

Data collection strategy

General description and unimode designs



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Explanation of symbols

.	data not available
*	provisional figure
**	revised provisional figure (but not definite)
x	publication prohibited (confidential figure)
—	nil
—	(between two figures) inclusive
0 (0.0)	less than half of unit concerned
empty cell	not applicable
2011–2012	2011 to 2012 inclusive
2011/2012	average for 2011 up to and including 2012
2011/'12	crop year, financial year, school year etc. beginning in 2011 and ending in 2012
2009/'10– 2011/'12	crop year, financial year, etc. 2009/'10 to 2011/'12 inclusive

Due to rounding, some totals may not correspond with the sum of the separate figures.

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1. Data collection strategy

The ‘Data collection strategy’ theme covers data collection at Statistics Netherlands by means of primary observation. Primary observation is the collection of data through polls and surveys. The most important methodological aspects of this form of data collection for businesses, persons and households are discussed below.

1.1 General description and reading guide

The Statistics Netherlands-wide Data Collection Strategy (Statistics Netherlands, 2005) is to collect as much data as possible in the first instance from existing registers and secondary sources. Secondary data collection is a separate theme in the Methods Series. The ‘Data collection strategy’ theme presented here is concerned with any primary data collection that is still required despite secondary data collection.

Primary data collection has the following characteristics:

- Statistics Netherlands formulates the request for information,
- which is forwarded through a given channel to whoever is able to supply the information,
- who provides Statistics Netherlands with the requested information through the same or a different channel.

An approach strategy exists to ensure that this process progresses satisfactorily. Fact is that things can go wrong at each stage. The question has to be clear and must be interpreted as Statistics Netherlands intended. The communication channel must transmit the signal without distortion, the recipient must actually receive the question, and must be willing and able to answer it, and finally the answer must be returned and received by Statistics Netherlands without distortion.

The Statistics Netherlands-wide data collection strategy identifies the following modes for primary data collection, in order of increasing cost:

- XBRL (an open and extensible standard for reporting business data);
- Internet observation (self-completion of a computer-assisted questionnaire);
- Mail survey (written self-completion of a paper questionnaire);
- CATI (interviewer administration by telephone of a computer-assisted questionnaire);
- CAPI (face-to-face interviewer administration or in business data collection field staff administration of a computer-assisted questionnaire).

Among the criteria involved in selecting a particular mode are the pace and costs of field work and processing the collected data. Other factors are bias in the outcomes because of undercoverage and nonresponse, and measurement errors introduced in the questionnaire completion process itself.

Achieving the most satisfactory result from primary observation by means of surveys firstly requires an awareness of the strengths and weaknesses of each individual mode, as discussed in Chapter 3. Based on this knowledge, a mode or a combination of modes can be selected for a survey.

Section 1.2 delineates the topics covered in this general introduction and the other subthemes. Section 1.3 describes the position of the approach strategy in the statistical process. Section 1.4 defines the most important concepts. Chapter 2 categorizes the data collection methods and discusses several aspects relevant to the selection of a strategy for various surveys. The subsequent chapters then deal in turn with the individual approaches. The concluding chapter briefly reviews the various advantages and disadvantages.

1.2 Scope and relationship with other themes

The corresponding methodological aspects of Data collection strategy are similar for surveys of individuals, households and businesses¹. Nonetheless, there are several important differences between the different populations of individuals/households and businesses.

- Persons and households (except for institutional households) are very similar on unit level. There is a greater diversity among businesses (large/small, sectoral and/or institutional). Business surveys therefore frequently need a stratified approach strategy, where the strata can be defined in accordance with various points of view. Complete observation of some strata sometimes occurs. However, stratified sampling may also occur with persons and households, such as to guarantee the observation of sufficient numbers of subpopulation members.
- Businesses are much more dynamic and have complex structures.
- The organization and accountability of businesses are bound more to regulations than persons and households. For instance, businesses must maintain auditable accounts, from which must data may be derived for statistical purposes. There is often a legal obligation to provide data of this kind. However, this aim often cannot be achieved directly because matters such as definitions, times and periods as recorded in the accounts tend to differ from the requested information.
- A point that is closely related with the above is that, in business surveys, (semi-) professional staff members themselves are generally capable of retrieving the information requested from the business information systems. In the case of persons or households, an interviewer has traditionally been engaged to help bring the requested information to light.
- The burden involved is a major factor for businesses (as is recognized in the temporary exemption from survey completion (*enquêtevakantie*)), but much less so for individuals.
- There are also differences in the nature of the requested data, which for businesses is usually quantitative, and for individuals often qualitative. Consequently, and because of the more dynamic nature, the focus in businesses is on a different methodology (correcting, extreme value (outlier) checks, etc.).

¹ The term business is defined here collectively to cover all types of units involved in business surveys.

- Otherwise, there is substantial variation within the business category. Small businesses tend to have a fairly stable structure and are relatively simple to observe, unlike large companies, with their dynamic structure and rapid changes, which can complicate the approach and data collection.

Despite these differences, there are enough similarities in data collection methodology to justify handling both businesses and persons or households in this general introduction. However, some subthemes, such as response-enhancing measures, are covered separately.

Response-enhancing measures are an essential part of every approach strategy, and are discussed in a separate subtheme. The measures include sending reminders, refusal conversion, gifts (incentives), feedback of specific sector information (benchmark mailing such as the Business Barometer) and suchlike. Recruitment of respondents and invitational letters are discussed in a separate subtheme of the 'Field work organization' theme.

Each individual data collection mode must separately be organized and optimized. How this is achieved and where necessary improved in Statistics Netherlands is described in a separate Methods Series theme, *Organization of fieldwork*. The main methodological aspects involved are concerned with the quality of the instruments to be used, and monitoring the data collection process. Possible elements are a recipe for performing a survey with a given mode, the availability of qualified, well educated, trained and briefed interviewers, and the monitoring and reporting of field work progress and performance. Another relevant aspect in this connection is the availability of an informative response definition and response reporting.

As mentioned, primary observation uses a questionnaire to specify the request for information. Methods for designing, testing and evaluating the questionnaire instrument, and the associated quality indicators, are covered in the *Questionnaire development* theme.

An important development in reducing the administrative burden for businesses is XBRL, which is an open standard for business data reporting and electronic interchange. The inclusion of questionnaires in an XBRL taxonomy would facilitate the fully automated creation of an XBRL questionnaire message through connection to a business accounting or information system. The XBRL subtheme is covered in Daas and Roos (2007).

