Re-engineering Dutch social surveys: From single-purpose surveys to an integrated design

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1. Introduction

The social surveys carried out by Statistics Netherlands have witnessed some fundamental changes over the last decades. The introduction of computer-assisted interviewing radically changed the design of most surveys. Besides, the role of social surveys within the system of social statistics have changed. Social surveys were designed in the past as single-purpose surveys. The majority of these surveys were stand alone surveys. All variables that were used in the analysis and output of the survey were collected in the survey itself. However, collecting data using surveys is often a very complex, costly and time-consuming process. The growing possibilities of registers and other administrative data sources and the drive for more quality and efficiency caused that the various social surveys were more and more integrated with other data sources. This led to a more integrated design of social surveys.

A little over ten years ago, Statistics Netherlands completed a first large-scale redesign of its household surveys (Statistics Netherlands 1998). One of its main features was the introduction of a continuous integrated survey on living conditions, which opened up a more efficient and effective use of computer-assisted interviewing, both Computer-Assisted Personal Interviewing (CAPI) and Computer-Assisted Telephone Interviewing (CATI). A similar mixed-mode design was later applied in the Labour Force Survey, which changed to a rotating panel design in 1999. After a first wave based on CAPI observations, the following four waves were all done by means of CATI.

In 2010 as part of a second large-scale re-engineering programme of Dutch household surveys, new major changes were implemented in the surveys. Traditionally, there are three modes of data collection for social surveys: face-to-face interviewing, telephone interviewing and postal surveys with written questionnaires. Nowadays, web surveys seem to be an attractive new mode to collect survey data, because they provide simple, cheap and fast access to a large group of people. Although there are still many pitfalls with web surveys,

statistical offices cannot ignore this mode of data collection, if they want to stay competitive and attractive to respondents and users. So, one of the key features of the latest Dutch household survey redesign is the introduction of a complete mixed-mode data collection supported by greater use of register data.

The next section outlines the driving forces and the objectives of the redesign project of the Dutch household surveys. Section 3 focuses on the approach that was chosen in the current redesign project. The results and experiences gathered so far are discussed in section 4, as well as the perspectives for the near future. The last section presents the conclusions.

2. Driving forces of the current redesign

Statistics Netherlands and its division of Social and Spatial Statistics are facing increasing quality demands by customers and stakeholders. Information is needed at more detailed levels and more and more crossings need to be made among different variables of interest. Also timeliness and coherence of statistics are important issues. This implies that Statistics Netherlands needs to react more flexible and faster to changes in user needs and to new user needs.

Next to these demands there is a strong incentive to collect data more efficiently and to reduce the costs of data collection. The old design of household surveys at Statistics Netherlands is not flexible enough and it also is too costly. Furthermore, within the old design it is very difficult to decide on a good trade-off between quality and costs.

In the past, continuously attempts have been made to improve the timeliness and to reduce the costs of household surveys, while at the same time maintaining a high level of data quality. Developments in information technology in the last decades of the previous century made it possible to use laptop computers for data collecting. The rapid development of the Internet has led to another new type of data collection: Computer-Assisted Web Interviewing (CAWI). A web survey (also sometimes called online survey) is usually a self-administered survey: respondents visit a website and complete the questionnaire by filling in a form online. Mixed-mode surveys combine several methods of data collection – face-to-face, paper-and-pencil, telephone and/or Internet – in one survey. Mixed-mode data collection offers more advantages than being cheaper than surveys with only field interviewers, who visit respondents at home. In the Netherlands social surveys are not mandatory. So, the introduction of mixed-mode data collection gives new possiblities to increase response rates as well as the representativeness of the sample by approaching respondents in different ways. For example, reaching respondents who are seldom at home by telephone or visiting people without a known telephone number. By mixing modes we can avoid the strong response and selection biases occurring in uni-mode surveys. In this way coverage and response problems are tackled at the same time.

Besides developments in information technology, there were also other driving forces that gave cause for reconsidering the present state of the household surveys. Since the last large-scale redesign of its household surveys, Statistics Netherlands had more register data at its disposal to produce statistics. This means that part of the primary data collection can be replaced by administrative sources, unless by current standards the quality or timeliness of the administrative data are still too low. Besides replacing variables in surveys by variables obtained from administrative sources, register data can also help in improving the efficiency of the survey process by supporting more efficient sampling schemes. Moreover, register data can also help in improving the quality of the output of household surveys by providing auxiliary variables for reweighting purposes. For this last purpose the timeliness demands on the administrative data are also less high.

