# Using CAWI in Household Surveys – Findings from Official German Statistics[1]

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## 1. Introduction[2]

In view of the steadily-rising Internet use by private households and enterprises in recent years, empirical social and market research has discovered a new survey tool, namely Computer-Assisted Web Interviewing (CAWI). CAWI methods vary from genuine online surveys to online collection of data from respondents' recruited offline. To date, only official economic statistics have benefited from this development. Interviewing in official social statistics is still based either on Paper and Pencil-Assisted Interviewing (PAPI) or on Computer-Assisted Personal and Telephone Interviewing (CAPI/CATI). Hence, the German Federal Statistical Office and twelve out of 16 Land Offices decided jointly to extend the German Household Budget Survey ('Laufende Wirtschaftsrechnungen' or LWR in German) to include a feasibility study on CAWI for respondents recruited offline. The main focus of the feasibility study, referred to as 'Online LWR 2004', is to measure the acceptance of CAWI, as well as socio-economic characteristics and data quality of respondents interested in CAWI. The purpose of this paper is to discuss and summarise the initial findings of 'Online LWR 2004'.

The remainder of the paper is organized as follows: A short overview concerning the purpose and survey organisation of LWR is outlined in section 2. The objective and implementation of the feasibility study are explained in section 3. Section 4 describes the initial empirical results. The final section concludes and highlights the main findings (section 5). The presentation at the conference will include socio-economic characteristics and data quality of respondents interested in CAWI too.

## 2. Overview of the 'LWR' German Household Budget Survey

The LWR provide yearly cross-sectional information on private households' income and expenditure structures. Socio-demographic characteristics and household equipment with consumer durables will also be collected. The framework of the survey is private households. Since collection of data on households of self-employed persons and households with a disposable net income of Euro 18,000 and more is excluded by law, such households are excluded. The survey based on approximately 6,000 households. Data are collected in written form (PAPI: paper and pencil personal interviewing). The respondent in each household is the head of household. Each respondent is supposed to fill out two questionnaires:

- Questionnaire 'General statements' (Allgemeine Angaben) containing highly standardised questions on households' socio-demographic and socio-economic structures. Households receive the questionnaire at the beginning of each year.

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[2] The authors would like to thank Dr. Wolfgang Bandilla, Zentrum für Umfragen, Methoden und Analysen, Mannheim for their valuable comments concerning the actual state of the Online Research as well as Neil Mussett for the accurate proof-reading.

- Questionnaire 'Book of household accounts' (Haushaltsbuch) covering a time slot of three months. During this period, the household has to provide standardised information on monthly sources of income, monthly expenditure on housing and non-standardised information on daily expenditure items such as food, clothes and items of everyday use.

The LWR survey is based on a local data collection process. Hence, each Land Statistical Office takes full, independent responsibility for carrying out fieldwork and data entry. After data entry and data verification, all data will be sent to the German Federal Statistical Office, which will produce a national LWR data set. Hence, the collection of the online questionnaire data is also a local procedure.

We use BLAISE for Windows (B4W) in the German Household Budget Survey (LWR). This is a highly complex method, as it can be used for nine different functions. All these functions can be launched within the BLAISE application. Most of them are based on one of the nearly 60 "Manipula" programs written for this survey.

1. Storage of addresses and other information on households
2. Sampling procedure
3. Management of field work
4. Data entry and verification of data
5. Development, implementation and maintenance of a classification of products (based on Classification of Individual Consumption by Purpose – COICOP)
6. Data processing (computing of differences between income and expenditure, summarising)
7. Categorisation of households of results
8. Export of data to start computing weights
9. Import of weights and export

The basic BLAISE application has been equipped with additional features to import address information from other surveys, verify address data for double records, and define a special export format for generating bulk letters, and so on.

The households participating in LWR are selected as a quota sample. Before drawing the sample, the households will be sorted into 35 stages, constructed on the combination of the quota information. To realize the sampling procedure, the BLAISE application has been enlarged. The sampling procedure is realized as a sequential step-by-step method.

Management of fieldwork is a complex process. Addresses have to be corrected, letters and questionnaires have to be sent, responses and other feedback from the households have to be noted, and reports about fieldwork have to be produced at any time. For this purpose we have developed a central file, known as the "Household File", containing all relevant information.

Data entry and verification are the central features of the BLAISE application. Two types of data are collected: classified data of the questionnaire "General Statements" and income and expenditure data of the questionnaire "Book of household accounts'. Until this year (2004), the latter information was collected four months every year – one month each quarter. Beginning with a new concept for this survey in 2005, we will gather data in the future for one whole quarter from each household. This part of the survey is highly complex because households are

requested to give the information for each member of the household and for every day of the month in detail: costs for housing, travel, price and amount of goods and services and so on.

