



**Economic and Social
Council**

Distr.
GENERAL

CES/2005/16
4 April 2005

Original: ENGLISH

STATISTICAL COMMISSION and ECONOMIC COMMISSION FOR EUROPE

CONFERENCE OF EUROPEAN STATISTICIANS

Fifty-third plenary session
(Geneva, 13-15 June 2005)

**THE DUTCH ANNUAL BUSINESS INQUIRY: DEVELOPING AND TESTING
THE ELECTRONIC FORM**

Invited paper submitted by Statistics Netherlands*

SUMMARY

The first step in the development of the electronic form for the Dutch Annual Business Inquiry was a small usability test. In this test, functional issues of the form were investigated, using a draft version that looked very much like the original paper form. This test also resulted in the identification of navigational issues, edit rules and visual design issues that make an e-form different from a paper form. The result of this test was a prototype of the e-form. This paper discusses research issues and set-up of the test, results and recommendations. An important research issue was whether the electronic form should resemble the paper form.

Keywords: business survey, internet questionnaire, visual design, usability testing

INTRODUCTION

1. A major issue in Dutch governmental policy as to data reporting in general is reduction of response burden. As a consequence, Statistics Netherlands strives for reduction of data reporting for individual businesses, as well as making data reporting as efficient and easy as possible. One way to do that is providing electronic questionnaires via the internet (Haraldsen, 2004).

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2. In 2004, the paper for the Dutch Annual Business Inquiry was redesigned. First of all, the form was stripped to items necessary with regard to output demands. Secondly, the form was redesigned with regard to the structure (sections of items), instructions and wording. And thirdly, the visual design of the form was restyled. This opened the way to developing an electronic version of this complex questionnaire.

3. This form will be developed in a number of steps and tested. Functional issues of the form were investigated in a small usability test, using a draft version very similar to the original paper form. This test also resulted in the identification of navigational issues, edit rules and visual design issues that make an e-form different from a paper form. The result of this test was a prototype of the e-form. In a second step, the prototype will be discussed with regard to programming issues, since for various branches of establishments the form has to be generated automatically. The next step will be a large-scale pilot in which the usability and data collection process of the e-form will be tested.

4. This paper focuses on the small usability test. The set-up of this study will be presented in the section under “Testing the electronic form”, followed by a section in which the results are described. Recommendations are then discussed, and the conclusions are presented in the last section of this paper. But we will start in the following section with a short description of the Dutch Annual Business Inquiry and its redesign.