One of the main reasons for the current redesign is efficiency. Currently, the budget available for face-to-face data collection at Statistics Netherlands is being gradually decreased by half. Consequently, a shift to cheaper modes of data collection and more extensive use of register data is inevitable. On the other side

comparability over time is a key aspect of the quality of survey data. To maintain uninterrupted time series, surveys conducted by national statistical institutes are often kept unchanged as long as possible. However, modifications in the survey process will almost always result in a break in time series. Even within the same data collection mode a change in a questionnaire, like changing the routing of the questions asked, may result in incomparable results. It is important to minimise the impact of a change in survey methods so as to minimise the inconvenience for users. In a setting where a redesign is likely to have impact on non-sampling errors, it is therefore important to have quality indicators that assist in the explanation of level shifts and make quality of statistics more explicit and visible. Maintaining quality and providing solutions for discontinuities for core variables is an important aspect of the current redesign project.

In addition to the objective to improve the cost-effectiveness of household surveys, user demands require adapting running surveys and adding new modules or questions in a flexible and easy manner. New data collection modes like the web offer possibilities to collect data quickly and in a cheap way and offer a first impression of a social phenomenon or issue. When a more in-depth analysis of these issues is required, more expensive and slower data collection modes can be used. Another issue is that the available resources should be geared to observe the core variables accurately, while less important variables can be observed using less resources. This also calls for more flexibility and a better balance between costs and data quality.

To react to these developments, Statistics Netherlands initiated a programme to redesign all household surveys (Van der Laan and Van Nunspeet 2009). The programme's main objectives relate to efficiency, quality and flexibility.

3. Redesign approach

3.1 Survey model

In the first phase of the redesign project a number of means were distinguished that could be used for the construction of a new design that better meets the objectives mentioned in section 2:

1. The use of registers and administrative data
    a. as a surrogate for data that are collected by surveys
    b. as auxiliary information for sampling, data collection strategies, processing and analysis.
    The main advantages of secondary data collection are costs and size. Drawbacks are a loss of independence and risks in timeliness of statistics.

2. The use of the cheaper data collection modes web and paper. These modes are cheap and to some extent respondent-friendly. Also response bias may be reduced in surveys that are sensitive for social desirable answers. However, response rates are low and interviewing of complete households becomes more difficult. Furthermore, these modes may lead to mode effects on other survey items.

3. Combinations of survey modules and themes. Some question modules or blocks may be included in more than one survey, thereby enhancing coherence, transparency and efficiency. Coherence is improved as more cross-relations can be made. Transparency is better as definitions are harmonized. Efficiency may be improved as the survey items for which accuracy demands are highest, i.e. employment and education, are spread over different surveys.

4. Re-use of respondents. Respondents can be randomly selected for a follow-up survey, possibly with the aid of screener questions. There are a number of obvious benefits and drawbacks in terms of costs and survey error.

5. The use of new estimation techniques, such as small area estimators and other model based estimation techniques that efficiently use available data. See Van den Brakel and Bethlehem (2008) for a discussion

concerning using model based estimation techniques rather than the usual design based estimation techniques for the production of official statistics. In the context of the current redesign, small area estimators were introduced to estimate monthly unemployment rates and to estimate unemployment rates for Dutch municipalities.

These means are combined in a data collection model consisting of two main elements:

1. a **core module** administered to the whole sample providing information on key output and background variables;
2. **topic modules** administered to parts of the sample providing information on variables for which sufficient precision to meet policy needs can be obtained from a smaller sample.

The core module comprises information on census-type variables and other key socio-demographic and labour market variables. Most of this information is already included in the core module of the Dutch Social Statistics Database, the overarching database on which all output of social, regional and spatial statistics is or will be based. The variables in the core module of the Social Statistics Database are derived from registers and cover the entire population. These variables include for example sex, age (date of birth), marital status (legal and *de facto*), place of usual residence, country of citizenship, country of birth (of the respondent and his or her parents), household (and family) size and composition, status in employment, branch of economic activity, earnings and location of place of work of employees, household income, tenure status of living quarters and degree of urbanisation. Data for core module variables that are not available from registers are collected by the core questionnaire, which is collected for all sampled units.

