

How to do...

Research

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Noordhoff Uitgevers



First edition

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First edition (corresponds to the second Dutch edition)

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How to use this book

While this book will prove useful for those performing research professionally, its main target group is the higher education sector.

Research in the educational sector

University students are trained to perform scientific research and performing that research forms an important part of their study program. Research is now becoming increasingly important in colleges of advanced professional education, with research activities included in the curricula of such colleges and training in research given throughout each course. Research is a complex activity and should not be undertaken lightly. The following are some ways that a teacher can gradually introduce students to the business of doing research, arranged in order of difficulty.

- Offer ‘Research techniques’ or ‘Research methodology and techniques’ (or something similarly named) early on in the course. You could require each student to perform regular small-scale research in order to accustom them to the process.
- As an exercise in problem-related learning, ask your students to perform independent research into operational issues relating to their particular field of study. They could perform this research either individually or within a group.
- Ask your students to perform applied research in an area relating to their particular field of study. The research could take any form: market research, research into consumer satisfaction, logistical research, quality research or a feasibility study are just some of the possibilities.
- As an extension of this, you could ask your students review the literature and write the review up in the form of a report or an essay.
- You could ask your students to perform a number of connected experiments, whether as part of a sociology course, a chemistry course or some other course.
- If the course includes an internship, you could encourage your students to perform a research project as part of that internship.
- Follow the lead of many postgraduate courses and require your students to round off their studies by doing a research project.

How teachers can use this book

We would invite teachers to apply the practical and methodological guidelines set out in this book to any one or all of the following situations:

- 1 As a way of supporting *small-scale individual research* within a group context. Requiring students to perform each step individually will enhance their understanding of the process.

- 2 To help students write a *research proposal*. You could ask your students to write a complete research proposal according to the guidelines set out in Step 1. You would assess the proposal in terms of its quality but not require the research to be performed.
- 3 To help students write a *research plan*. You could ask your students to write a complete research plan according to the guidelines set out in Step 2. You would assess the proposal in terms of its quality but not require the plan to be implemented.
- 4 To help students *design their research*. You could ask your students to follow steps 1 through to 3, ultimately creating a research design blueprint. You would ask your students to develop the instruments they need to employ though not actually employ them.
- 5 To help students undertake a *fully fledged research project*. You could ask your students to take a more or less theoretical topic or a case and follow at least seven of the eight steps described in this book
- 6 To provide your students with support while they undertake an *actual research project* commissioned by a genuine client either during an internship or as a postgraduate requirement. They would have to follow every one of the steps and demonstrate that they have complied with any additional criteria set by their particular course.

Get going!

How to do research is not a book on research theory: it is a practical, solid and coherent blueprint for research. We introduce each step first, and then we launch you on your way via various activities. Each activity is numbered for the sake of convenience, and in turn is also introduced. Checklists are sometimes included too. The research report that is the subject of Step 7 represents a compilation of the previous steps. You may need to consult some additional literature.

The assignments in this book fall into two categories:

- 1 *Activities*. These are the things that you will have to do to perform the research itself. While the activities have been numbered, the numbering does not automatically follow the order in which they have to be performed. You may find yourself having to do several things at once since each activity is interrelated. You might have to retrace your steps on occasion, perhaps even returning to a previous step. On the other hand, you may find that you can skip some activities.
- 2 *Additional assignments*. These are shown at the end of each step. They are not immediately relevant to your research report.

www.howtodoresearch.noordhoff.nl



The website www.howtodoresearch.noordhoff.nl contains support material in the form of spreadsheet models, checklists, hyperlinks and Word MS models. Teachers will also find useful material on the website, including a PowerPoint presentation, tips for organizing your teaching and a list of criteria for assessing research.

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Design your research



The previous step culminated in the drawing up of a *research plan* which included your objectives, the theoretical framework, the research problem and constructs associated with the cases/units of measurement that you wish to research. You will also have planned your research in broad terms and drawn up a global budget as well as ascertaining the threats to your research project.

Step 3 involves designing your research: creating a *research design*. In other words, you will work out how best to perform your research. A lot will depend on how you formulate your problem and the type of research that is indicated. Your design will precede data collection and analysis, the next two steps. But first you will need to develop your instruments: the surveys, test sets and observation charts that you will put to use in steps 4 and 5. Since these will determine the future course of your research to a large extent, you can then add update both the research schedule that you drew up during the previous step as well as the budget.

This step will culminate in a detailed set of research instruments, a detailed research schedule and a detailed budget.

You will perform the following activities during Step 3:

- 3-1 Operationalize your research questions
- 3-2 Make preparations for collecting data
- 3-3 Make preparations for holding interviews
- 3-4 Assemble a focus group (if applicable to your project)
- 3-5 Design a survey (if applicable to your project)
- 3-6 Design a case study (if applicable to your project)
- 3-7 Design your observational research (if applicable to your project)
- 3-8 Design your experiments (if applicable to your project)
- 3-9 Plan a brainstorming session (if applicable to your project)
- 3-10 Design a monitoring study (if applicable to your project)
- 3-11 Design a plan of analysis
- 3-12 Draw up a detailed budget
- 3-13 Draw up a detailed research schedule

Step 3 will deliver the following products:

- detailed research instruments
- a detailed research schedule
- a detailed budget

TIP



Maintaining your logbook

- Make sure your logbook is up to date and that it includes this and all the subsequent steps.
- Keep your supervisor up to date. A model of an interim report can be downloaded from the Internet.