To verify the data, both parts of the survey have to be integrated – for every household, for every quarter and for the whole year. Verification means that household structure in every month must match either the status at the beginning of the year or the changes documented by the household itself. Verification also means that, for instance, the economic status of a person (or household) must fit the earnings type. Furthermore, the incidence of selected expenditure items is to be checked in relation to households' status – such as if rent is reported by all tenants. In fact, every record contains more than 7,000 fields.

The households report their daily expenditure items in plain text. To process the data, this plain text has to be classified. The list of products can be shown in alphabetical order or as a hierarchically structured list, including a "trigram coding" option. For coding, the BLAISE user will use a short description to find the product, but there is also a long description to differentiate between similar products.

Since 2002, income and expenditure items have been added up to form a monthly household budget (net result). Selected groups of products are totalled. Households have to be classified with respect to socio-economic variables. At the end of data entry, verified data have to be exported to start the weighting procedure. Data sets from all German Länder have to match before weighting. Subsequently, the weights will be imported into the original data set at Land level to publish the result. All these features are realized by a set of "Manipula" programs.

## 3. The Online LWR survey

In the discussion and planning of an online survey it turns out that the 'General statement' due to the length and structure of questions is suited as online survey. Given that the 2004 Online LWR constitutes the first attempt to introduce online questionnaires in German official social statistics, there is no precedent to help in designing a user-friendly online questionnaire to collect highly-complex data on the socio-demographic and socio-economic composition of households. It was impossible to use examples from market research because such online questionnaires mainly collect simple information on leisure or consumption conduct, and do not involve data checking procedures. Beyond this, LWR data are collected in written form and as such experiences of interviewer about LWR respondents were not available.

### 3.1 The Online questionnaire

For these reasons as described above, we have copied the widely-used graphic design of online questionnaires of German official business statistics. As the screenshot 1 illustrates design was based on several index cards.

Screenshot 1: Start index of the online form Online LWR 2004
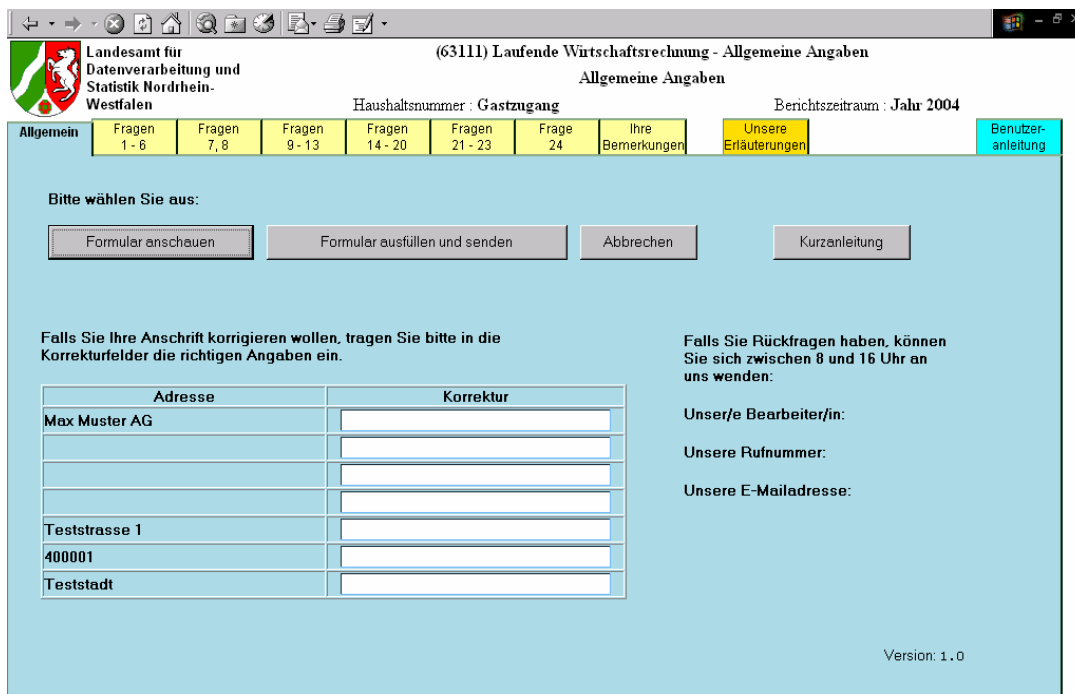


Each index presents a group of questions, accompanied by buttons providing necessary background information, in order to understand the whole intention of the question in case of doubt. Since each index card includes a headline, the principle pursued in completing the online questionnaire should be easily understood, and indeed should be self-explanatory. Once the selection procedure has been carried out, the first index of the online form is displayed. Here, the respondents find the relevant contact address and phone numbers of the Statistical Office. On the same index, they will find their own contact data, which they may amend.