The core questionnaire was introduced in January 2009 and consists of the following variables:

- Household box (check on size and composition of the household of the respondent(s))
- Educational attainment (highest level of education completed)
- Labour market participation
- Branch of economic activity of self-employed persons and unpaid family workers
- Occupation in employment
- Religion (denomination or ideology)
- Voting behaviour as a proxy for social participation and for improved non-response adjustment
- Canvass for follow-up modules, to ask telephone numbers and e-mail addresses.

The Social Statistics Database variables are also available for non-respondents and are used to reweight the net sample or to make imputations for missing variables. The core module complies with the Eurostat proposals for a set of core social variables (Eurostat 2007).

The follow-up modules will collect detailed information on the various subjects covered by the existing surveys. However, currently used questionnaires cannot be translated just like that to follow-up module questionnaires. Because of the introduction of mixed mode, all follow-up modules have to be appropriate for all modes of data collection. For the CAWI and CATI modes it is not desirable to have questionnaires that last more than 20 minutes. Longer questionnaires put a higher cognitive burden on respondents and interviewers, resulting in loss of data quality. For the CAPI mode longer interview durations are acceptable, as the interviewer is physically present at the home of the respondent and has more control over the circumstances of the interview. Also, because of travelling time it is desirable to have longer interviews in the CAPI mode, as the time of interviewers is used more efficiently. In practice, because the most important household surveys were carried out by CAPI, this implied that questionnaires had to be shortened or split up to be made appropriate for mixed-mode data collection.

3.2 Modes

In the last few years, a lot of effort has been done at Statistics Netherlands to investigate the possibilities of introducing web and mixed-mode data collection strategies for household surveys (Janssen 2006 and 2010). Mixed mode has several advantages. De Leeuw (2005) describes it as an opportunity to compensate for the weakness of each individual mode at *affordable* cost. It can provide more choice and flexibility for respondents, while improving timeliness and minimising non-response and non-response bias. Furthermore it provides the means for operational efficiency savings. In mixed-mode surveys often a sequential approach is taken. First, the cheapest mode of data collection is applied: web interviewing and postal (paper and pencil) surveys. Non-respondents are re-approached with the next cheapest mode of data collection: telephone interviewing. Finally, for remaining non-respondents, the most expensive mode of data collection is used: face-to-face interviewing.

A well-known but not well-defined problem with mixed-mode data collection is caused by so-called 'mode effects'. The same survey can have different outcomes depending on the mode of administration. These differences can all be ascribed to 'mode effects'. However, these different outcomes can have quite differing causes. A survey mode can influence the character and magnitude of coverage errors, of non-response errors and of measurement errors. These errors together cause the differences. It is important to try to disentangle these effects and quantify mode effects in the narrow sense of measurement errors which are related to the survey mode. Measurement errors are observation errors (as opposed to non-observation errors like under-coverage errors and non-response errors) and related to the questionnaire used in the survey. 'Mode effects' thus increase or decrease the bias in a survey.

From a literature review (Ariel et al. 2008) on mixed-mode studies, it can be deducted that the presence of an interviewer plays an essential role. The interviewer can assist in explaining the questions, triggers on the other hand sometimes social desirable response behaviour, but can also motivate the respondent, so minimising 'satisficing' (response behaviour that results from not performing the phases of the question-answer process carefully and comprehensively). Significant mode effects are frequently reported in the literature and these are strongest between modes with and without an interviewer. However, the magnitude of mode effects is rarely reported and different studies on the same subject, for example reported alcohol consumption, do not always have the same effect. Important to note is that mode effects do not occur with all variables or all kinds of questions in the same manner. However, mode effects do exist and should be taken seriously. This leads to the conclusion that by introducing in a mixed-mode design an Internet or postal version, the risk of mode effects will probably increase. On the other hand, the present literature does not suggest that mixing modes will cause such mode effects that a mixed-mode design should be discouraged. On the contrary, in general there seems to be no right mode for a particular survey. Some variables are for example better measured using CAPI, some of them are better measured using CAWI. An important question is whether to use one set of questions for different modes ('uni-mode design') or a dedicated set of questions per mode ('universal design'). A 'universal design' has important consequences for the collection and processing of data, because the set of questions can change from mode to mode in order to keep the question cognitively equivalent. At the moment a uni-mode design is preferred, unless for a few situations where mode-specific questions are used.