Operationalization

You have already investigated (as part of the previous step) the *constructs* and/or characteristics that you will have to measure or describe. They constitute your so-called *variables* and you will use them to answer your research questions. Wealth is a construct, and so is chemical reactivity, student satisfaction, sportiness and the like.

It can sometimes be hard to convert a research problem into a unit of measurement. If so, you could devise some *indicators* that, collectively, form a single variable. Take a situation in which your research problem focuses on the concept of prosperity. You cannot simply ask a group of respondents (your research units) how prosperous they are. You will have to select a number of indicators first: income, for example, or car ownership, or holidays. Taken together, they constitute 'prosperity', your variable. Breaking down your research questions into variables and indicators is known as *operationalization*. A variable like sportiness can be operationalized using such indicators as monthly visits to gymnasiums, the number of kilometres cycles each month and monthly sporting event attendance. The resources you develop during this step will depend on how you operationalize your research questions.

You can also operationalize your research questions if you are doing technical research. For example, if your research involves investigating the environmental impact a chemical factory is having, you could break the variable of environmental impact down into tonnes of toxic emissions produced annually, annual consumption of natural gas in tonnes and tonnes of waste products that have to be disposed of annually. Your indicators could be subdivided further: toxic emissions could be broken down into type of gas: sulphur compounds, carbon monoxide or nitrogen compounds.

TIP

Statistics

If you need some help, consult a LinkedIn social medium. Many experts enjoy sharing their expertise with others.

ACTIVITY 3-1

Operationalize your research questions

- a Make a summary of your research questions.
- b For each research question, identify relevant variables (constructs). Refer to relevant theories and literature to back up your choices.
- c For each construct, identify the indicators you will use to measure or describe them.
- d Work out what instruments you will use to collect your data.
- e Make sure your choices meet with your client's/supervisor's approval.

Gathering data

The way you approach your research will depend on your budget, the time available, your research units and the variables you wish to investigate. Your research instruments will also need to be appropriate to your target group. For example, if residents of an old people's home are your research units, there is little point in doing Internet-based surveys.

Research methods can be either quantitative or qualitative in nature and you could either perform desk research or field research.

Quantitative versus qualitative

Quantitative research involves collecting numerical information about a large number of research units and extrapolating the findings to the population at large. The research results will be expressed in the form of figures and percentages. One distinguishing feature of quantitative research is that large populations are involved. Large populations make results more representative, more accurate and more reliable. Analysing the results obtained through quantitative research (Step 5) involves the use of *statistics*.

The following are three ways of obtaining quantitative data:

- via surveys (questionnaires)
- via secondary analysis of existing datasets
- via experiments

TIP

Statistics

If you need to employ statistics to analyse your data, make sure that you know enough about them. Your research design will suffer otherwise.

Your variables will be measured via the answers given to closed questions and data obtained from quantitative research. A number of different scales can be used to measure your variables. You will need to have an idea of what measurement scales you intend to employ while you are designing your research. Measurement scales fall into several categories:

- *Nominal*. On a scale of this sort, the categories differ in name only, not in value: take 'male' and 'female' for example – the one is no more or less than the other.
- *Ordinal*. On a scale of this sort, the categories differ in name as well as in value. The differences can be expressed in terms of more or less than each other: take, for example, primary education, secondary education and tertiary education; that is, a ranking from low to high.
- *Interval*. On a scale of this sort, the categories differ in name as well as in value. That value can be expressed in numerical form: take, for example, temperatures expressed in °C.
- *Ratio*. On a scale of this sort, the categories differ in name as well as in value, the difference can be expressed in numerical form and in relative terms (for example, twice as much as), and the scale has an absolute zero point: take, for example, age.

Qualitative research usually involves immersing yourself in your material: gathering a lot of research data in respect of relative few research units so as to avoid overlooking important data. You might, for example, want to investigate a particular aspect of behaviour and its background causes. You will need to spend a lot of time with each respondent. Your research methods could include observations, interviews, focus groups, case studies and maybe even brainstorming.

TIP

Data collection methods

Monitor the quality of your research constantly by referring back to the section 'Meeting quality standards' in Chapter 1 (see page 24).

Qualitative research begins with making preparations for gathering data: for example, developing instruments, devising parameters for experiments or questions for a survey. As you make these preparations, keep in mind that your project must remain feasible.

TIP

Step 4 deals with practical issues associated with collecting data. Read through this step now to get an idea of what to expect.

Desk research or field research?

A number of different various resources– instruments – for collecting data are available and you can perform that research as either:

- *Desk research* using existing data such as literature, prior research, Internet sources or databases.
- *Field research*, a collective term for types of research in which the data is collected 'on location' and under circumstances that are as close to normal as possible. Field research might take the form of experiments, interviews, focus group surveys, observations, case studies and surveys. They will be discussed at a later stage.

Research is often a combination of various types of methods. Since field research is a costly exercise, you might be best off investigating whether your research can take the form of desk research. However, applied research nearly always requires some form of field research.