The use of multiple modes in the same survey creates specific problems, and is discussed as a separate subtheme under the heading 'Mixed mode: the combined use of multiple modes'.

So, the following components are covered in other parts under the main *Data collection strategy* theme:

- mixed mode: the combined use of different modes;
- response-enhancing measures, with separate documents for social statistics and business statistics;
- XBRL.

As stated, field work organization and questionnaire development are separate themes.

1.3 Place in the statistical process

Data collection strategy for the collection of data through surveys are part of the input through primary observation. They are considered when designing a survey, after deciding on the information to be collected through primary observation, the constraints (costs, timeliness, response burden) that apply, and the appropriate quality requirements (accuracy).² They are also applied in data collection to improve response quantity and quality, with a view to maximizing returns (e.g. through response-enhancing measures, such as sending reminders and refusal conversion).

1.4 Definitions

Term	Definition
Business respondent	The individual or organization that provides the requested data. See also: Respondent.
CAPI	Computer-Assisted Personal Interview. The term personal means face-to-face, with a live interviewer.
CASAQ ³	Computer-Assisted Self-Administered Questionnaire. The term is also abbreviated as CSAQ or CASQ. The full form CASAQ is preferred because it preserves both of the elements 'CA' and 'SAQ'. See also Couper et al. (1998).
CATI	Computer-Assisted Telephone Interview.
Interviewer-administered	Data collection by means of interviews that are administered by an interviewer. See also: Self-administered.
Mail survey	Self-completion of a paper questionnaire that is sent and returned by post.
Mode	Synonymous with observation mode
Nonresponse	<ul style="list-style-type: none"> Unit nonresponse: observation unit for which no questionnaire data were obtained. Item nonresponse: question in a questionnaire to which no answer was obtained (where one or more other questions were answered, i.e. not in conjunction with unit nonresponse).
Observation mode	Method of collecting the necessary information. The mode determines both how questions are presented to a respondent and how the answers are recorded.
Observation unit	Unit about which data are collected. The unit could be an individual or household, a business, organization, or branch, but could also be a geographical unit. See also: statistical unit (which is not necessarily the same as an observation unit).
Questionnaire	A set of questions that are intended to collect information from a

² See also Willeboordse (2008)

³ CASAQ is also known as CASI, which stands for Computer-Assisted Self-Interviewing. This abbreviation is deprecated because it is unclear what 'self-interviewing' actually means. What is probably intended is that the respondent conducts a dialogue with an imaginary interviewer. In terms of communication this is often a stated requirement for a well-designed self-completion form. However, there is no actual interviewer, so neither can there be any interaction, nor any of the attendant effects that are typical of an interview.

	business or individual respondent.
PAPI	Paper and Pencil Interview. Interview based on a paper questionnaire. Often incorrectly used to refer to self-completion of a written paper questionnaire.
Respondent	The person who is presented with and answers the questionnaire. The questions in business surveys may actually be answered by bookkeepers, accountants or accounting firms. See also: Business respondent.
Self-administered	A form of data collection in which the business or individual respondent completes the questionnaire in person. See also self-completion.
Self-completion	The questionnaire is not administered by an interviewer but completed by the respondent in person. The person concerned could possibly arrange for the fully automated compilation of answers by forwarding a questionnaire message to a business information or other system. Where self-completion is not automated, the respondent reads the questions from paper or a display screen. The computer could also read out the questions with simulated speech. The answers are written down, keyed in, or entered using voice response, by the respondent in person. See also Footnote 4.
Self-report	Self-completion, in particular of sensitive questions, possibly also as a confidential part of an interview, on the interviewer's laptop computer, or on a sealable paper form.
Statistical unit	Unit about which the survey outcome reports (to the users of a statistic).
Survey target person	The person about whom data are being collected (see statistical unit).
Web survey	A survey in which the questionnaire is posted on a website, where it can be completed on line, or downloaded to be completed off line. The answers are uploaded on a secure Internet link.
XBRL	This is an abbreviation for eXtensible Business Reporting Language, which is an open and extensible XML-based standard for the interchange of financial data.

2. The various methods of primary data collection

2.1 Main types of approach

The most important distinction in how questionnaires are administered is whether an *interviewer* is involved, or the respondent is invited to complete the questionnaire in person, which is known as *self-completion*. Combinations are also possible, such as where the respondent completes the questions himself, but in the presence of an interviewer who is available to help and give encouragement. It is a convention to use an 'I' in acronyms for modes that involve an interview. Almost all interviewer-administered interviews in Statistics Netherlands are for surveys of persons or households, which are generally referred to as social surveys. The oral administration of an interview is by *telephone* or *face-to-face*. In telephone interviews, the communication is aural. In face-to-face interviews, the live interviewer is also able to use nonverbal communication. It can be helpful in this situation to have visual material available, such as a show card, folder, or other graphical aids.

It is usual in business surveys for the companies and organizations selected for observation to make their own arrangements for questionnaire completion. The data collection is said to be 'self-administered'. Actual completion can be delegated to the firm that does the company's accounts, in which case the firm becomes the business respondent. Some Statistics Netherlands social surveys are traditionally also self-completed, but then for special tasks such as keeping a diary of spending or journeys (i.e. the diary method). The term 'self-report' is often used where sensitive subjects, such as health, or offences committed, are involved. Self-completion invariably implies visual questionnaire presentation⁴. It can be presented on a display screen, a paper questionnaire or form, and possibly also as a manual with specifications of the questions (e.g. for creating the connection for automated standard reporting from business information systems).

Although self-completion is common for businesses, the use of an interviewer or member of the field staff may be chosen for important subgroups (strata), and certainly if the impact of a business on the statistical output is relatively important, or the company has a complex structure.

Another important distinguishing factor for modes is how the questionnaire is controlled. If the questionnaire is in the form of a computer programme, then the

⁴ In the United States sensitive subjects in individual surveys often use an *audio* variant of self-completion known as audio CASI or ACASI (audio computer-assisted self-interviewing), in which the questions are read out in computer-simulated speech with the respondent keying in the answers on the keyboard (O'Reilly et al., 1994). If the questions are presented by telephone, the answers can be given on the keypad (i.e. Touchtone Data Entry). Voice recognition techniques for answering are still in development. The telephone ACASI variant is known as T-ACASI (Villarreal et al., 2006).

computer automatically presents the questions in the correct sequence. The answers are recorded in electronic form directly through keystrokes or mouse clicks and verified immediately, presenting the question again if necessary for correction or additional information. An advantage of computer assistance is the considerably reduced susceptibility to errors in asking the questions and entering the answers. An example are answers lying outside the accepted range. Checks can be incorporated into the questionnaire. ‘Hard’ checks prevent respondents continuing with the questionnaire until the ‘incorrect’ answer has been rectified. ‘Soft’ checks cause a warning to be sent to the respondent in the event of an improbable answer.