Moreover, respondents can choose between viewing (left button 'Formular anschauen') and answering the questions (biggest button 'Formular ausfüllen und senden'). If they decided to view only, they can browse through the whole questionnaire filling in the fields, but at the end hey can't transmit the data. This read-only option is useful to look for information about the survey and to decide whether any documents or other items are needed to answer the questions correctly. It naturally reduces the risk of transmitting an empty online data set but does not avoid it completely. The solution found was to examine at least formal data verification concerning all answer fields (completed/left empty) before starting the transmission process, and to install a 'View online questionnaire' button excluding the 'Transmit data' index card. The problem remains as to how to handle an instance in which a household has transmitted more than one online data set. Given the relative lack of knowledge regarding respondent conduct in online surveys, we resolved this question pragmatically, and only registered the count of returns per household, merely considering the first transmission. Further transmissions per household have been stored in a separate file ("cloned file"). The identification numbers of

households sending twice or more often have been listed in a schedule. The BLAISE user who is checking for double records could decide to change the records.

If respondents wish to fill in the questionnaire and send the data, they must select the answering mode (biggest button). After choosing the answering mode, respondents are forced to fill in all fields of one page/ index before it is possible to proceed to the next page/ index. That means that no question can be skipped (see screenshot 2). This mode – used for most questions – makes it obligatory to complete every field on the page.

Screenshot 2: Start index of online questionnaire 'General statements'



This is a somewhat inconvenient mode since respondents will be drawn back to the page they are leaving. But the greatest challenge was to introduce a data verification procedure during the filling out process without constraining or indeed hampering any individual filling out method or, what would have been even worse, producing unintended data or leading to problems in understanding should the respondent have difficulty understanding the question. Moreover, any additional restriction or verification method risks demotivating respondents due to the shifting of mainly financial resources from the statistical office to the respondent. However, if we introduced an extensive data-verification process during the filling out process, we could not be confident that we would not be creating a new problem by solving an old one: The technical opportunities offered by online questionnaires obviously often run counter to the needs of respondents. For that reason, we did without verifying the content of the data except for two questions (one exception is illustrated above and means that the birth year 1850 should be transformed at least in the birth year 1900 as minimum).

The second verifying process is not illustrated; it was used for the question about household equipment. Here, respondents had to provide information as to whether some selected goods are used by the households. This answer could be passed if at least one product had been named.

However, the main focus lies on measuring the acceptance of online questionnaires as such. Thus, we decided to analyse the quality of the data provided by 'online households' and 'offline households' once they had been received, in order to obtain representative empirical results as possible on this field.

If the respondents had answered all questions, data transmission could start (screenshot 3).

Screenshot 3: Last index of the online form Online LWR 2004



However, before it was possible to commence transmission, a data check had to be carried out. This check verified the formal correctness of selected data, e.g. if the field for the year of birth contained only numerical information. If problems were detected, the respondent was routed back to the index, a textbox was displayed and the field with the error marked with a red line. The cursor was automatically placed in this field. If there was more than one field to correct, the cursor passed these fields step by step. After amending the data, the respondent could proceed directly to the end of the questionnaire and repeat the check. The data had to be corrected prior to transmission. The reminders could not be ignored.

If the respondent was unable to fill in the questionnaire at once (or if he did not wish to do so), he could use a temporary storage option offered on the next to last index. Of course, this option was not associated with a check for plausibility of the data. At a later dates, when the respondent next logged in, the stored data could be reloaded and be accepted or changed. If he/she decided to transmit the data, it was necessary to go to the last index of the questionnaire to check and transmit the data. Once the data had been transmitted, a receipt for the data was sent to the respondent to store on his/her own computer.

## 3.2 The online data collecting process

When the households received the participation form via "snail mail", they were also informed about an Internet link where they could take a first look at the online questionnaire. At the next step the households received the individual password information (password and USER ID) via "snail mail".

The conditions which households must meet in order to take part in the online survey are very simple: They need access to the Internet, browser software and Acrobat Reader to display comments on the questionnaire and helpful information. The "Statistik online" application runs on any system (MS Windows, Mac and so on). The browser needs the following configuration: It has to be enabled to run JavaScript and authorizing by password. Scripting is used to check if the questionnaire has been filled in correctly.