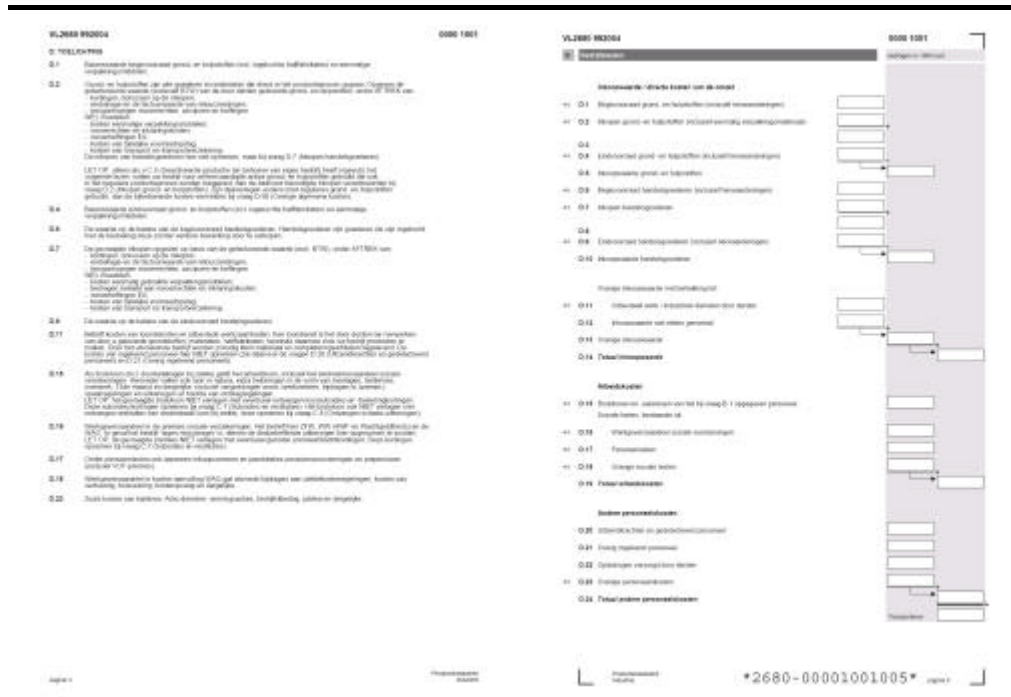
THE DUTCH ANNUAL BUSINESS INQUIRY

5. In the Dutch Annual Business Inquiry, businesses are requested to provide information on benefits and losses. In 2005, a sample of about 70.000 businesses was drawn for the 2004 Inquiry. These businesses received a paper form including an advance letter, saying that –among other things– this inquiry is mandatory. About 45% of the sample is self-selecting, meaning that they receive the questionnaire every year. This concerns the larger establishments with 50 and more employees.

6. The longest questionnaire for large establishments consists of up to 40 pages. A questionnaire may be seen as a booklet of A4 pages with the items on the right page and the instructions and explanations on the left page (see Figure 1). The items are grouped into sections, which may be more than 4 pages long. Sections concern issues like employees, benefits, costs, and business results. The questionnaire is characterized by voluminous instructions and explanations, because of differences in definitions as used by businesses.

7. The questionnaire is complicated and difficult to complete. This has to do with the fact that a lot of detailed information is requested. Furthermore, the information has to be collected from various departments, and most of the definitions and the order of the items on the questionnaire do not match the those of the administration. These aspects make the completion process of the form very cumbersome and time-consuming, resulting in measurement errors. Also the lay-out of the paper questionnaire caused measurement errors.

Figure 1. The original questionnaire of the Annual Dutch Business Inquiry



8. These results stem from a detailed evaluation study of the paper questionnaire (Giesen, 2004, 2005). With these results in mind, the structure and the lay-out of the questionnaire was redesigned. This came down to:

- breaking the questionnaire down into smaller sections of no more than one page, resulting in a better oversight for each section, and fewer calculation errors;
- a strict order of item label, short instruction, answer space, thus connecting – in reading order – items and answer spaces;
- locating additional instructions and explanations at the bottom of a page, like footnotes;
- restricting instructions and explanations to the most essential information, resulting in short and readable notes.

In Figure 2 two pages of the newly designed paper form are presented. To get this result a professional designer was consulted.

Figure 2. The redesigned questionnaire of the Annual Dutch Business Inquiry

The image shows two pages of a redesigned questionnaire. The left page is titled 'Bedrijfsgegevens' and contains sections for 'Bedrijfsgegevens' (Company Information) and 'Financiële gegevens' (Financial data). The right page is titled 'Inkoopwaarde en directe kosten van de omzet' (Purchase value and direct costs of sales) and contains sections for 'Inkoopwaarde en directe kosten van de omzet' and 'Toelichting' (Instructions). Below the forms are sections for 'Aanpak' (Approach) and 'Toelichting' (Instructions).

TESTING THE ELECTRONIC FORM

9. The results of the evaluation of the paper form helped in thinking about the visual design of the electronic questionnaire. Because of this study, we already had a clear view of the response process with regard to this questionnaire (Giesen, 2004, 2005; see also Willimack et al., 2004). However, some research issues had to be answered. We had to find out how the electronic form would work in practice, and what features had to be included in the e-form in order to make it easy to use. Another important issue was whether the paper and the electronic forms had to be designed in the same way. To research these issues, a usability and test study was carried out.