It may be tempting to incorporate as many checks as possible with a view to obtaining a consistent and plausible record. However, restraint is called for. Firstly, a respondent may be greatly irritated by excessively frequent rebukes, possibly leading to the questionnaire being abandoned. Secondly, values that seem improbable may actually reflect the real world. If so, the checks will impede the rapid observation of changes in society. Thirdly, too many hard checks can prevent the discovery of questions that are being interpreted incorrectly: they hamper the evaluation of question phrasing. However, checks are advisable for important variables that help determine the further route through the questionnaire. Checks pose less risk when the questions are presented by interviewers, who can act as mediators or go-betweens. The people who have to analyse the dataset will prefer many checks, as will those involved in processing and data editing. Conversely, people whose main concern is interviewers and respondents will want few checks. The balance is often difficult to make. Otherwise, it is not necessarily the case that an internally consistent completed questionnaire is actually telling the truth: hard checks force respondents to answer consistently, but not honestly. Certainly if the check caused some irritation, a respondent may simply want to move on. This behaviour is known as ‘satisficing’, which is described in the ‘Questionnaire development’ part.

Another important advantage of computer-assisted questionnaires is that the data is directly available in electronic form, without first having to be keyed in, thereby avoiding many processing errors.

Table 1 shows a typology of approach methods. The methods shown in bold are used regularly by Statistics Netherlands. Some other methods are sometimes used experimentally. The frequently used approach methods are discussed in Chapter 3.

Table 1. Typology of approach methods

	INTERVIEWER PRESENT	NO INTERVIEWER
PAPER	PAPI	Written survey
LAPTOP COMPUTER	CAPI	CASAQ (CASI)
TELEPHONE	CATI	Voice response
PC RESPONDENT	CAWI	Web survey

2.2 Sample

The units about which data are being collected must reflect the target population well enough to allow target variables in the population to be estimated with acceptable accuracy. This requires a list or frame of identifiable units on which basis access can be gained to the units to be selected. Often a sample is drawn at random from this frame, but it is also possible to arrange for full-coverage of businesses in a given size category. If the units are people, the frame will be the general population register (GBA). The usual frame for businesses is the set of business units in the general business register. An important factor is how well a frame covers the target population of units about which statistical statements are to be made.

2.3 Coverage

Certain modes inherently require specific channels to be available for data interchange, for example because an XBRL message may be generated, or access to the World Wide Web is needed. Undercoverage will occur in a CATI survey where the frame of units from which calling lists are created does not include individuals without a landline telephone or with an unlisted number. Likewise individuals with no Internet connection are excluded from web surveys. Even if a channel is available, the actual response achieved with it may be either more or less satisfactory than with a different method of data collection. Undercoverage and selective nonresponse may lead to biased outcomes. The main detriment of the selection effects that arise from the use of certain modes is that they diminish the representativeness for the target population.

2.4 Nonresponse

It is not always possible to obtain data from all the units about which data are to be collected. People may refuse to take part in an interview, or may be impossible to contact. Businesses may neglect to enter or return data. Because incomplete observation can lead to biased and less accurate statistics, measures are needed for achieving a satisfactory response at an agreed quality level.

2.5 Business and individual respondent, proxy

The person a survey is actually concerned with (the survey target person) is not necessarily the person who answers the questions. If in a social survey questions concern a minor or infant, then a parent or care provider will answer the questions. Where the survey population includes several individuals in the same household, it is often acceptable for a respondent to act as a proxy for someone else when answering or completing the questionnaire. However, the use of proxies is subject to certain constraints. It must always be clear who answered questions on behalf of whom. A proxy must also be deemed to be in possession of sufficient knowledge: minors are not the right persons to answer questions about family income, and proxies cannot properly assess the extent of someone else's physical impairments, and so on. For instance, it would be hard for other family members to answer the Labour Force Survey questions about looking for a job. Attitudes, opinions and moods cannot be reliably and validly obtained through proxy responding. Proxy answers are invariably of lower quality than answers from the actual survey target person (with the exception of children, *non compos mentis* targets, etc.). The use of proxies is accepted because it can greatly reduce the costs of acquiring a response, because fewer visits are needed to a given household. A decision to permit proxies or not is therefore a matter of balancing costs and quality.

In business data collection, questionnaires are often completed by the accounting firms that are usually also responsible for the company's accounts. It is unclear whether the quality is worse or actually better than if the company were to complete the survey itself. The result may be influenced by the kind of information requested: accounting firms probably always have the financial data at hand, but will less often have data about personnel or in-company training courses. Regarding the continuity in reporting for regularly recurring questionnaires it is desirable that the same contact person fills in the questionnaires. However, it is impossible to enforce this.

2.6 Mode

Different data collection methods may lead to different outcomes, partly because the means of communication used in a mode may themselves lead similar respondents to produce different outcomes (which is known as the mode effect), and also because different modes imply that different kinds of respondent are observed (which is known as the selection effect). Mode effects and selection effects make outcomes less comparable. This drawback must be weighed against the gain in economy and timeliness that using different modes may bring. This aspect is discussed further in the 'Mixed-mode observation' subtheme.

All these aspects may lead to errors in the ultimate estimate of the target variables. We use here part of the total scheme of error sources. We refer for the overall picture to the 'Sources of error in statistical surveys' theme (Bethlehem, 2010).

2.7 Sources of error connected with the approach strategy

The total error of a survey can be divided into various error components. The first is the error connected with basing the estimates on a sample rather than a full census of the population. Some other errors also occur with full-coverage observation. These other errors are connected either with the observation process, such as measurement errors, processing errors and the inclusion of observations of elements from outside the target population (overcoverage), but on the other hand errors occur by non observing certain elements. A possible cause of nonobservation is that certain elements are incorrectly excluded from the sample or sampling frame (undercoverage), but the usual cause is nonresponse: elements that are part of the sample are either not reached or refuse to take part. Some examples of the sources of undercoverage are people with unlisted telephone numbers if telephone surveys are based on the telephone directory, people not having access to the Internet, or illegal immigrants if a sample of persons is drawn from the official population register.