3.3 Experimental research

As yet Statistics Netherlands has carried out some field experiments in mixed-mode designs. These concerned the European ICT Survey in 2005 (Janssen 2006), a pilot survey on the Informal Economy (especially on 'undeclared work') in 2006 and the Crime and Victimisation Survey in 2006 and 2007. These field experiments were aimed in the first place at investigating the feasibility of mixed-mode designs and optimising these designs in order to get a high response at low costs. They were not intended to study systematically mode effects separately from selection and response effects.

The past years Statistics Netherlands also carried out a series of experiments embedded in the Labour Force Survey which were aimed at quantifying the effect of alternative questionnaires, modes of data collection and approach strategies on the estimates of the employed and unemployed labour force (Van den Brakel 2008).

In 2008, an experiment was conducted to evaluate the willingness of respondents to participate in follow-up modules. In this experiment, respondents to the Health Interview Survey were asked for permission to be re-approached for another questionnaire and to provide a telephone number or e-mail address and in which mode they preferred to be approached for the follow-up module. Respondents were re-approached by e-mail with a web questionnaire, if they had provided an e-mail address and by CATI if only a telephone number was available. Non-respondents to the follow-up module web questionnaire were also re-approached by CATI after a while. For the follow-up module the Crime and Victimisation Survey questionnaire was used. The main conclusions from this experiment were:

- The time between the first (Health Interview Survey) interview and the follow-up module has no influence on achieved response rates of the follow-up module. This time period varied from two to six months.
- Given preferences for modes had no influence on response rates.
- Half of the group approached by e-mail also received a letter by mail. This group responded much better on the web questionnaire, but after the telephonic round for non-respondents there was no significant difference in overall response rates for both groups. Since CAWI is much cheaper than CATI, the strategy including a letter is much cheaper than the strategy only using e-mail to invite respondents to participate.

In 2009, another experiment was conducted in which the ascription of differential strategies to different groups in the sample was aided by so-called representativeness indicators, or R-indicators, see Luiten and Wetzels (2010). These R-indicators are defined in Schouten (2008) and Schouten et al. (2009). Aim of the pilot was to augment representativeness of sample realisation, against minimally equal, but ideally less, costs and with minimally equal, but ideally higher, response rates. A mixed-mode design was chosen, in which a mail and/or web first round was followed by a CATI follow-up of non respondents. Fieldwork strategy of the pilot was determined before commencement of fieldwork for three different groups:

- households with a high chance of co-operation received an invitation for the web survey.
- households with a medium chance of co-operation received an invitation for the web survey and a paper questionnaire. Either could be filled in.
- households with a low chance of co-operation received only a paper questionnaire.

All households received one reminder. The reminder mentioned that an interviewer would call, if the questionnaire was not received within shortly. The non response was followed up by cati in which the number of contact attempts and cooperation were stimulated or dampened.

From this experiment we concluded that the differential fieldwork strategy was successful in maintaining the level of response, while significantly augmenting representativeness and at the same time substantially reducing costs. The R-indicators showed that representativeness was especially augmented as a result of better representative eligible- and contacted cases in the pilot. The shaping of cooperation had less impact.

Based on all experimental and regular mixed-mode surveys conducted so far, our experience is that in the first stage of a sequential approach strategy, the CAWI mode (sometimes including a PAPI mode for those respondents who prefer to fill in a written questionnaire), Statistics Netherlands has achieved 25-40 per cent response, depending on the type of survey. Re-approaching the non-respondents with a CATI mode yields another 25-30 per cent response. Finally, the CAPI mode for the remaining non-respondents (without known telephone number) can add 10-15 per cent additional response. However, these percentages do not seem stable

and will most likely change in future under the influence of the still growing access of respondents to internet and Statistics Netherlands' preferred approach strategy for household surveys.