TIP

Feasibility

- Constantly monitor what you do during this step with reference to the BIOTAFT factors described in Step 1 (putting limitations on the scope, checking availability of data, checking how acceptable the research is likely to be, checking its financial and organizational feasibility, checking whether enough time is available).
- Consult theories relevant to your field of study during this step.

ACTIVITY 3-2

Make preparations for collecting data

- a Read through the entire step first, and using the guidelines described in the previous step, plan ways of collecting data.
- b Decide on the best way of doing your research: as qualitative or quantitative research. Make sure your reasons are sound!
- c Identify the variables that you intend to use to answer each of your research questions (refer back to your research plan).
- d Identify the indicators you intend to use. Make sure your reasons are sound! Define each of your indicators.
- e Think carefully about which resources to use, taking account of the costs involved. Make sure your reasons are sound! Your resources must be suitable for addressing your research problem and meeting your objectives. Even if they are not doing market research, inexperienced researchers tend to take a superficial look at the literature and then select surveys as the obvious choice. Interviews or experiments are sometimes the more obvious choice.
- f Discuss your choice with your supervisor.
- g Discuss the instruments you need to perform your research. We will look at them during the latter part of this step.
- h Discuss your progress to this point with your client (if you have one). If you had to tender for your research contract, you might need to discuss matters relating to the budget and in the light of this, decide whether your research plan is still feasible. Write a report on your discussion.

Desk research

You may not always have to collect new data in order to answer your research question. Some questions can be answered using data that is already available. *Desk research* is research done using existing data as found in non-specialized literature, on the Internet, in social media or in existing databases. Desk research is a form of research that does not require you to collect your data via field work. While desk research is usually qualitative in nature, it can be quantitative. With the advent of the Internet, specialized databases of all kinds can now be consulted (sometimes for a fee) and used to answer research questions. A great amount of data suitable for research purposes is available on the Internet.

Desk research does have some disadvantages, however:

- You will most likely be using old data: data you collect yourself will be more current.
- It is relatively unstructured compared to surveys and experiments.
- It is difficult to assess the validity of found information.
- You may have to establish whether you are allowed to use the data you have found. Permission is sometimes denied.
- You as researcher can exert no influence on how the data is collected.

Its advantages are as follows:

- Desk research is relatively easy to perform.
- You do not have to leave the comfort of your own house.

- It provides a framework against which to compare results you have found yourself.
- It can provide input for your list of topics or questionnaire.
- You could consult a variety of different sources, making your research more reliable.

The following lists some sources that you could consult (Swanborn, 2002):

- *Population registers.* Data found in population registers is reliable and accessible and it is easy to come by: newspapers and the Internet publish information derived from government sources on such things as population growth, environmental and socio-cultural issue and so on. The Bureau of Statistics provides a lot of information of this sort.
- *Literature study.* A literature study is a study of a subject in a particular field made on the basis of the literature (scientific or otherwise) pertaining to that field. Your sources could be journals, books and newspapers but also the Internet, which can provide access to specialized databases, sometimes at a cost. Investigate whether your client or your course have subscriptions to such sites. Abstracts in scientific journals are often useful sources of information.
- *Secondary analyse.* You may sometimes come across a data file showing measurements or observations relating to research that somebody else has made. Analysing such data for purposes other than the original purpose is known as secondary analysis. It is important that information obtained via such means be recent, reliable and valid. If you request a data file because you are suspicious of the research in question and you then perform an analysis of that information yourself, what you are doing is known as a *reanalysis*.
- *Content analysis of texts derived from mass media sources.* These are analyses of newspaper and journal articles and of TV programs. You could, however, also do a content analysis of an annual report or of diaries and letters.

Social media sources provide existing data on which a content analysis could be based. Thousands of messages are generated every second on Twitter and Internet blog spots. While an individual message is not likely to provide much in the way of content, added together, those tweets and blog spots provide a representative picture of what people are thinking about. If you are doing a content analysis of a topical subject and you are curious about how a particular subject, theme or brand is mentioned in specific contexts and sites, social media will provide you with a lot of information.

In what follows we will discuss the various *instruments* you can use to gather your data: interviews, focus groups, surveys, case studies, observations, brainstorming and monitoring studies. We will list the advantages and disadvantages of each so that you know which are most suitable for your research purposes.

Interviews

Interviewing is a form of qualitative research and involves gathering your data during the course of a discussion. An interview can take several forms:

- If it is a *structured interview* you will have to write down all of your questions beforehand.
- A *semi-structured* interview involves making a prior list of all of the topics that you wish to discuss. The opening question is often the only one that has been formulated beforehand.
- Only the topic, the main points of discussion and the opening question will need to have been prepared at the start of an *unstructured interview*. The interview will continue until the topic has been dealt with to your satisfaction.

Interviewing an expert is one way of obtaining a great deal of information about your research topic. Think carefully about who to interview and what questions to ask. While an interview is a form of *field research*, you could do some preliminary desk research in order to find out who knows the most about a particular field. Make a shortlist of experts you could approach and make timely arrangements to do the interviews.