As shown in the description above, the households had to subscribe to use the whole sending option of the web application. If they did not do so, they could view the questionnaire but were unable to transmit their data. The first step in completing the questionnaire was to log on to the application. Then respondents had to choose the statistics and the year for which they wished to provide information. This general feature of the application was offered although it was only possible to select one set of household statistics and to dispatch the first year's data. However, this selection procedure is a part of the application which cannot be disabled.[3]

Data entry and the transmission procedure can be launched more than once. Respondents can therefore correct their own data as to whether relevant changes have taken place. The data incoming for the second or last time have been stored in a different file. This means that whenever a respondent sent data twice or more, the Statistical Office has two records: the first and the last. Fortunately, it emerges that only few households have sent several returns. The alternative, namely to delete the password after one return, seems overly restrictive within the scope of a feasibility study.

To secure the connection between the respondent's personal computer and the server, data were sent with 128-Bit encoding and via HTTPS. Some firewalls were installed to protect the web application. The incoming data were immediately forwarded into the protected area of internal data handling.

## 4. Overview of planned analyses and initial empirical results

Since the data collection process is local, the recruitment and application processes are local too. The scope and forms of recruitment and application often depend on specific local financial resources and organisational structures. In one Land Office, some households were excluded from recruitment due to the age of the respondents because it could be assumed that they do not have Internet access at home. In another Land Office, the password and User ID were given together with the participation form at the beginning of recruitment. Surprisingly, the response rate in this Land Office was above average, and certainly higher than in other Offices. The date on which password information is sent obviously has a major impact on the response rate.

The first purpose of the feasibility study was to obtain empirical information on the acceptance of online questionnaires. We currently have initial information on the response rate and

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3 It is required in business statistics because the same respondent (firm) may be obliged to provide information for different years, quarters or sets of statistics.

experience of the technical application. The 12 Land Offices has to recruit 5,000 households of the LWR survey. Out of 5,000 households, 1,028 were interested in the Online LWR 2004 feasibility study (18 percent). Given these response rate results, it was possible to conclude that only one household in five was interested in the online survey. On the one hand, we have to wait for the verified complete data sets of 'General information', containing information on households' Internet access because not all the 5,000 households may have Internet access. However, we already know from other, weighted databases that almost one household in two had Internet access at home in 2003. Comparing these two rates, we can therefore conclude that some households with Internet access decided against the online questionnaire in favour of completing a paper questionnaire and dispatching it via the traditional mail. However, the real response rate in the group of households interested in completing the questionnaire online (1,028) was after all over 80 percent (882 online respondents). When a recruited 'Online-household' did not complete the online questionnaire, the household received a paper version of 'General statements' (as the other 'Offline –Households') via snail-mail.

The second purpose of the feasibility study was to gain insights into the differences in data quality between CAWI and PAPI respondents. "High quality data" means that no additional effort is required to correct or clear the data. To measure this effort, we used the remarks option in BLAISE. Any time a record had to be corrected or completed, the BLAISE user should take note of why this work has been carried out and what effort this involved. The BLAISE user had to differentiate between 'completed/corrected without additional contact with the respondent' and 'completed/corrected after contact with the household'. Such empirical results will be represented at the conference.

The third purpose of the feasibility study was to get information on technical and organisational improvements. Since we could not observe respondents during the answering process, we naturally added an evaluation questionnaire on the 'Book of household accounts' paper questionnaire. The questionnaire contains 17 positive or negative statements on the graphic design as whole, on the principle of index cards, on the technical access conditions, filling out and sending procedures. For each statement, the household could choose between answers (1) applicable, (2) not applicable and (3) no answer. The third answer code could include the household refusing to give its opinion, as well as instances in which a household did not need or did not use the module (such as the possibility to save the given answer on the server). We have received completed evaluation questionnaires from 728 households, in which 687 questionnaires contain valid statements (codes 1 or 2) in the majority of fields.

In general, the quantitative analyses of the evaluation questionnaire obtained consistently positive results on graphic design and completion method. More than half of private households gave solely positive answers in all 17 statements. Less than 10 households out of the 687 households reacted solely negatively to the online survey. The majority of households (96 percent) would answer the online questionnaire again. A minority of households reported technical problems as to access or to the transmission process.

Below, we present six of the 17 statements of the evaluation questionnaire illustrating the main experiences of respondents with regard to the technical application of the online survey.
    A) I did not need to install additional software to view the online questionnaire.
    B) I was able to view the questionnaire without any (technical) problems.

C) I like the index cards in terms of clearness. They make navigation within the online questionnaire easier.
D) The intermediate storage worked well.
E) I was always able to get hold of a contact person on the telephone hotline.
F) I would fill out the online questionnaire again.

