initial tool, but to get more detail from the respondents who completed the questionnaire you could then interview them [13]. The advantages and disadvantages of quantitative and qualitative approaches should be considered. You should think about some practical consequences of using a mixed method approach in that it will require additional resources to collect and analyse the subsequent data. Triangulation techniques are often used to explain more fully the richness and complexity of human behaviour by studying it from more than one viewpoint, hence the use of both quantitative and qualitative methods. It is also useful to confirm concurrent validity; i.e., where the data or results of the test concur with the data or results from other tests. For example, if you were to investigate practitioners' perceptions of their role as mentors to undergraduates, a predominantly qualitative mixed method approach could be used as this would be an exploratory study rather than testing a hypothesis. A series of interviews could be conducted in the first instance in order to generate data from which a rating questionnaire could be developed. In order to triangulate the data collected a focus group could be conducted to confirm the concurrent validity.

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## 7.10 Data Analysis

It does not matter which research paradigm you use for data collection; you will find out very quickly just how much data you generate. This information needs to be organised and you will have to account for each piece of data generated. Information such as a person's age and gender are important data points. An interview that has lasted an hour could generate 50 pages of transcribed data. So, whether the data are written or numerical, you need to manage them [14]. On a practical note, you must ensure that data are stored and kept in a secure place. Remember to back-up all data or make hardcopies. Security is particularly important if you used an audio-recorder or video to collect your data from identifiable participants. You must implement measures to ensure that signed informed consent forms are not linked to your raw data so that there is no risk of the participants being identified (see Chap. 6).

If you use an experimental approach you will have to capture your data using computer software. DePoy and Gitlin [14] suggest a staged approach: check the data collection form for omissions, and then try to address missing data. You have to label each variable and then decide on the order to you need have to enter the variables into computer software programme. Guidance on quantitative data analysis is provided in Chap. 15. When you input your data, it is good practice to carry out a systematic check to ensure you have entered the data correctly. It is very easy to hit a wrong key on your keyboard, especially if you spend long hours working at your computer. The check also ensures that you have captured all your data and that no information has been omitted.

For qualitative data, it is common to undertake analysis while sorting out the data. This approach generates enormous amounts of data; usually narrative, but could be videos. Audio-recorded information from interviews has to be transcribed verbatim; video data have to be analysed frame by frame. These data are verbal or nonverbal; quantitative data on the other hand are numerical. Analysis of data requires sorting the data into meaningful categories, taxonomies or themes that explain the meanings or underlying patterns of a phenomenon of interest [15]. The collected data have to be managed. Usually the first stage for interview data is transcribing of audio-recorded interviews. You can do this yourself or get professional transcribers to do this. It is important that interviews are transcribed verbatim.

One advantage of personally transcribing data is that you do get to listen to the audio recordings many times; this should give you a feeling of what is being said. This should help you in your analysis of the data. However, it can be very time-consuming and tedious. There is voice to text software available. It may take you approximately 6–10 h to type a 1 h interview transcription. Once the transcription is complete you then have to check that you typed the data accurately and verbatim, and ensure that there are no misspellings of words or missing data. Once this is complete you then have to immerse yourself in the data: you read or listen to it several times. When you commence generating categories of information, you should establish a way of accessing the key passages that reflect these categories. How to organise this is to a great extent up to you. You could use cards, or word processing programmes, to catalogue, store and manipulate the information. Then you will have to analyse the data, and you must allocate time to do. It is useful while you undertake this task to make notes so that you can make comments regarding the data. Once again you have to refer to your original questions and aims to ensure that your analysis addresses the focus of your research. You can often generate further questions during this process.

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## 7.11 Reporting and Writing Up Research

This stage is the culmination of all your hard work. Your project may have a strict assigned word count. If so then you should consider carefully what you want to write about. Clearly you have to address the questions you posed, but you can also include some discussion of the strengths, limitations and constraints of your project. Your research may have highlighted some unexpected findings, and this should be

considered as a possible area for further research. Evidence-based practice does serve to decrease the uncertainty that patients and healthcare professionals experience in a complex healthcare system. Your research, if in the public domain, will be scrutinised. It is worth considering what practitioners will be looking for when critiquing your work; this should be considered when developing your protocol. Beaven and Craig [16] suggest considering the following.

- Are the results of the study valid?
- Is the quality of the study good enough to produce the results that can inform clinical decisions?
- What are the results and what do they mean?
- If your research relates to practice, you might also consider whether the results of the research can be applied in a clinical setting.

Structure and presentation of a research dissertation are covered in Chap. 17. Writing for publication in order to disseminate research findings is presented in Chap. 18.

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## 7.12 Conclusion

Designing and carrying out a research project is a multifaceted activity. Planning a study can often take more time than conducting research. The key to planning a research project is organisation and good time management. When undertaking a research study it is important to review relevant literature to inform a proposed study's methodology and contextualise what is known about the subject area. After reviewing literature, informed decisions regarding the methodology for a proposed study can be made. Ensuring you are aware of the advantages and disadvantages of the selected methodology to collect your data is essential to increase the validity or trustworthiness of the data collected. It is very important to organise and hold regular meetings with your project supervisor to ensure your progress is monitored and deadlines are met.

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