Where nonresponse and undercoverage exclude elements from observation, the quality of all variables of the survey will be adversely affected. For example, the effect of interviewing far too few young people will be disastrous for the estimates of *all* target variables.

Measurement errors are on the level of individual variables (except for overcoverage errors). These measurement errors are related mainly to the questionnaire. They also cause bias on the aggregate level if they occur systematically rather than at random, which is detrimental to the validity of the statistical outcomes.

For example, the position of a question in a questionnaire can sometimes influence the outcomes. Moving the question can increase or decrease the score. After the first few, the answers to the rest of a long list of yes/no questions will sometimes be the same, as the respondent stops thinking and just enters 'yes'. Where questions have too many answer categories, those towards the end will tend to be underestimated or overestimated. The medium plays a role in this case: it is common in telephone surveys for the respondent to opt for a category near the end of a list, whereas in written surveys the first answer option that comes close tends to be selected. This is referred to as the recency versus primacy effect.

Context effects are known to lead to fairly large differences in response patterns. For instance, several Statistics Netherlands surveys have a series of questions where respondents have to report their own criminal conduct. Some surveys precede this list with a series of questions about their own experience as a victim of crime, where others have questions about leisure activities. It is not surprising that far less self-committed criminal behaviour is reported in the questionnaire that first asks about victimization.

Another familiar cause of measurement error on the variable level is forgetting or making mistakes about past events, which is referred to as the memory effect. Someone may remember recently having taken cocaine, or visiting the doctor, but be unable to say whether that was a month or six weeks ago. These measurement errors are also related to the survey mode.

The advantage of using an interviewer is the opportunity to explain and clarify the questions, and to ensure that the complete list is processed, but a disadvantage is the possibility of provoking socially desirable answers: respondents may tend to give answers that they think the interviewer will not disapprove of.

On average, surveys in which respondents answer the questions themselves without anyone else present, or able to look, are completed more honestly, but the risk of questions being skipped or misunderstood increases. Moreover, it can happen that answers given by respondents on paper are different from those given on a laptop computer: CASAQ (computer-assisted self-administered questionnaire) would appear to be perceived by the survey target person as even more anonymous than a paper list, while also preventing questions being skipped.

Socially desirable answers arise mainly with sensitive questions. Some subjects are more sensitive in nature than others for different respondents.⁵ For example, for most of the population, criminal behaviour is a sensitive theme, as is sex. Likewise, socially desirable answer patterns can be expected about excessive smoking or drinking behaviour. Surveys always arrive at a far lower estimate of alcohol use than those based on sales or excise duty figures. Within surveys, estimates based on data obtained through an interviewer are lower than those based on answers entered by respondents themselves. Socially desirable answers are also modulated by the chosen medium. For some subjects, telephone administration leads to slightly different response patterns than face-to-face administration because the interviewer is slightly more anonymous, while the respondent has more freedom to adopt a certain pose.⁶

Such aspects of the administration mode that have a direct influence on respondents' answering are known as mode effects. Mode effects occur on *variable level*: some, but not all, variables produce different outcomes depending on the medium used for data collection. Mode effects are therefore different from (self-)selection effects that occur at the sample element level. An example of a selection effect is the relatively poor representation of elderly people in web surveys and the web variants in mixed-mode surveys. Other examples are the nonobservation of young people in face-to-face surveys because this group is more often not at home, or underestimates of ethnic minority numbers in telephone surveys based on a sample drawn from a telephone directory because of the high proportion of unlisted numbers in this category. These selection effects on the sample element level are not generally considered to be mode effects. At first glance selection effects appear to be worse than mode effects because selection effects occur on the level of sample elements within a mode rather than for only a few questions per respondent per mode. On the other hand, it also appears that solutions for selection effects may be easier to find

⁵ A test respondent once commented that she entered her own weight honestly in a CASAQ (CASI) survey, but would not tell an interviewer. For many people, their weight is a neutral subject. The sensitivity is probably influenced by the actual weight.

⁶ These effects often interact with the gender, age and ethnicity of the interviewer and of the respondent.

than those for measurement errors. Weighting can partially adjust for selection effects, but cannot rectify all the mode effects in a survey at once.

The size of the bias caused by a given measurement error depends on the one hand on the average deviation from the actual value for the elements concerned, and on the other hand on the number of sample elements where the error occurs. For example, it is not so bad if nonrespondents differ greatly from respondents as long as the response rate is close to one hundred per cent. Conversely, a response rate of, say, sixty per cent would be a small problem if on average respondents and nonrespondents score almost the same on each target variable in the survey.

For mode effects too, the size depends on the number of respondents involved, and on the magnitude of the deviation. For instance, it is conceivable that in a mixed-mode design telephone interviewees have a significantly lower score for some variables than face-to-face interviewees, but in case the deviation is small, and only a few respondents have been interviewed by telephone, the influence on the ultimate population estimate may be negligible.

The effects of the separate modes are discussed in Chapter 3. A bibliography of mode effects is given in Ariel et al. (2008). Furthermore, the part that deals with mixed mode extensively covers aspects of questionnaires that may prevent, or conversely exacerbate, these mode effects.

Note on the ‘true value’ approach

‘Measurement error’ is used above as a synonym of ‘effect’, although this is an oversimplification. A measurement **error** assumes the existence of an actual value, or the truth, as it were. This assumption will be correct for many survey questions, such as date of birth, or shoe size. It is not such a simple matter with questions about attitudes. Some research traditions consider that ‘constructs’ of this kind really do exist, but according to orthodox stimulus-response theories it is possible to say only that everything you measure is just the answer to a given question (the response to a stimulus), and there is no *true value* independent of the measuring instrument (i.e. question + mode). We therefore prefer the term ‘effect’ rather than ‘measurement error’.

The following chapters describe the individual modes, together with the associated quality-enhancing and response-enhancing measures. Detailed measures for enhancing response are given in the relevant subthemes of the ‘Field work organization’ theme.

3. The individual observation modes

3.1 CAPI: Computer-Assisted Personal Interview

A 'personal' interview means one that is face-to-face with a live interviewer, who reads out the questions and notes down the answers. The interviewer and respondent are able to communicate nonverbally through facial expressions and suchlike, and thus obtain a mutual sense of what is going on. It is also possible to present simple brochures, show or flash cards or a means of identification. The use of a paper questionnaire rather than a computer-assisted type was the usual form of face-to-face interviewing in Statistics Netherlands before the introduction of handheld and laptop computers. This form is known as PAPI, which originally stood for 'Paper And Pencil Interviewing'. Unfortunately, the term PAPI is now frequently used to refer to a written questionnaire to be completed by respondents themselves. PAPI is the correct term if a member of the field staff assists in answering a paper business questionnaire.