An interview could be conducted *face-to-face*, *telephonically* or via an *online chat*. If the expert lives close by or if you have enough time to travel to meet him, we would advise that you conduct the interview face-to-face. This is the most reliable way of interviewing since the non-verbal aspects of the interview can be included. If you need to, you could also conduct a group interview.

The disadvantages of an interview are as follows:

- Unwittingly or otherwise, the interviewer might slant the questions in a particular direction and hence produce subjective information.
- Conducting a good interview takes a lot of experience: there is an art to it.
- The results can be difficult to quantify.
- An interview is relatively time-consuming and is labour-intensive.

The advantages are:

- Follow-up questions can be asked, and an opportunity for obtaining in-depth answers.
- Persistent questioning can bring unexpected details to light.

You may sometimes find that there is no need to deviate from the questions that you compiled prior to the interview. Sometimes you may find yourself going off at a tangent, with your interviewee's responses setting a new agenda. With a completely structured interview, the *interview format* will be similar to that of a survey composed entirely of open questions (see 'Survey' on page 73 in this step). A semi-structured or unstructured interview will have a less detailed interview format.

ACTIVITY 3-3

Make preparations for holding interviews

- a** Think of some people you might like to interview and the interview topics you would like to discuss.
- b** See whether these people are available.
- c** Think of some questions you would like to ask and an appropriate interview format. Refer to the variables and indicators that you have outlined in your research plan.

Field research based on a focus group

Focus group research is qualitative research involving group discussions. The researcher makes arrangements for a group of people – his respondents – to discuss a research topic. He is in charge of the discussion and will try to organize things in such a way that all of the issues on the agenda are discussed within a set time. A group discussion can be dynamic, with the respondents stimulating each other to produce ideas.

As with interviews, you will have to consider what sort of information you want the focus group to provide. Your research plan will by now show the indicators and variables you need to answer your research questions. You should format your focus group interview using the plan you intend to follow to analyse your data.

The disadvantages of focus group research include the following:

- All of the respondents must be present at the same time and place. The weather and the traffic can have a negative effect on the percentage of people who turn up.
- The researcher must have experience in leading a focus group.
- You might find that one particular respondent tends to dominate the focus group. As the researcher, you have to be able to deal with such a situation.
- Maintaining a focus group is relatively costly: you might have to hire a location and provide the respondents with some material incentives (remuneration).

The advantages of focus groups include the following:

- The researcher has the opportunity to follow up questions.
- There is likely to be a lot of mutual interaction between the respondents.
- Group dynamics encourage vigorous discussion.
- Non-verbal interactions between the respondents are visible.
- Unexpected details may emerge.

Focus groups work to a format: a list of subjects that you would like them to discuss. Sometimes they may branch off into side issues and they may not get around to discussing all of the issues.

There is a recent tendency towards online *focus groups*: chat sessions involving a number of respondents. Their great advantage is that the respondents do not have to leave their homes to take part in a discussion. There has been an extensive discussion of focus groups in the literature (Fischer & Jalsing, 2007).

ACTIVITY 3-4

Assemble a focus group (if applicable to your project)

- a Consult the literature on working with focus groups (perhaps even online groups).
- b Determine who your population will be drawn from and select a sample group of respondents to approach.
- c Draw up a list of topics for your group to discuss.

Survey

Administering a *survey* or questionnaire to a group of people is a quantitative form of research. It is a way of finding out what people are thinking or what they know by asking them a lot of questions. As with interviews, you will need to consider what sort of information you want the survey to deliver.

Surveys may take different forms. An *ad-hoc survey* is a way of finding out what the situation is at a particular point in time and preferably on no more than one occasion. It relates to a once-off event and how that event is viewed.

A *continuous survey* is research done over a long period of time in order to find out what the effect is of certain decisions on certain opinions. It might be research into a political issue or research into viewing figures.

Surveys have the following advantages:

- They are quantitative and hence can be analysed statistically.
- Non-experts are often able to administer them.
- They can be administered to a lot of people and hence they are likely to be more reliable.
- As a research method, it is relatively quick.
- They can be administered face-to-face or telephonically, or the respondent can fill them out either in writing or via the Internet.
- They are relatively inexpensive.

They have the following disadvantages:

- They are fairly rigid and you cannot adapt your questions to suit the situation.
- They do not allow you to follow up answers.
- If you have only a few respondents or do not expect many there is no point in doing them.
- The respondents may be inclined to give socially acceptable answers.
- Unlike interviews, they preclude the unexpected.
- It can be hard to find willing respondents: surveys are now so common that people have grown tired of doing them.

TIP

Since surveys tend to be fairly superficial and preclude the unexpected, you might find it useful to supplement your research with qualitative research forms such as interviews or observations.

The success of your survey will depend on the questions you formulate, your population and the reliability of the answers.