The bar - diagram shows that about 95 percent of online respondents did not need any additional software (see bar A).

Bar – Diagram: Statements of the evaluation questionnaire

## Six of 17 central statements of the evaluation questionnaire (n=687 households, unweighted)
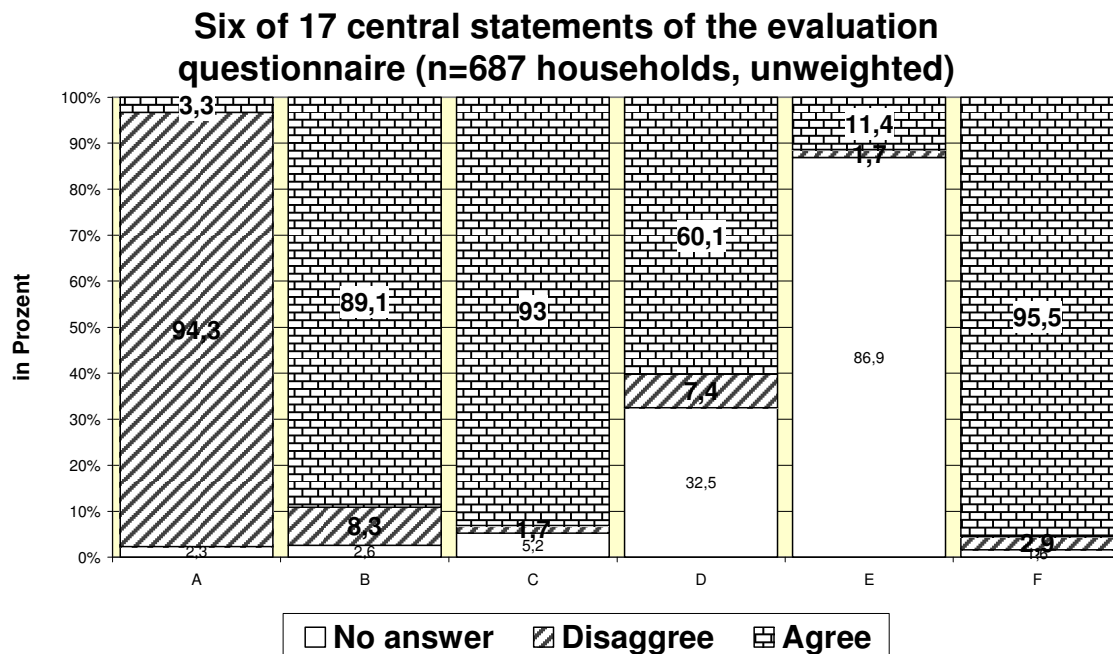


The majority of households (89 percent) were able to view the questionnaire without any technical problems (see bar B). Only 8 percent did not agree with the statement. The principle of index cards in online questionnaires worked well in household surveys, too: About 93 percent were able to complete the filling out process in this way (bar C). Over thirty percent of households obviously did not use the possibility of intermediate storage, as they neither agreed nor disagreed with the statement. However, 60 percent of online respondents agreed that intermediate storage worked well (bar D). Surprisingly, the rate of online respondents with no valid information on the statement about using contact persons is very high, at 86 percent (bar E). We expected more households to look for help and advice. However, the most important result is represented by the high rate of online respondents who would be willing to take part in the online survey again (bar F). On the basis of these empirical results, it is possible to conclude that the integration of an online survey part in the Household budget survey was successful.

The fourth purpose of the feasibility study was to analyse the socio economic characteristics of online and offline respondents. The recent empirical results will be represented at the conference.

## 5. Conclusions

From the technical perspective of using CAWI, the question of data checking procedures remains. In comparison with alternative collection methods such as CAPI (Computer Assisted Personal Interviewing), CATI (Computer Assisted Telephone Interviewing) or the classic PAPI method (Paper and Pencil Assisted Personal Interviewing), the major drawback of CAWI is that the first step of data entry is not accompanied by a data checking procedure. On the other hand, a final conclusion cannot be made until the data quality of the online respondents is analysed.

Furthermore, we concluded from remarks made on the evaluation questionnaires that some households used Internet access in public institutions, such as a city library, or on their PCs at work in order to answer the online questionnaire. From the individual remarks made on the evaluation questionnaires, we also learned of a few technical problems which we did not ask about on the evaluation questionnaire. For example, some households were unable to print out the receipt document containing the data that had been transmitted. A few online respondents would have liked to receive confirmation after sending the online questionnaire. It may be that the implementation of such a possibility will further reduce the rate of households sending data more than once.

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