3.4 Maintaining output quality

One of the prerequisites of the redesign project is that the quality of the survey data should remain constant. It is well known that adjustments in the survey process can affect survey characteristics such as response bias and therefore have a systematic effect on the parameter estimates of a sample survey. When an ongoing survey is changed, it is not clear whether a change in the series is a result of a real development or is induced by the redesign. So, we need to be able to measure changes. This can be done in three different ways (Van den Brakel, Smith and Compton 2008):

1. By performing experiments to compare design variants under consideration with the current design, before implementing a new design
2. By running old and new designs concurrently for a period of time (parallel runs)
3. By applying an intervention analysis by time series modelling.

Experiments use a specific, randomized design to test hypotheses. These designs are not necessarily equal to the survey design eventually used, as specific groups may be overrepresented or only a small part of a new design is tested. In a concurrent design, a specific new design that may have been selected based on the result of experiments as the best alternative is compared to the old design to be able to measure discontinuities directly. This provides a natural but costly way to evaluate the effect of the change in design. This allows us to estimate the main survey parameters under both survey designs and to test whether these estimates are significantly different. It also provides a safe method of transition, since the new approach is conducted with a full-scale sample before its formal acceptance and implementation. Time series models are appropriate to join series together, particularly if there are sufficient observations available under the new design (see for instance Van den Brakel and Roels, 2008). This approach is also a second best option to quantify discontinuities if a parallel run cannot be conducted, for example because of budget constraints. Timeliness is the main drawback of this approach, since the effect of the redesign is estimated more accurately as more data on the new design become available.

Next to being able to measure discontinuities, it is also desirable to be able to find explanations for changes in time series. In order to monitor the survey data quality, Statistics Netherlands has developed a set of indicators to monitor the effects of subsequent modifications in the survey process on the quality of the data produced. These indicators (see Schouten 2008) are proxies for changes in relevance, accuracy, timeliness, accessibility, comparability and coherence of survey data, following the quality dimensions introduced by Eurostat (2003).

Using these indicators from the quality framework, quality measurements are performed before and after redesign steps. Changes in indicator values provide information on the causes of changes in target core variables. Measurements for some indicators may require experiments or information from registers to provide a benchmark.

4. Results and further perspectives

The survey model described in section 3 is introduced in several steps, based on efficiency requirements, time needed for adjustments in survey designs and questionnaire designs, and information from additional research and experiments. In this section, the main results and future plans of the redesign project will be discussed.

In January 2009 the first results of the redesign project were implemented:

- The core questionnaire was introduced in the Health Interview Survey, a continuous CAPI survey. This provides information on the new survey model, the experiences of interviewers with the new core questionnaire and of the possibilities of using voting behaviour for reweighting and the labour market questions for estimating monthly unemployment figures.

- The sample design of the Labour Force Survey was adjusted by adding an oversampling of registered job seekers. This oversampling reduced the variance of the estimates of the unemployed labour force with 15-20 per cent. This meant that the gross sample of the Labour Force Survey could be reduced by 15 per cent without reducing the quality of the results.

- The first quality measurements of the Labour Force Survey and the Health Interview Survey were made to provide information on the situation before implementing the redesign steps.

In January 2010 the main results of the redesign project were implemented. These include:

- The Health Interview Survey was redesigned into a full mixed-mode survey. The current Health Interview Survey questionnaire was therefore split up in two topic modules, one handling questions on health and living conditions, the other mainly handling questions on social participation and volunteer work. These topic modules are administered after a new mixed-mode version of the core questionnaire. In CAWI and CATI the Health module follows directly after the core questionnaire which results in an interview of about 20 minutes. The second topic module follows after two to three months in the same mode as the first interview. In CAPI, the two topic modules follow directly after the core questionnaire, as in CAPI longer interview durations are permitted. Also, in the standard mixed-mode strategy the CAPI mode is mainly used to reach hard-to-reach or unwilling respondents. Splitting up the follow-up module would introduce the possibility of attrition of these important respondents.

- The core questionnaire was also introduced in the first wave of the Labour Force Survey. Also, the first wave of the Labour Force Survey was no longer only administered face-to-face but also by telephone. Sample units with a known telephone number were selected for CATI, all other respondents were selected for CAPI. The core questionnaire and the questionnaire for the first wave of the Labour Force Survey were combined into one interview. To prevent average interview durations from being larger than 20 minutes, some questions were moved from the first wave questionnaire to the second and third wave questionnaires.