Surveys and survey questions: requirements

Surveys need to conform to certain demands (see also Verhoeven, 2007). They need to be:

- *Clearly formulated.* The survey must be both easy to fill in and easy to administer.
- *Comprehensive.* A survey can only provide answers to the questions you set. Make sure that they cover your research questions completely.
- *Unbiased.* A survey must be couched in neutral terms and not incline the respondent towards a certain point of view.
- *Not too long.* A survey should be compact. A long list of questions will lower the response rate.
- *Relevant.* Make sure that you do not include questions that have nothing to do with your research. Your questions must have a coherent frame of reference.
- *Unambiguous.* All of your target group respondents must be able to understand the questions. Make sure that the questions are straightforward and that your respondents know what they are being asked.
- *Well organized.* Ease your respondent into the survey. For example, start with a neutral topic and only start asking more sensitive questions after you have gained the respondent's trust. Avoid asking difficult questions right at the beginning and at the very end, when the respondent may be starting to tire.
- *Coherently arranged.* Avoid skipping from one topic to another and back again.
- *Logically arranged.* Avoid asking your respondents questions about matters that are not applicable. For example, if your respondent answers in the affirmative to 'I am a female', make sure that the following question is not 'how do you shave your beard?'

You can choose from a number of different types of question, with your primary choice between open versus closed questions. With open questions, the respondents are free to provide their own answers. With a *closed question* the answer categories have been pre-established. Statistical analyses can be applied to questions of the latter type.

Closed questions could be answered in any one of the following ways:

- *Single option.* A single option question is a question to which the answer is limited to one option: for example, 'What is the brand of your computer?'
- *Multiple options.* A multiple option question is a question to which various answers can be given: for example, 'What job positions are there within your company?'
- *Semi-open.* A semi-open question has an open category in addition to a number of closed answer categories. You could include an open category if the options you have listed are not exhaustive. This is often done by including an open answer box and a dotted line: 'Other, namely....'

- *Scale.* Questions that are answered using an answer scale are often questions about opinions. The answer options are arranged along a scale ranging from negative to positive. There are often an uneven number of options: a scale of three, five or seven possibilities. This is so that the middle option can be a neutral one. You could also ask the respondent to give a *mark*. People do not usually have any trouble understanding marking systems.
- *Dichotomous answers.* With dichotomous answer options the respondent can choose from only two options: yes/no options, for example.
- *Ranking.* Ranking involves asking the respondent to place a series of things in a chosen order.
- *Picture associations.* With this method, the researcher shows the respondent some pictures and asks questions such as which one the respondent likes best.

TIP

**Devising a survey**

- The website gives some examples of the question types mentioned.
- Formulating useful and unambiguous survey questions is not easy. Try formulating some and see whether they deliver useful answers.
- Read your list of questions out aloud now and then.

Your answer categories must be arranged in a logical order and be exhaustive. They have to be measurable to be analysed and they should not overlap. Make sure that they are appropriate for your survey target group.

Population

A *population* is the total number of *units* to which your findings will refer. A population need not be human: if your research is scientific, your population could also be the measurements you have taken to test a hypothesis. It may be difficult to include every unit of your population in your interviews or observations. If so, you should select a sample. A *sample* is a representative number of your research target population.

If population research falls within your budget and the time available to you and you have enough manpower available to survey everybody, then you should certainly consider doing a *population survey*. After all, if the entire population is included in your survey, the results will be 100% reliable. However, if you are doing a customer satisfaction survey in a company that has fewer than 50 employees, a population survey is advisable. If your budget or time is limited or the population is large (all the inhabitants of a city, for example), you should opt for a sample.

There are two ways of selecting a *sample*.

- 1 As a *random probability sample*. Selecting a sample at random means that every person or element of a target group – the overall population – has the same chance of being selected to take part in the

research. Before you select a sample population, make sure you investigate whether there is an existing data file containing all of the members of your population. The file could be a list of all employees or all members, or it could be the official population register. A file showing the names of every individual in a particular population is known as a sampling frame. If a sampling frame is available, the natural choice is a random probability sample.

- 2 *Non-probability sample.* If a sampling frame is not available, your only other option is a non-probability sample. This way of selecting a sample has the disadvantage that the sample selected is not necessarily representative: one person's chance of being selected may not be as great as another person's chance. It may be influenced by the fact of being in a certain place at a certain time, or because a person is known to another. As such, this way of selecting a sample is less reliable.

One way of selecting a non-probability sample is to purchase a file of addresses (email addresses, for example) from a supplier of addresses. Before you do so, make sure that the file is genuine and that you are not breaking any privacy rules.

TIP

**Selecting a sample**

The website contains a number of links to sites that discuss random and non-random methods of sample selection as well as links to a number of different suppliers of addresses.

Reliable responses

You must ensure that sufficient data is available for your results to be considered reliable. How this applies to a survey will be explained below.

A *population* is the sum total of your research units (for example, the entire population of the Netherlands). Your *sample* is a selection of those research units that you would like to contact. Now imagine that questionnaires have been posted to 10,000 Dutch people. The *response* is the number of research units – Dutch people, therefore – who have responded by returning the questionnaire. If 2,000 Dutch people responded, the response rate will have been 20%. The number of *usable responses* is the number of questionnaires that were filled in properly. If 100 were incomplete or have to be rejected because the respondent did not fill the questionnaire in seriously, the usable responses will drop to 1,000.

Your number of usable responses will determine how accurate your research is. You should determine beforehand how big your sample will have to be to obtain a usable response.