10. At the time Statistics Netherlands started thinking about the electronic form, the results of the evaluation study of the paper form were not yet available. So, the old form (Figure 1) was used as a basis. This form was programmed in Blaise. The use of Blaise set the layout conditions. This form is presented in Figure 3. The original sections are the tabs in the e-form. Furthermore, the form is characterized by pages that need scrolling. To help the respondent complete the form, edit rules like calculations and checks were added to the e-form. To obtain explanations to items, the key combination <Ctrl><F1> had to be pressed; this was indicated by ‘*’.

Figure 3. The e-form of the Annual Dutch Business Inquiry, first version

11. This form was tested in three waves, as is indicated in Table 1. In the first wave, an on-line version of this form was tested by 15 colleagues of Statistics Netherlands. These colleagues were familiar with the paper questionnaire, and comprised testers from the CBS cognitive lab, business interviewers, questionnaire developers, and helpdesk employees. The designer who redesigned the paper form was also involved in this test wave.

12. In the second wave, this form was tested in the field by 6 CBS business interviewers and involved 37 businesses. The questionnaire was loaded from a CD-Rom onto the laptop of the interviewers and was completed by the interviewers at the offices of the businesses. The interviewers were instructed in the use of the electronic questionnaire.

13. In the third wave, in-depth interviews were carried out with 6 business respondents at their office. The respondents were not familiar with the questionnaire. These interviews were carried out by testers from the CBS cognitive lab in cooperation with business interviewers. The business interviewers are experts on this form, and can identify errors in the completion process. These interviews were video taped. In this wave, the respondents had to download the questionnaire from a CBS server via the internet (at a https-address), log-in to the questionnaire with a username and a password, complete it off-line, and send the data back via a secure internet connection to a CBS server.

Table 1. An overview of the test waves

	Wave 1	Wave 2	Wave 3
Period of testing	August 2004	October 2004	November/December 2004
Questionnaire	Blaise	Blaise	Blaise
On/off-line	On-line via internet	Off-line, installed from CD-rom on laptop of business interviewer	Off-line, downloaded via the internet
Number of completions/ interviews	15	37	6
Tested by:	CBS cognitive lab testers, business interviewers, helpdesk employees, questionnaire developers, designer	6 CBS business interviewers	Business respondents interviewed by 2 CBS business interviewers and 2 cognitive lab testers

RESULTS OF THE TEST STUDY

14. In this section, the results of the three test waves will be described. The results will be presented in the order of the response process, i.e. i) retrieving the questionnaire, ii) starting up the questionnaire, iii) introduction to the questionnaire, iv) filling-in the questionnaire, v) transmitting the data and vi) deleting the questionnaire.

Retrieving and installing the questionnaire

15. In the test, three ways of distributing the questionnaire were used. The on-line version, in wave 1, was characterized by long sending and receiving sessions. Even for fast data connections, the time needed to receive a new page was well over 5 seconds. This was due to the length of the questionnaire and the included edit rules. Distributing the questionnaire via CD-Rom, as was done in wave 2, on a large scale is relatively expensive.

16. In testing wave 3 (with the downloadable version), it was observed that the problems regarding retrieving and installing the questionnaire were mainly to do with getting the https-address right. In this wave, respondents had to type in a long https-address from a letter. This gave rise to typing errors. Also the fact that a secured address was used (https) brought about errors in the address: people did not see the 's'. Once the respondent had logged-in on the CBS-server, the questionnaire could be downloaded and installed. The installation procedures did not cause major problems. One respondent could not download the questionnaire because of a firewall.

Starting-up the questionnaire

17. Once the questionnaire had been installed on the computer, it could be opened. In wave 3, however, respondents first had to log in to the questionnaire by means of a username, a password and an additional security code. This procedure did not cause any trouble, except for the use of the additional code, which was supposed to prevent unauthorized logging in to the questionnaire with a hacked username and password.

Introduction to the questionnaire

18. After the respondent logged in to the questionnaire, a first page with information regarding the questionnaire was presented. This page contained information on the sections of

the questionnaires and their order, as well as information on how to navigate, find the instructions, and transmit the data.