- In 2010 new quality measurements for the Labour Force Survey and the Health Interview Survey were made.

- Also, in 2010 all model-based estimation procedures for monthly unemployment data and for small area unemployment data were fully implemented.

The results of the first evaluations on the new design of the Health Interview Survey indicate that response rates are slightly higher than in the old CAPI design. Also the representativeness of the data collected is better in the new design, which is confirmed by computing R-indicators. In the new design, about half of the respondents respond by CAWI, about one third respond by CATI and one sixth by CAPI. By comparing the output based on the new design with the output based on the parallel run for the Health Interview Survey, the effects of the introduction of the full mixed-mode design on the output were evaluated. The results of this analysis indicate that there are no discontinuities for the core variables of the Health Interview Survey.

Ideally we would have liked to introduce a CAWI mode for the first wave of the core variables of the Labour Force Survey as well in 2010, but introducing a web questionnaire for the Labour Force Survey requires for a number of issues to be solved. For instance, while only one person is interviewed in the Health Interview Survey, the Labour Force Survey is a household survey in which all household members (older than 15 years of age) are to be interviewed. Interviewing large households with a web questionnaire or even by CATI raises a

number of practical issues: the interview should not get too lengthy and (in CAWI) it is difficult to ensure that every household member fills out the questionnaire, which will result in partial non-response. Also, the Dutch Labour Force Survey uses modules for automatic coding of educational attainment, branch of economic activity and occupation during the interview. These modules are complex and have to be operated by interviewers who have been trained to do so. Respondents cannot be expected to classify themselves without the help of a trained and experienced interviewer. So, these modules need to be simplified and adjusted to be available for self-administered questionnaires, which is not a trivial task and which will result in less detailed information.

The introduction of CATI in the first wave of the Labour Force Survey provided useful information on interviewing households by others modes than CAPI. Main conclusions so far are that attention should be paid to interview durations of households consisting of more than three persons of 15 years and older. In addition, households with a known mobile phone number turned out to be hard to reach when approached by CATI, mainly because of a relatively high number of invalid or otherwise unusable phone numbers. Therefore, households with a known mobile phone number are now being approached by CAPI.

Before introducing the CAWI mode into the Labour Force Survey design, in 2011 a pilot is conducted to be able to answer two important design questions concerning interviewing households through the internet:

1. Which response rates are to be expected when using the CAWI-CATI/CAPI mixed-mode strategy for the Labour Force Survey? Are there specific groups that do not participate well via the internet? Groups of special interest are large households and ethnic minorities.

2. Does the introduction of the CAWI mode result in higher level of partial responses?

Based on the results of the design evaluation, households consisting of more than three persons of 15 years and older and households with a known mobile phone number are selected for face-to-face interviewing. Three months after the first wave of the pilot a second wave is conducted to evaluate attrition rates. All households willing to participate in the second wave receive an advance letter, asking them to fill out the questionnaire for the second wave on the internet. In the second wave a split half design is used. In one group a reminder is sent to households that do not respond within a week, asking them again to complete the questionnaire on the internet. The other group does not receive such an advance letter. The aim of this is to evaluate the positive and negative effects of sending a reminder. It may boost response rates, but there is also a case for the assumption that respondents get irritated and decide not to participate. Both groups are approached by CATI a few days after the first group received the reminder. From the first wave a telephone number is known for almost the entire sample.

The results from the design evaluation, the pilot on the Labour Force Survey, experimental and regular mixed-mode surveys conducted so far and the quality measurements on the Health Interview Survey provide information on which groups are eligible for a differentiated mixed-mode strategy. For instance, for some groups of respondents the CAWI- or CATI-step in the standard mixed-mode design might better be skipped in a differentiated mixed-mode design for practical or quality reasons.

5. Conclusions

The main conclusion of this paper is that moving away from single-purpose social surveys and introducing topical modules in an integrated design of household surveys combined with optimal use of administrative data can make social statistics richer, more cost-effective and more useful as a tool to answer policy needs and can help closing the gap between social statistics and social science.

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