3.1.1 Application

The direct presence of an interviewer with a laptop computer makes CAPI the ideal method for administering difficult questionnaires with complex routing. Interviewers can provide any necessary explanation and respond immediately to any comments respondents may have. Furthermore, it is possible to employ devices such as show cards. Moreover, interviewers are able to encourage respondents and maintain their attention. These benefits can also have adverse effects. Indeed, the setting most likely to produce socially desirable answers is a face-to-face interview. This form of interview is therefore less suitable for very sensitive subjects.

Another advantage of face-to-face interviewing is that the motivating role of interviewers permits relatively lengthy interviews. Whereas Statistics Netherlands telephone interviews are restricted to twenty minutes on average, the limit for face-to-face interviews is forty-five minutes because of the greater quality of the contact (i.e. rapport) between interviewer and respondent. Other bureaus than Statistics Netherlands use different questionnaire lengths, though. For example, the Norwegian statistics bureau considers that CAPI questionnaires may take up to ninety minutes. A questionnaire's quality and attractiveness obviously play an important part.

Interviews administered by interviewers at respondents' homes, involving much travel, are by far the most expensive form of survey. This is why the Statistics Netherlands-wide data collection strategy restricts the use of CAPI surveys to cases where it can be demonstrated that other, less expensive, modes would not yield a satisfactory quality. The high costs also mean that CAPI is the mode in which the use of proxies is most likely to be acceptable. CAPI also allows the greatest control over who answers the questions. The risks attached to proxy answers are therefore less severe.

Another disadvantage of CAPI observation is the complexity of data collection and the long fieldwork period.

Likewise, it is uncommon for field staff to administer CAPI interviews in businesses because these relatively highly qualified employees are also expensive.

3.1.2 Access to the survey population

The target population for person and household surveys is almost completely covered in the Netherlands by the general population register (GBA). The only individuals missing are those illegally present in the country. However, this does not mean that all selected individuals actually live at the address where they are registered. This problem is serious in the major cities in particular, and appears to be getting worse in smaller towns. For this reason, it will often be simply impossible to contact the survey target person. If this phenomenon were distributed randomly, it would lead only to a lower response, with no risk of severe bias. Unfortunately, certain groups would appear to be more likely than others not to reside at the stated address, including some categories of benefit recipients and students. Other people who can be hard to find include those who live with someone else but are unwilling to give up their own home.

In theory, therefore, the GBA is an almost complete frame, but a variety of practical problems are attached to using this register as a frame for survey research. Some studies therefore use an address sample. Addresses are selected from the postal address lists, which can usually be matched with one or more households in the GBA. This information and any additional data (e.g. about membership of the working population) allow interviewers to adapt their approach. It is possible to create personalized invitation letters for eighty per cent of the addresses (Luiten et al., 2008). In theory, an address sample can also be used to observe the illegal population. However, it would clearly be very optimistic to expect a high response from this population.

The institutionalized population (i.e. people who live in institutions like shelters or nursing homes) are a special case. These people are removed from the random sample if they are officially registered at an institutional address. If they are still registered at their old address, they will be counted as nonresponse.

Where businesses are observed through CAPI, the frame is the general business register with addresses.

3.1.3 Response

Before a response can be obtained, contact must be made with the survey target person, who must then consent to be interviewed. As mentioned in 3.1.2., there is often a discrepancy between the almost complete frame and the actual usefulness of that frame in finding persons for a survey. This situation already causes a certain lack of contact. After sending an invitation letter, the interviewer will make several attempts to find the survey target person at home. The number of visits cannot be unlimited in view of the high costs involved.

The interview may or may not go ahead once contact has been made, depending on a variety of circumstances: the respondent's refusal to cooperate, a language barrier so great as to make an interview pointless, the respondent's inability to make time available during the field work period, or long-term absence. For a complete description of the call record, see the relevant 'Field work organization' subtheme.

Nationally, interviewers achieve a response of around 65% from the visited addresses or individuals. This figure is calculated over the survey units minus frame errors and administrative nonresponse (including language problems). Around twenty per cent refuse to cooperate. There is a fairly large variation in response rate from one region to another. About 70% is achieved in the northern provinces, but only 50% in the Amsterdam region (Labour Force Survey for the first nine months of 2009). Young people and members of ethnic minorities also respond less than average.

A variety of response-enhancing measures are available for avoiding bias as a result of selective nonresponse. These measures can also be used selectively, which is to say that they can be directed only to poorly responding groups. The practice of modifying the approach strategy for the poorly responding groups in the course of the field work is referred to as 'responsive design'. See the 'Response-enhancing measures' subtheme.

3.1.4 Measurement errors

Except for the bias caused by selective nonresponse, CAPI is a high quality measuring instrument. The interviewer is able to assist, show cards can be used, and the pace of the interview resembles that of a normal conversation. The measurement errors that are typical of CAPI arise because of interaction with an interviewer. The tendency to give socially desirable answers is greater with CAPI than with CATI (see Section 3.2). Interviewers sometimes ask what are known as 'leading' questions, by suggesting a response option, or not asking a question in exactly the prescribed way, or nonverbally revealing their own opinions. Field interviewers can also distribute their efforts somewhat selectively in order to achieve response. They may be less willing to visit certain neighbourhoods, and they will be more reticent at some addresses than others. Tight monitoring can be used to try to curb these tendencies.

'Leading' can also occur when field employees assist in answering a business questionnaire (in electronic or paper form).

3.2 CATI : Computer-Assisted Telephone Interview

CATI is usually performed from a central location (call centre) by means of a call management system that distributes outgoing calls among the interviewers and monitors progress and appointments (e.g. to call back later). An advantage is the opportunity for central instruction and supervision. Administration of a computer-assisted questionnaire by telephone can also be decentralized, with no central supervision.

3.2.1 Application

Telephone surveying has three general benefits (Holbrook et al., 2003).