19. Data transmission was done in wave 3. In the previous waves, the first page was the first page with data boxes. In these waves, the 'respondents' did not know what to do, although they were familiar with the questionnaire.

Filling in the questionnaire

20. Completing a questionnaire like the Annual Business Inquiry is a very complex process. During the test interviews, respondents sat in front of their computer, surrounded by piles of administration papers, notepads and a calculator. The filling-in process involved their turning from the questionnaire to the administration papers, finding a pen to make notes, returning to the questionnaire on the screen, opening the explanations to the item using their mouse, going in search of additional administration papers, typing in numbers in the calculator, etc, and finally entering the data in the questionnaire. Respondents were also disturbed by the phone ringing, and by colleagues coming in asking for information. It is hardly surprising that, during such a process, respondents became easily confused when completing the questionnaire. Therefore, the usability of the e-form is of great importance.

21. The focus of the test was on the usability of the questionnaire. Statistics Netherlands' assumption is that when respondents have difficulties with the usability, they become irritated and try to complete the questionnaire as quickly as possible (resulting in item non-response or estimation of answers resulting in measurement errors; Krosnick, 1991). Aspects that concerned with usability are the visual lay-out and navigation. Some ideas to improve usability were mentioned by the respondents during the interviews. These ideas concerned printing, searching, calculating, carrying-over, explanations and progress indication. These issues will be discussed in the following subsection.

Visual lay-out and navigating

22. The e-questionnaire is composed of tabs (as can be seen in Figure 3). Each tab corresponds to a section on the paper questionnaire. In the tested questionnaire, the tabs are labelled A, B, C, etc. The tabs, at the top of the screen, were not identified as tabs, and as such did not help respondents to navigate through the questionnaire: they did not realize that they could skip from one tab to the next by clicking the tabs.

23. Because respondents did not identify the tabs as the separate sections of the questionnaire, they got lost. After completing the items in the first tab, and pressing <enter> to the last item, they were automatically led to the next tab. All of a sudden a screen with empty answer spaces was presented. This confused the respondents, who then wondered where the answers had gone. The interviewer had to instruct the respondents on the use of the tabs. One

respondent remarked that a structure like the explorer would be more logical, with all sections listed at the left side of the screen.

24. Furthermore, some tabs were comprised of long pages, corresponding to long sections on the paper questionnaire. This made scrolling necessary, resulting a bad overview of the section.

25. An e-form should be clear and user friendly, like every questionnaire (Dillman, 2000; Fowler, 1995). The layout should be functional in the sense that it should help the respondent in finding his way through the questionnaire. Furthermore, respondents want to know what sections of the questionnaire are completed and what remains to be done. The visual layout of the tested e-form did not meet these requirements and this resulted in a lot of questions from respondents as to how to continue and where to go next.

Printing

26. Respondents requested the possibility to print the questionnaire. In the tested version, no printing option was available. Statistics Netherlands found that respondents wanted to make a paper copy for several reasons. First of all, while completing the questionnaire, they want to know where they are and what data they have already entered. Secondly, when other departments have to be consulted, separate sections of the questionnaire can be passed on in hard copy. After the questionnaire has been completed, respondents want to check the data on paper and obtain authorization to send the data to Statistics Netherlands. And finally, they want a paper copy for their archives.

Searching aid

27. While completing the questionnaire, some respondents ticked off the items in their administration papers that were already entered in the questionnaire. At the end of the questionnaire, they noticed that not all items had been checked off. However, they did not know where to put these items. Up to this point, the questionnaire was leading in the response process, meaning that they searched for the items in their administration papers that matched the definitions on the questionnaire (or at least, what they thought would match). From this stage on, however, the administration papers became leading. Now, they had to find the entries in the questionnaire that matched the items in the administration papers. At this point, respondents would find it useful when they could search for labels, instead of having to browse through the questionnaire and hoping to find the correct item. Here, respondents indicated that an entry-search facility would be helpful.