If you are doing applied research, it is usual to base your findings on a confidence interval of 95%. What this means is that if we were to perform the same experiment 100 times on the same population but with different samples each time, 95 of the repeat experiments would lie within the confidence interval. The closer the results to the limits of the interval results the more reliable the estimation of the actual effect.

Confidence interval will depend on the amount of variability (as measured by the standard deviation) and the size of the sample (the number of people included in the population study). The larger the sample, the smaller the confidence interval.

TIP

Reliability

If you are doing quantitative research and you wish to demonstrate statistically significant correlations, your sample – in effect, your usable response – will need to be large enough to support your results. A tool for calculating the size of your sample can be found on the website.

3

ACTIVITY 3-5

Design a survey (if applicable to your project)

- a Determine what your research population is.
- b Decide whether to select a whole population for your research or a sample of that population.
- c Explain the reasons behind your choice.
- d Select a sample of respondents to approach.
- e Work out how you will perform your research.
- f Design your questionnaire/telephonic survey.
- g As you do so, make sure that you take into account the above comments in relation to measurement levels, survey questions, closed questions, population and samples.
- h If possible, have your questions checked by an experienced researcher.

Case study

It is not always possible to examine a large number of research units. A *case study* is a qualitative method whereby certain aspects of a very limited number of cases are examined at great depth using several sources of information.

Organisational research, a form of research which examines the efficiency of organizations, is an example of a case study; quantitative research into general employee satisfaction in the same company is not. It is not usually possible to extrapolate conclusions from single cases. Despite this, a researcher can have good reasons for doing case study-based research:

- to demonstrate that something is possible or that it exists
- to find a solution for a case-related problem
- as preparation for another type of research: a survey, for example
- as a way of convincing someone of something
- in order to test an existing theory or hypothesis: a well-performed case study can dismantle a theory entirely
- to compare a specific case with a standard: for example, to compare a patient's illness with known illnesses

- to reveal hidden motives: for example, research into the politics behind a country's participation in a war
- in order to study a rare phenomenon, such as a newly detected disease

The reliability of a case study's results can be enhanced by studying other cases or performing additional research of a different kind.

The main advantage of a case study is that it allows the research subject to be examined in considerable depth. Its main disadvantage is that it is impossible to generalize from such research, which is usually one of the main reasons for doing it. This problem can be overcome by doing some additional research: experiments, for example.

Postgraduate research projects tend to be case study-based: data analysis, risk analysis, research into quality standards, logistical research and so on. Despite the fact that it is impossible to generalize from a case study, the conclusions and recommendations drawn from it can be very useful for the organization in question.

ACTIVITY 3-6

Design a case study (if applicable to your project)

- Carefully select one or two suitable cases.
- Decide which variables and aspects you wish to study.
- Describe in detail how you intend to obtain your information.

Observation

Observation is a form of research which involves noting down the behaviour of research cases, whether it be observations of how customers behave at a checkout point or petrol pump, or how motorists behave at speed humps. Observational research is not restricted to people, however: bird and animal behaviour lends itself to such a method, as does the weather and other natural phenomena. Observational research can be either quantitative or qualitative in nature.

You will have to work out beforehand what information you want your observations to deliver. Your observation sheet should be divided into categories: gender, age group and whatever else is relevant.

By this stage your research plan will list the indicators and variables needed to answer your research question. When you draw up your *observation sheet*, include the behavioural aspects that you wish to observe and boxes next to them to tick or cross. This will allow you to compare the results more easily and to process them quantitatively.

As a research method, observations have the following advantages:

- Actual behaviour is observed. With a survey all you have to go on is the validity of the responses.

- You have an opportunity to observe behaviour that the respondent is not conscious of.
- Your observations will be valid even in situations where the behaviour in question is infrequent.
- Language plays no part in observations.

The disadvantages include the following:

- It is usually time-intensive and hence costly.
- The observer can influence the behaviour of what is being observed.
- The reasons behind the behaviour are not open to observation.

ACTIVITY 3-7

Design your observational research (if applicable to your project)

- Determine what to observe and where and how to observe it.
- Determine what resources you will need (recording equipment, for example)
- Set limits on the observations you intend to make. How long should each observation last?
- Determine what categories of behaviour you will observe.
- Draw up an observation sheet.
- Make a list of what exactly needs to be observed.

Experiments

Experiments or tests are observations performed under clinical conditions and are usually quantitative in nature. In this form of field research, at least one factor – the independent *variable* – is altered, the aim being to see what then happens to a dependent variable. For example, temperature, the independent variable, might be altered in order to measure pressure, the dependent variable, the aim being to find a cause and effect connection between them. Here, temperature is the cause and pressure is the effect. A hypothesis is usually postulated prior to the experiments: in this case, it might be 'If there is an increase in temperature, the pressure will also increase'.

Experiments need to be carefully planned and carried out. Their purpose is to investigate some aspect of reality with a view to putting a scientific hypothesis to the test. Experiments are sometimes best carried out in a laboratory since this allows for optimal control of the conditions.

While experiments are often performed in the field of science, they are also performed in other disciplines. Sociologists use experiments in order to test theories about how people behave collectively. Psychologists perform experiments under clinical conditions in order to compare the behavioural patterns of their subjects. In the pharmaceutical industry, doctors experiment with drugs in order to find out what effect they have. Experiments of this sort have a *control group*: patients who do not receive the drug. This is known as *double-blind research*: research in which neither the patients nor the doctors treating them know whether the drug they are being administered is a placebo or not. The researchers do, of course, know.