- It is a relatively inexpensive method. Because no home visit is needed, the associated travelling expenses and compensation for travel time do not apply. A telephone interview is also faster than the face-to-face counterpart. The limited opportunities for nonverbal communication and the impossibility of seeing what the other is doing generally help speed up the questioning. Silences tend to be perceived as unwelcome interruptions in the communication, and are therefore avoided.
- Surveys can generally be set up and performed quickly. Results can be achieved rapidly. It is often possible to fit smaller surveys in with the larger telephone campaigns. CATI handles the numbers to be called very efficiently. The call management system selects the numbers reliably, effectively and at appropriate times. Progress is known at all times and intervention is possible. Any necessary questionnaire corrections can be implemented rapidly.
- Centralization in a call centre promotes a uniform standard working method. Interviewers can be instructed, supervised and guided centrally.

In addition, CATI offers all the benefits that are associated with a computer-controlled interview. With the computer presenting the next question automatically, the interviewer is completely free to concentrate on the call, while facilitating complex routing in which questions are fine-tuned to the situation of the observation unit. The outcomes of hard checks on logical inconsistencies and soft plausibility checks can be presented to the respondent immediately, and conflicts can be resolved in contact with the primary source.

Telephone surveys also have communication-related weaknesses. The question and answer process is completely aural. The use of visual aids is limited, if possible at all. A visual aid can sometimes be used if the answers are noted down first in a diary, and reported later by phone. Visual support can then be linked to the diary. Interviewers are unable to see what else the respondent might be doing, or observe the situation. The possibility of nonverbal communication is limited to audible signals (e.g. coughing, or humming). Silences tend to be perceived as awkward, but avoiding them can mean leaving insufficient opportunity for reflection, and prompting hasty answers. The fast pace of communication may in every aspect threaten response accuracy. However, there is no objection to telephone interviewing if the answer is readily available, or a spontaneous answer off the top of the respondent's head is required.

The faster pace of verbal communication, combined with expectations about the use of the telephone as a means of communication, make this medium inappropriate for long interviews. Telephone respondents express more often than face-to-face respondents dissatisfaction about the length of the interview. Fatigue and irritation will be more likely to lead to suboptimal answers ('satisficing'). See e.g. Holbrook (*ibid.*).

Proxy answering is sometimes acceptable for CATI. For instance, if proxies were allowed in an earlier face-to-face approach, it would be inconsistent to disallow them in a later approach. However, since calls are relatively easy to make, there is

little reason to allow proxies from the point of view of costs. Furthermore, research with the Labour Force Survey (Kempkens and Van der Hurk, 1993) has shown that proxy responding in combination with CATI leads to a lower quality of data than CATI without proxy, or CAPI with or without proxy. Careful consideration should therefore be given before allowing proxies with CATI.

3.2.2 Access to the survey population

Statistics Netherlands policy is to approach potential interviewees first by sending an approach letter stating the purpose of the survey, explaining the privacy policy and requesting cooperation. The same applies to telephone surveys. Drawing from the population register (GBA) provides addresses for letters.

However, it must be possible to link a telephone number to the name and the address. This occurred in two rounds in 2008. The response in the first five months of 2008 was higher than the last five months, probably mainly because of a change in telephone number provider; for a sample of persons from the GBA frame, 71% and 64%, respectively, and for an address sample from the GBA frame 69% and 63%, respectively. In other words, it was impossible at the end of 2008 to link a telephone number to at least one in three GBA elements. This situation has not changed much since then.

This telephone accessibility problem has deteriorated in recent decades. 1987 Health Survey respondents were asked whether they had a telephone and, if so, whether the number was unlisted. 95% had a telephone, of which 7% had an unlisted number, and therefore no less than 88% were listed normally in the telephone directory. In 2008 only 69.6% of the 2008 respondents (from June through December) in the face-to-face Health Survey had a known telephone number, and the figure for the entire sample was 65.5%.⁷ Unfortunately, the distribution of inaccessibility by telephone is not random: in 1987 approximately ten per cent of people in the 20 to 29 year age range and also ten per cent of divorcees had no telephone. No less than 21% of divorcees had an unlisted number. The accessibility of young people was therefore 82.7%, and only 68.2% for divorcees, compared with the average of 88.3% (ibid.). See also Engbersen et al. (1990) who show that unemployed people and benefit recipients are relatively more likely to have an unlisted number.

It may be assumed that nearly everyone nowadays has some kind of telephone, whether mobile, Internet, or land line. However, accessibility has declined substantially, and this trend is not set to change. This is a major disadvantage of unimode CATI surveys.

A telephone follow-up survey after a face-to-face approach will allow considerably more telephone numbers to be obtained from the respondents. Depending on the

⁷ The positive correlation between face-to-face response and having a known telephone number is well established (Van den Berg 1987). In the months in 2008 mentioned above the response rate among people with a known telephone number was 68.3%, and of people with no known number 56.7%.

‘pleasantness’ of the first survey, the subject and the announced duration of the follow-up interview, up to ninety per cent of respondents will provide a telephone number. Unfortunately not everyone will eventually take part.

It is very rare in business surveys not to be able to find a company’s telephone number. A greater problem is identifying the right contact person and their telephone number. This information is recorded for each survey in the customer relationship management (CRM) system.

Telephone screening can often be useful for business surveys and some social surveys in finding a certain type of person or identifying the right contact person for sending a questionnaire. For instance, screening is used in recruiting people from certain income categories for the Expenditure Survey, and was used in the past to find women of fertile age for the Family and Fertility Survey.

A tried-and-tested method of finding telephone numbers is random digit dialling (RDD). In particular in the US, where no population register similar to the GBA is available, and where ‘area sampling’ is commonly used, there are sophisticated systems for randomly generating telephone numbers in a certain series with a high degree of success. Market research bureaus in the Netherlands also have systems of this kind. A great advantage of RDD is that it also allows unlisted numbers to be called. Unlisted numbers are fairly common in the Netherlands among members of ethnic minorities and divorced women. A disadvantage is that no letter can be sent in advance to announce the telephone interview⁸. An experiment with RDD at Statistics Netherlands is described in Vousten (1999), where the specific aim was to reach ethnic minorities in certain districts of Rotterdam.

3.2.3 Response

The response from telephone numbers is approximately 66% for a one-wave, cross-sectional household survey. If the response is calculated over the originally selected gross sample – i.e. disregarding whether or not a person has a telephone number – a typical response figure starting from the original GBA elements would be 42%. Therefore no response will be obtained from the majority of GBA elements in a data collection strategy that uses only the telephone.

Response rates clearly depend on the effort taken. It is common to make several contact attempts during different parts of the day. In these periods a substantial number of automatic call attempts are made by the computer system. For this aspect, see the ‘Field work organization’ theme.