Automatic addition and subtraction

28. In the tested questionnaire, items were automatically added or subtracted. This is a major feature of computer-assisted data collection (Couper et al., 1998; De Leeuw, Hox & Snijkers, 1995). Respondents were positive about this feature. In some cases, however, the results were unexpected or it was unclear where the numbers came from. This was the case when the calculated numbers were not logical, or when the results were put at the end of the page and respondents had to scroll to find them.

Carrying-over (imputations)

29. In the paper form, many relations between items exist, for example, the summation at the end of a page has to be carried over to the next, or the summation of a section is used in another one. On paper, respondents have to be instructed in these matters (as is the case with addition and subtraction). In the e-form, these rules had been computerized. Statistics Netherlands believed that this would make the form easier to complete, since on paper many respondents had shown difficulties with these rules (Giesen, 2004, 2005). It was discovered, however, that respondents became confused when, for example, the computerized imputation rules were not logical to them, or when it was not clear where the imputed number came from. Furthermore, they could not edit the imputed numbers, since these answer spaces were locked.

Instructions and explanations

30. In the tested questionnaire explanation windows could be opened by pressing <Ctrl><F1>. Explanations were indicated by ‘*’ with items but respondents did not notice this mark. Therefore, they were not aware that explanations were available. Even when they did notice the ‘*’, they did not know what it meant. Only after they were told that an explanation window could be opened and how it could be done did they use it.

Progress indicator

31. Since respondents cannot easily browse through an electronic questionnaire, as is the case with paper forms, respondents indicated that a progress indicator would be desirable. This indicator gives feedback to the respondent as to what parts have been completed and what still has to be done.

Transmitting the data

32. To send back the data, respondents had to log in to the internet. Before doing so, the respondent had to confirm that all relevant items had been completed. After this had been done, a pop-up window appeared asking whether the data should be transmitted now.

33. In this process a number of problems appeared. First of all, after the filling-in of the questionnaire had been confirmed, respondents had to press <enter> to continue (the interviewer had to inform them of this). Secondly, in a number of cases, respondents didn't manage to log in to the CBS server because of technical problems. Also, respondents were confronted with messages from the computer saying that ‘manipula.exe’ was trying to connect to a remote server. This computer program was part of the e-form, but since respondents were unaware of this hidden part, they did not know what to do.

34. After the data had been transmitted, confirmation was received, thanking the respondents for the data. Respondents were positive about this message. However, after this message window was closed, the window saying that the data are ready to be sent appeared again on the computer screen. This was very confusing. Some respondents thought that the data had to be sent again, although a confirmation had been received.

Deleting the questionnaire

35. After the response process was completed, respondents might have wanted to delete the questionnaire from their computer. In this study, respondents did not indicate that they would like to do this.

RECOMMENDATIONS AND DISCUSSION

36. Based on the results of this research, the following recommendations are proposed with regard to the electronic questionnaire of the Dutch Annual Business Inquiry.

i) Retrieving and installing the questionnaire

- Statistics Netherlands recommends a downloadable questionnaire to be installed on the computer, and completed off-line. This recommendation is based on Statistics Netherlands' experience in this study and the evaluation of the paper form (Giesen, 2004, 2005). A rule of thumb (as used by the Dutch Tax Office) is that questionnaires of over 25 items should be off-line versions.
- This questionnaire may be completed in several sessions, and by several people from several departments. A downloadable form makes it possible to stop and start again at any given moment. Also, all information concerning the questionnaire and entered data is available, making it possible to run through the questionnaire while keeping track of the overview. Furthermore, the time to be on-line is relatively short, in comparison to an on-line version.
- A drawback of the off-line version is that businesses with firewalls may not be able to retrieve the questionnaire. Statistics Netherlands expects, however, that in practice this may not be a big problem. This is based on the experiences with the Dutch Tax Office. Since 2005, businesses are compelled to use electronic tax forms, that have to be downloaded via the Internet.
- Downloading and installation should be clear and simple, and could be done by providing an Internet site with a simple http-address (like e.g. www.mycbs.nl). When this site is a personal site, it should be secured by a username and a password, for example. The download and install procedures should preferably be in accordance with known conventions as used by MS-Windows.