Doing experiments allows a researcher to find out whether predictions based on a theory are actually correct. If the theory does not match reality that theory will have to be adapted or replaced.

The advantages of experiments:

- The researcher has control over what he is doing, and to a large degree he can determine the conditions under which the experiment is performed.

The disadvantages of experiments:

- Experiments are costly.
- Experiments have a limited applicability.

TIP

If you are doing experiments that involve people, make sure that you do not overstep any ethical boundaries.

ACTIVITY 3-8

Design your experiments (if applicable to your project)

- Determine what experiments you need to perform.
- Determine which independent variable you will alter and which dependent variable you will measure.
- Determine what resources you need to measure the dependent variable.
- If applicable, formulate a provisional hypothesis.

Brainstorming

Brainstorming is a qualitative method aimed at mapping out a particular situation or coming up with ideas or innovative solutions.

Group brainstorming sessions involve the free expression of ideas with the aim of thinking up as many as possible and allowing everybody a chance to have a say. Brainstorming sessions work best if they are under the guidance of someone whose task it is to introduce the topic and to make sure that the rules are adhered to.

The *Delphi method* is a variation on brainstorming. It differs from it in that the members of the group do not communicate directly with each other but in writing and anonymously. One advantage of anonymity is that everyone's opinion carries equal weight. On the other hand, the method precludes the stimulating effect of group dynamics.

Brainstorming has the following advantage:

- There are no restrictions on the ideas that are generated.

Brainstorming has the following disadvantages:

- It is not structured in any way.
- There is no way of guaranteeing that the ideas can be implemented.

ACTIVITY 3-9

Plan a brainstorming session (if applicable to your project)

- a Determine what it is that you want to find out.
- b Consult the literature for ways of organizing a brainstorming session (possibly using the Delphi method).

A monitoring study

A *monitoring study* involves comparing data collected at various points in time. Its goal is usually to detect a developing *trend*, whether that be an increase in global warming, pass or fail rates in schools, TV viewing figures or figures relating to course enrolments. The data may be collected in a variety of ways, though some monitoring studies specify that the data be collected in the same way each time.

Monitoring involves the use of *denominators*. A few examples of denominators follow:

- absenteeism (e.g., 10 days in 100 working days)
- machine utilization rates (e.g., an 80% rate of utilization)
- wasted lesson time (e.g., 5% of time lost)
- assessment of a teaching method (e.g., a rating of 8)
- percentage of products that fail to meet a standard (e.g., 10%)
- number of complaints made (e.g., an annual average of 500)
- product shelf life (e.g., three years)
- soil degradation (e.g., contaminated soil monitored during the course of 10 years).

ACTIVITY 3-10

Design a monitoring study (if applicable to your project)

- a Decide on the denominators or indicators of what you wish to monitor.
- b Define your denominator in detail.
- c Ascertain the best way of gathering your data.

Plan of analysis

By now your research plan will show the indicators and variables you need to answer your research question. It should also describe every theory you need to substantiate your research. Based on your theories, you may even have an indication of the connections your research is likely to find or even a probable hypothesis.

As part of Step 5, you will analyse the data that you have collected. Before you do so, you will need to design a *plan of analysis*. It should outline the analytical methods and resources you propose to use. You should describe the *variables* – the characteristics of your research units – that you will use to answer each of your research questions. This step is likely to be a necessary one since research questions are not always

directly applicable to the research question. Your questions may involve various *indicators* that, taken together, constitute a single variable.

Imagine that as part of your research problem you need to define the variable 'wealth'. Simply asking a group of research units (people, in this case) how wealthy they are is unlikely to deliver useful information. You will have to decide on a number of indicators of wealth: income, possession of a car, holidays. These indicators constitute the variable 'wealth'. The results of your analysis will culminate in your research conclusions and recommendations.

ACTIVITY 3-11

Design a plan of analysis

- a** Reread the research plan you drew up in Step 2. Those variables and indicators must be included in your plan of analysis.
- b** This step and Step 4 describe various instruments for data collection. Read through these steps carefully and decide on a way of collecting data.
- c** Step 5 describes several ways of analysing data. Read through this step carefully and decide on a way of analysing your data.
- d** Formulate your plan of analysis.

More specialised types of research

Some of the techniques for data collection described in this step can be applied to a customized *design*. For example, if you have been asked to fit out a new cafeteria or design a new information system, a new chemical factory or a new warehousing facility, you might need to do a case study as part of your research. The analytical and design models and design techniques (drawing and modelling tools) specific to your particular field, whether that field be information technology, management science, logistics or another technology, will influence that design. You will need to familiarize yourself with them.

Detailed budgeting and budget choices

A research project can be as extensive as you want to make it. Your choice of research instruments and number of measurements will usually be limited by the amount of time, manpower and (in particular) money available. The apparatus used in scientific and medical research can be very expensive, not to mention the chemicals or drugs used.