3.2.4 Measurement errors

CATI has the same interviewer-related advantages and disadvantages as CAPI, albeit with some subtle differences. Interviewers have a somewhat less motivating effect in CATI than in CAPI because they are not physically present. A more

⁸ There is a list-assisted variant, in which generated telephone numbers that are listed in the telephone directory do receive a letter.

anonymous interviewer means that the general tendency for socially desirable answers is slightly less, but it also gives more freedom for the respondent to adopt a certain pose (reflected by generally more reporting of income data). The faster pace of the conversation gives the respondent less time to reflect before answering, which makes telephone interviewing somewhat less suitable for questions that demand recall from memory or striking a careful balance between response options. Furthermore, questions with many response categories are less suitable because there is no opportunity for showing flash cards.

If CATI is used nonetheless for asking the above kinds of questions, measurement errors are more likely to occur than with CAPI.

3.3 Mail survey

3.3.1 Application

Unfortunately, the term PAPI is now frequently used to refer to a written questionnaire to be completed by respondents themselves, without an interviewer. . When observing individuals and households, this kind of questionnaire is either delivered by hand by an interviewer or sent by post. In some mixed-mode surveys a written questionnaire on paper is available for respondents who have no Internet access. For this aspect see the ‘Mixed-mode’ subtheme.

Paper questionnaires are used for sensitive subjects. For instance, part of the Health Survey has always been administered on paper. Furthermore, self-reports of crimes committed or drug use can best be acquired through a paper questionnaire (or CASI, see below). If the survey is one in which all household members are part of the survey population, a paper questionnaire can be left for any individuals who were absent at the time of the CAPI interview. This is definitely a good idea where proxy reporting is unacceptable, which will be the case for sensitive subjects. However, with paper questionnaires it is hard to know who actually provided the answers.

Business observation in the past used many paper questionnaires, which were sent and returned by post.

There are obvious limitations to the complexity of the questionnaire, since complicated routing is impossible. Care should be taken to avoid overestimating respondents’ skills in following navigational instructions.

The costs attached to paper questionnaires depend strongly on the amount of work needed for processing and correcting. The processes of sending and returning are cheap in comparison with other observation modes.

3.3.2 Access to the survey population

Paper questionnaires reach the survey population when the survey target persons reside at the addresses to which the questionnaire was sent or delivered by hand. This will certainly be the case for a follow-up survey or where the survey target person requested himself a paper questionnaire. If a paper questionnaire is sent

without prior contact there is almost never any certainty that it will actually reach the survey target person. It is impossible in general to detect frame errors.

For business surveys accessibility depends on the quality of the business register, as with all other Data collection strategy. Reaching an appropriate contact person within a company is often more difficult. Considerations of continuity also make it desirable to find the same contact person consistently for a given survey.

3.3.3 Response

The response to personal and household mail surveys is lower than for other modes. When all conceivable attempts to raise response have been made, the rate will in general not exceed forty per cent. Response may be very high in the case of follow-up research or paper questionnaires sent on request. In the Health Survey, for which the CAPI interviewer delivers a paper questionnaire by hand, around eighty per cent of the issued questionnaires are returned, if necessary after a reminder.⁹ The response to written questionnaires sent on request in mixed-mode surveys may exceed ninety per cent (National Security Monitor (VMR-extra), 2008, see Beukenhorst and Wetzels, 2009).

Bias occurs in unimode mail surveys because the response is skewed by the higher participation rate of highly educated and qualified individuals with a good command of Dutch.

3.3.4 Measurement errors

An advantage of paper surveys is that no interviewer is present to evoke socially desirable answer patterns. A disadvantage is that no help or explanation can be given. An effective remedy could be to provide explanatory notes, assuming that business and individual respondents actually read them. Explanations are generally not carefully read. It is therefore advisable to phrase questions so as to avoid the need for separate explanation, e.g. by incorporating the explanation into the question. The layout of a self-completion questionnaire is extremely important to the way explanations are used.

Questionnaire routing soon becomes complex – which leads to much item nonresponse as questions are mistakenly skipped. Item nonresponse of this kind occurs because it is impossible during completion to check answers.

Business questionnaires often require calculations to be performed. Electronic questionnaires can do this work for respondents, but paper questionnaires cannot. Therefore more calculation errors occur with paper compared to electronic questionnaires. Also what are known as ‘1000-errors’ are common in paper questionnaires. These are errors where answers should be given in units of one thousand, but respondents overlook this requirement. There is in paper questionnaires no way of checking for these errors.

⁹ It is also possible for the questionnaire to be completed immediately in the presence of the interviewer.

In other words, if paper questionnaires become too complex, considerably more measurement errors will occur than with computer-assisted questionnaires. Including a paper questionnaire among the possible media in a mixed-mode design will impose limitations on the questionnaire for all modes.

Because of its visual nature, a paper survey will sometimes exhibit primacy effects, in which respondents confronted with questions with many answer categories select the first one that is roughly applicable.

The same visual nature also leads to another adverse effect: the occurrence of measurement errors with matrix questions, in which respondents are asked to answer a whole series of identically formatted questions in succession. An example would be a series of statements where respondents have to give the extent of their agreement. The risk with a paper questionnaire is that respondents will tend to evaluate all statements equally, in a straight line downwards.

3.4 Web survey

If a questionnaire is downloaded from, or completed on line on a website, this is generally referred to as a web survey. For a typology see (Couper, 2001). In this paper he points out how unclear the term is because it covers a multitude of diverse methods. In his opinion, a specification should always be given of what is involved. We briefly discuss some of the options below. A common method is for respondents to be asked to visit a website, e.g. <https://formulieren.cbs.nl>, and log in with a user ID and password to access a questionnaire or e-form. Sometimes the questionnaire program has to be downloaded and completed off line on the respondent's PC, before uploading the data over a secure Internet connection. Many standardized electronic business questionnaires (e-forms) work in this way. In some cases, the responses may be delivered in encrypted form by e-mail. Other web questionnaires are displayed and completed in a browser. A single HTML page may suffice for an entire questionnaire if it is extremely compact, with no routing and few checks on the answers. This page may be completed either on line or off line. An Internet connection is required for returning the answers. Where completion is dynamic and interactive, and includes routing and checks, page-by-page interchange is required between a Statistics Netherlands server that holds the questionnaire and the respondent's browser that displays the pages and sends the answers. This requires a permanent Internet connection. However, it is possible to interrupt the completion process and resume later without losing the previously entered data. As Internet spreads, social surveys will also increasingly make use of self-completion of questionnaires posted on websites.