ii) Starting-up the questionnaire

- The questionnaire may start with a log-in procedure. Since the respondent may feel that the questionnaire contains confidential data, a log-on procedure may be needed. A respondent will then be asked whether he would like to protect the questionnaire with a username and password so that unauthorized personnel can not open it. This procedure may be optional.

iii) Introduction to the questionnaire

- The test study shows that respondents need a clear introduction to the questionnaire. After having logged-in, the questionnaire should open with this page, listing information on the structure of the questionnaire, how to proceed, navigate, obtain explanations, fill in and transmit the data. This page should, however, not exceed one screen.

iv) Filling in the questionnaire

- The visual design should be functional in the sense that it should help the respondent find

his way through the questionnaire, and providing information on what has been completed already and what remains to be done. Furthermore, as the evaluation of the paper form shows (Giesen, 2004, 2005), the questionnaire should be composed in a consistent way; every lay-out element that is not consistent may confuse respondents.

- The composition of the questionnaire should be instantly clear and simple. This should also be true for navigation. The tabs and the long pages (making scrolling necessary) did not provide an overview of the questionnaire. A set-up that people are used to is a design with the sections listed at the left side of the screen, as is shown in Figure 4. Punselie (2004) recommends that such a structure should not be too deep. According to him, a structure with more than 4 levels results in people losing oversight. Also, each level should consist of no more than 7 items. This should help in presenting all relevant options at every moment.
- In the literature on Web questionnaires, a lot of attention is given to the visual design and navigation (see Best & Krueger, 2004; Punselie, 2003; Schonlau et al., 2002; Vroom, 2002; Van der Geest, 2001; Dillman, 2000). This indicates that these issues are important regarding usability.
- Scrolling should be avoided as much as possible. Each section should be made to fit on a computer screen.
- The questionnaire should be composed out of small, clear sections. Here, the redesign of the paper form (as discussed in the second section of this paper) helped in designing the electronic form.
- The questionnaire should have a printing function. This may be a function which asks what section of the questionnaire should be printed, e.g. this section (empty), this section (including answers), the whole form (including answers), or an empty form.
- An entry-search facility would help in obtaining a better match between the administration and the questionnaire items, instead of matching on face value and what comes first. This facility would help in making completion easier as well as reducing measurement errors.
- Edit rules with regard to calculations and carrying-over (imputations) should be implemented in the form. However, these rules should be clear and logical to the respondents. Although not tested in this study, Statistics Netherlands states that the same is true for consistency and range checks. However, experience with computer-assisted data collection (Haraldsen, 2004; Couper et al., 1998; De Leeuw, Hox & Snijkers, 1995) shows that edit rules should be implemented with care and tested carefully. Too many interruptions and error messages may frustrate the response process, and irritate respondents. When occurring, clear error messages should indicate the error to the respondent.
- Instructions and explanations should be presented in a clear way. It should be clear to respondents immediately that explanations to items are present, and that they can be viewed simply by clicking a button. This button and short instructions should be presented in such a way that they will attract attention, i.e. placed where the eye is. The explanations themselves should be clear and short, as are the instructions to the new paper form (see the second section of this document).

- While completing an electronic questionnaire, respondents need feedback on their progress. A clear progress indicator should be implemented.
- v) Transmitting the data
- Before transmitting the data, a confirmation of the completeness and accuracy of the data should be requested.
 - Technical problems with regard to the transmission process should be avoided: this process should be tested carefully.
 - The transmission of the data should be confirmed, indicating that the data have been received. After this message has appeared on the respondent's screen, the send-button should not be presented anymore.
- vi) Deleting the questionnaire
- Although this study did not provide any data on the need to delete the questionnaire afterwards, Statistics Netherlands feels that this option should be implemented in the system. In most software programs this is a default option.