Your client will want to see your research budget before approving it. If you anticipate having to use the services of an external research bureau or expensive research aids for part of your research, you would be advised to request a quotation prior to presenting your budget to the client. Research bureaus often have a very high hourly rate. The more time needed for a particular research instrument to be used, the more it will cost to employ a research bureau.

Comparing costs: an example

The figure below compares the costs in terms of time, money and manpower associated with research instruments in common use (in the event that you are not doing the data collection yourself).

An interview performed for a *qualitative research project* is the least expensive method, though it takes a lot of time to organize a group discussion since all of the participants must be assembled at the same time and place and someone will be needed to take notes. Observations and case studies are methods that require a considerable investment of time and money to be done satisfactorily. They are highly reliable methods, on the other hand.

Fig. 10 gives a comparative overview of the costs associated with various qualitative research methods.

Fig. 10 Comparison of costs: qualitative research

	Interview	Focus group	Observation	Case study
Time	low	high	high	high
Cost	low	average	high	high
Manpower	low	average	low	low

If you are doing quantitative research, face-to-face research is the most reliable method (since there is less likelihood of interference) though the most costly in terms of time and manpower. A telephonic survey takes less time to do than face-to-face research, though it is still relatively time intensive and quite expensive. A written survey is very time intensive but relatively cheap and requires little manpower.

Internet-based research is the easiest research method. However, it is highly susceptible to interference and consequently the results are less likely to be reliable.

Fig. 11 gives a comparative overview of the costs associated with various quantitative research methods.

Fig. 11 Comparison of costs: quantitative research

	Face-to-face	Telephonic	Written	Internet
Time	high	average	high	low
Cost	high	high	average	low
Manpower	high	high	low	low

Time, cost and manpower should not be the only reasons for choosing a particular research instrument. How reliable your research is, what it is that you want to find out and how best to approach your target group are factors that must also be taken into account.

TIP

Making arrangements

- Clients are inclined to ask you to do more research than that which you have been employed to do. Your workload may increase exponentially. Avoid agreeing to do more than you have to. The biggest problem facing inexperienced researchers is how to keep their research within limits.
- Find out whether a plan of implementation or a customized design is also part of your assignment.

ACTIVITY 3-12

Draw up a detailed budget

- Calculate the 'how many' of your project: how many questionnaires, experiments, observations, interviews and case studies. The more there are, the more expensive your research will be.
- Estimate what your data collection is likely to cost.
- Confer with your client about the amount of budget available.
- Choose your research methods with this budget at least partly in mind.
- Check the availability of your resources. If you need a specialized instrument to perform a physics experiment, that instrument will have to be available.
- Referring to the BIOTAFT factors described earlier, check whether your research is still feasible.

Detailed scheduling of your research

Now that you have some detailed idea of the next two steps, refine the global schedule that you drew up under the previous step.

ACTIVITY 3-13

Draw up a research schedule

- Do a quick inventory of the activities in the steps to come and decide whether you can skip any of them. Supplement the ones that you intend to do with activities that relate specifically to your type of research.
- Work out in what order your activities are best performed: which depend on others to be completed first?
- Make a list of the resources you need.
- Set a commencement and completion time for each activity.
- Establish who will perform the activities and estimate how long each will take.
- Draw up a detailed schedule showing the research activities that still remain to be performed.
- Discuss your detailed budget and research schedule with your client (if applicable to your project).

You have now reached the end of Step 3, and as well as detailed budget and research schedules you now have instruments for collecting and analysing your data. The next step involves putting your instruments to use and actually collecting your data.

Additional assignments

- 1 Swanborn has divided the data needed to perform desk research into four groups. What groups would the following data sources fall into?
 - a Central Bureau of Statistics (in the Netherlands)
 - b DDMM data (data relating to Internet advertising)
 - c Audience data
- 2 You have arranged an interview with a person to talk about his views on the current economic situation in the country.
 - a Format the interview as a structured interview.
 - b Format the interview as a semi-structured interview.
- 3 You are doing a survey of students who are considering enrolling in the business management course. Your goal is to find out what is motivating them.
 - a Devise a survey containing ten questions.
 - b Administer a couple of the provisional questionnaires to the actual research population and then evaluate your questions in terms of their usefulness.

How to do research is the English version of the second edition of the Dutch book *Zo doe je een onderzoek*. It is also available as e-book.

How to do research offers students a practical, solid and consistent plan on how to do research.

Why *How to do research*?

- step-by-step plan on how to do research;
- practice-based approach;

On a regular basis research is carried out for companies, institutions and governments. Having strong research skills is therefore important for all college and university graduates. During their studies students get various research assignments and they learn to write research reports and theses to help them prepare for later on in their careers.

This book is a how-to-book and teaches students how they can carry out their own research in eight steps: Step 1: determine your topic, Step 2: draw up a research plan, Step 3: design your research, Step 4: collect your data, Step 5: analyse your data, Step 6: formulate your conclusions and recommendations, Step 7: write your research report, Step 8: complete your research. Each step starts with an introduction, after which the student proceeds through so-called activities.

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Roel Grit (www.roelgrit.com) is a best-selling author at Noordhoff Publishers. He wrote 15 books, including *Project management*, *Managing your competencies*, *Making a business plan* and *Projectaanpak in zes stappen* (P6-methode).

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