3.4.1 Application

Web surveys can take the form of access panels, in which respondents are recruited to join a panel that is asked to respond to web questionnaires. Successful recruitment is essential for the quality of this kind of panel. A random sample from the population register (GBA) must be recruited personally through an invitation letter, possibly accompanied by other approach methods, in order to maximize the

response. Any sample elements who have no Internet connection would ideally be provided with one. Respondents then receive the questionnaires to be answered.

A very common web survey method, which Statistics Netherlands does not use, involves inviting people to join a panel through a banner on a website and a variety of advertisements in different media. A reward is invariably offered to respondents who complete all the questionnaires they receive, or just those they think are fun or interesting. This kind of panel therefore in no way qualifies as a representative sample. The response is based entirely on self-selection. Consequently the outcomes absolutely cannot be viewed as representing the entire population. Unfortunately, methods that involve observing a few important variables in a small but satisfactorily representative survey, in order to weigh the panel using these variables, do not solve the problem (see Bethlehem, 2008).

Currently Statistics Netherlands uses web surveys among persons and households only as part of a mixed-mode design. See the 'Mixed-mode approach' subtheme. The reasons are given in Sections 3.4.2, 3.4.3 and 3.4.4.

Internet is already being used far more frequently for business data collection, and is sometimes the only mode available for responding. The same trend is also evident internationally.

3.4.2 Access to the survey population

Not everyone has an Internet connection yet, and not all who do have one, have broadband, which is almost indispensable for completing online questionnaires conveniently. Coverage and convenience of access are therefore imperfect. However, the situation is changing rapidly, with coverage increasing year by year, and the related selectivity declining just as rapidly. This problem will solve itself.

Likewise, not all companies have an Internet connection yet, but this situation too is changing rapidly, and in due course there will be no more impediments for web surveys.

3.4.3 Response

The response to individual web surveys remains far below that for CAPI or CATI surveys. Statistics Netherlands has achieved no more than 30% response in this mode. Fine tuning and the use of incentives may lift the response a little, but it is doubtful whether it will ever rise above the forty per cent that can be achieved with mail surveys, which also have to make do without an interviewer's powers of persuasion.

There is little or no way of monitoring who actually completes the questionnaire. It is unclear whether it is advisable to include more than one person per household in the sample. There are examples where doing so has given satisfactory results. It is likewise still unclear how acceptable proxy answering is. There are examples of surveys where proxies were permitted, but the option was very little used.

The response to business surveys is much higher, which clearly has some connection with their mandatory nature. The e-PS 2006 (Structural Business Survey), which had to be completed electronically, and for which a written alternative was provided only on request, yielded a total response of 80%, of which 80% was by electronic means (data 2007).

3.4.4 Measurement errors

Compared with paper questionnaires, a major advantage of web surveys is that they are computer assisted, which avoids many measurement errors, such as 1000-errors, calculation errors, and routing errors. On the other hand, they have the same disadvantages related to their visual nature and layout: explanatory notes are poorly read, possible satisficing by straight-line answering of matrices, and primacy effects. What they also have in common with paper surveys are the disadvantages related with the absence of an interviewer. For example, lower motivation may mean more 'don't know' answers, more frequent selection of neutral middle categories, and a greater tendency to stop answering the questionnaire prematurely.

4. Conclusion: the modes compared

Chart 1 sets out for personal and household surveys the various modes with respect to several aspects discussed above. It is hard to give a precise evaluation because of the many variants within the modes that may influence each aspect positively or negatively. For example, costs will increase substantially for a web survey that gives people in the sample expensive incentives in advance. However, CAPI surveying will almost always be the most expensive option. Important cost factors include the use of interviewers and any travelling expenses. The main influence on timeliness is the need to send reminders in order to obtain sufficient response. Coverage and accessibility are determined by the quality of the GBA, how many telephone numbers are unlisted, and the lack of a register of Internet users (e-mail addresses). Response is strongly determined by the use of interviewers, as are the nature and magnitude of measurement errors.

Chart 1. Ranking of modes according to various aspects, household data collection, from most to least appropriate

Costs:	web, mail, CATI, CAPI
Timeliness:	CATI, web, CAPI, mail
Coverage and accessibility:	CAPI, mail, CATI, web
Response:	CAPI, CATI, mail, web
Measurement errors, attitudes:	web, mail, CATI, CAPI
Measurement errors, sensitive subjects:	web, mail, CATI, CAPI
Measurement errors, conceptual questions:	CAPI, CATI, web, mail
Measurement errors, facts:	CAPI, CATI, web, mail

Chart 2. Ranking modes according to various aspects, business data collection, from most to least appropriate

Costs:	web, mail, CATI, CAPI
Timeliness:	CATI, web, CAPI, mail
Coverage and accessibility:	mail, CATI, CAPI, web
Response:	CAPI, CATI, mail, web
Measurement errors, attitudes:	web, mail, CATI, CAPI
Measurement errors, sensitive subjects:	web, mail, CATI, CAPI
Measurement errors, conceptual questions:	CAPI, CATI, web, mail
Measurement errors, facts:	CAPI, CATI, web, mail

Selecting the mode, or possibly a combination of modes, always involves balancing available resources, required quality and kind of survey (subject, type of sample, the need for correction and processing, etc.). In general, the official Data Collection

Strategy for statistics production is first to investigate whether a register (of sufficient quality) is available. If not, the least expensive surveying variant is selected, unless it can be demonstrated that the quality of the observation would be unsatisfactory. The next least expensive option would then be considered, and so on. Further optimization can be achieved by using a mixed-mode strategy. See for this aspect the separate ‘Mixed-mode approach’ subtheme.

5. Literature

5.1 Recommended literature

There are entire bookshelves devoted to Data collection strategy and survey methodology. The field is moreover developing rapidly. The following therefore lists just a few recent books that have plenty of references to previously published important sources.

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Version history

Version	Date	Description	Authors	Reviewers
Dutch version: Benaderingsstrategieën / Algemene beschrijving en uni-mode designs				
1.0	07-01-2010	First Dutch version	Dirkjan Beukenhorst Frans Kerssemakers	Robert Göttgens Jean Ritzen
English version: Data collection strategy / General description and unimode designs				
1.0E	12-09-2012	First English version	Dirkjan Beukenhorst Frans Kerssemakers	