37. With these recommendations in mind and following guidelines presented in the literature on internet surveys (see Dillman et al., 2004; Best & Krueger, 2004; Haraldsen, 2004; Punselie, 2003; Schonlau et al., 2002; Vroom, 2002; Van der Geest, 2001; Dillman, 2000), this questionnaire was redesigned. The result is presented in Figure 4. This e-form is designed in Adobe In-design with help of a professional designer. It is considered a prototype of the visual design, showing how the questionnaire should look, including some functionalities. The next steps are the development of the actual electronic questionnaire and testing its usability.

CONCLUSIONS

38. Completing the Dutch Annual Business Inquiry questionnaire is a very laborious and complex process (Giesen, 2004, 2005). Business respondents are poorly motivated to complete such questionnaires (Willimack, 2002): they see no benefits, only costs. This results in kick-and-rush behaviour (d'Haens & Steehouder, 2000) and **satisfying** (Krosnick, 1991): respondents rush through the questionnaire, mis-reading it, and provide the answers that are easiest for them. When the questionnaire is badly designed, this behaviour will be even stronger. Ultimately, respondents will stop responding.

39. In order to prevent such behaviour from occurring, the electronic questionnaire as tested needs a lot of improvement. As a result of the test, many recommendations have been suggested. In general, these recommendations involve making the electronic questionnaire clear and logical in every way. This means that the questionnaire should be simple, clear and consistent with regard to the visual design and its features. Also the structure of the questionnaire should be logical to the respondent, and should help to maintain an overview. Breaking down the questionnaire into small parts and small tasks may assist in its step-by-step completion. Because no interviewers are present to provide assistance in these Internet questionnaires for Computer-Assisted Self-administered Interviewing (CASI), instructions and explanations should be immediately clear. Built-in features should be transparent: hidden rules and features may confuse respondents and make them feel uncertain, even when they are

familiar with the paper form. To paraphrase Van der Geest (2001): Web questionnaire design is communication design.

Figure 4. The e-form of the Annual Dutch Business Inquiry, prototype.

The screenshot shows a web browser window titled "enquête groothandel 2006". The main content area is titled "Samenvatting winst- en verliesrekening 2006" with sub-sections for "Bedrijfskosten".

Bedrijfskosten

Inkoopwaarde Neem het totaal van de inkoopwaarde over zoals vermeld in uw winst- en verliesrekening (W&V).	1.220.365,37
Loonkosten Bruto lonen en salarissen, vermeerderd met premies sociale voorzieningen, pensioenlasten en overige sociale lasten.	240.731,24
Afschrijvingskosten Neem het totaal van de afschrijvingskosten over zoals vermeld in uw W&V.	64.543,18
Overige kosten Neem het totaal van de overige bedrijfskosten over zoals vermeld in uw W&V.	<input type="text"/>
Bedrijfskosten totaal	<input type="text"/>
BRUTO BEDRIJFSRESULTAAT	<input type="text"/> OK

At the bottom of the form, there are buttons for "Ongedrukt maken", "Opslaan", "Afdrukken", and "Afdrukken". There are also navigation arrows and a "Help" button.

On the left side, there is a navigation menu with the following items:

- Introductie
- Waggen
- Boekjaar en oorzakelijke
- Marktoverzicht
- Samenvatting winst- en verliesrekening 2006
- Bedrijfskosten
- Bedrijfskosten
- Resto
- Voorzieningen en resultaat
- Specifieke bedrijfskosten
- Specifieke netto- en bruto
- Specifieke inkoopwaarde
- Specifieke loonkosten
- Specifieke afschrijvingskosten
- Specifieke overige kosten
- Invoering
- Verzoeken

At the bottom left, there is a box for "Bedrijfsnaam" (Horeca Vers Max BV) and "Log innummer" (1234567890).

40. In general, questionnaires should be easy to use, i.e. respondent friendly (Snijkers, 2002), and the visual design and its features should support the response process. This test shows that completing a questionnaire on the computer and reading from the PC screen is very different from completing a paper questionnaire. Haraldsen (2004) and Dillman (2000) also reach this conclusion. In order to make the questionnaire work well, the visual design and its features have to be adapted to the chosen medium. As a consequence, the electronic questionnaire should be designed differently from the paper form.

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