

## CHAPTER 2

# How research can lead to better government forms

Carel Jansen & Michaël Steehouder

Studies into forms can yield interesting results, both for form fillers and the organisations involved, as well as for researchers in the field of document design. A number of empirical studies have revealed that Dutch government forms raised a diversity of serious problems. Efforts to improve the forms based on the findings of these studies have proved to be successful: after revision of the original forms, four times as many forms were completed correctly.

Follow-up studies have provided more insight into the effect of single characteristics: the type of answer spaces provided and the position of various types of explanations and instructions. More research is needed, especially into the strategies that people apply when filling out forms and into the consequences of presenting forms on-line.

### 1. Introduction

All residents of the Netherlands who enjoy a salary or a benefit have to complete — at least once in their life — a so-called *Loonbelastingverklaring*. This form serves as a basis for decisions on their individual tax coding, and thus on their net monthly salary. Most taxpayers, however, are poorly informed about the system of tax coding, have difficulties with completing the form, and do not know that they should submit the form again if their personal conditions change, for instance by marriage. The explanatory information on the form is scattered and incomplete, and most employers are unwilling or unable to help their employees in filling out the form (Schaafsma & Van Wagenveld, 1995). This example of the *Loonbelastingverklaring* shows that the Dutch tax department, despite a series of successful efforts, has not yet achieved its ultimate communication goal to “make it easier” for their clients to deal with the IRS, as the department’s motto promises.

Difficult forms are a problem for the public as well as for the government.

Knapper & Mc Alley (1982), for instance, found that only 18% of the applicants for *Individuele Huursubsidie* (Individual Rent Subsidy) were able to complete the form without help from a friend, a relative, or a civil servant. Obviously this situation is detrimental to the widely accepted democratic principle that citizens should be able to control their own affairs. Moreover, it is a barrier to many citizens trying to obtain their social rights and the money attached. For the government badly designed forms can affect the quality of the decisions that are taken. If citizens who fill out a form do not understand a particular question, they can hardly be expected to give the correct answers. Apart from that, bad forms can be very costly, as was demonstrated, for instance, by Jansen et al. (1991a, b). In this study, the reprocessing costs of two related forms used by the Dutch Ministry of Education and Science proved to be approximately Dfl. 180,000 on a yearly base, while better forms would reduce this amount to a third.

The call for better government forms is not new, but it is only since the eighties that Dutch government organizations have really invested in research-based design of their forms. In 1988, for instance, the *Rijksvoorlichtingsdienst* (Government Information Service) enabled a group of researchers at the University of Twente, whose efforts were coordinated by the authors of this chapter, to conduct a study aimed at strengthening the foundation for designing "user-friendly" forms (cf. Jansen & Steehouder, 1989, 1992; Steehouder & Jansen, 1992). The study resulted in a doctoral thesis (Jansen & Steehouder, 1989) and an advisory textbook on form design (Jansen et al., 1989), intended for government agencies and companies providing services in form design.

Our line of research can be considered an example of document design positioned between theoretical work and purely applied studies (cf. Schellens & Steehouder, 1994). We started with analyzing the problems users have with a certain type of documents; next we developed interventions (where possible on theoretical grounds) meant to help reducing these problems, and, finally, we tested the effects of the measures taken. By applying this strategy to a number of documents and in a number of situations, we have tried to come up with heuristics for designers that would exceed individual cases.

In this chapter, we will first show that forms can be analyzed and investigated from different perspectives. We will then proceed with a review of the main findings of our studies on form-filling problems. Next, we will discuss the outcomes of a few studies into the effectiveness of specific design options. In the last section, electronic government forms will be the central topic.

## 2. Perspectives on forms

Investigating forms can be an interesting undertaking for government organizations as well as document researchers. For government agencies, forms are important instruments to accomplish several organizational functions. For researchers, the specific characteristics that forms share and the communicative problems they often cause make this type of documents challenging objects for analysis and experimentation.

### 2.1 Organizational functions of forms

The functions of forms in an organization pose important constraints on the content and form of the document. In discussions on the design of government forms, three organizational functions in particular come to the fore: the *legal function*, the *data transaction function*, and the *public relations function*.

First and foremost, forms are important *instruments in the implementation of rules and regulations* that apply to the individual situation of citizens. Bureaucratic procedures require input from the citizens. They have to apply for a grant, claim a benefit, or provide the information that enables the agency to come to the correct decision. Since such procedures have important legal aspects, forms serve — to a certain extent — as legal documents, and as such they have to be in conformity with the law or the regulation from which they originate. The answers on forms also have to be put in a legally adequate wording, which sometimes includes formal legal language and official formulas.

The second organizational function is the *data transaction function* (Miller, 1981). Forms transfer data from one entity to another — in our context: between individual citizens and the government. It is in the interest of both parties that this transfer is effective (the transfer has to be complete and correct) and efficient (the transfer should take as little time and effort as possible). Forms have to be designed in such a way that they enable optimal (often automatic) processing by the organization. Consequently, an appropriate form design process is always embedded in the design of a data transaction system, including a detailed analysis of the information needed and of the procedures involved in data processing. Not surprisingly, most form redesign projects in government agencies (and in private companies as well) also include reconsidering and often cutting the number of forms used by the organization, redesigning procedures for processing the forms, and even implementing and customizing

new software. For a number of Dutch examples, see Blom & Van Saasse (1989); Edens (1989); Mulder (1989); Van den Berg (1992).

A third organizational function has become increasingly important in the past decade: the *public relations function* that forms may fulfil. Government organizations realize more and more that their functioning depends to a large extent on the cooperation of the public. They also begin to recognize that their forms can be quite effective (or detrimental, for that matter) in establishing goodwill. Many forms are used by a large number of citizens and they are often read more carefully than whatever other document from the organization. The number of accurately and timely returned forms is increasing not only as they are easier to fill out, but also as they encourage more citizens to do so.

## 2.2 Forms as a text genre

One of the characteristics of forms is that they are “two-sided” documents. They can be seen as a medium for a restricted question and answer dialogue (Wright, 1980), where the initiative is essentially taken by the organization that needs information. In our studies, we have focused on forms that have to be filled out by individual citizens. In discussing the communicative functions of these government forms, it makes sense to look at both parties involved: the government agency and the citizen.

From the government’s perspective, a variety of communicative functions may be fulfilled in a form. The most important communicative functions are the following:

- asking questions about the citizen’s situation;
- giving the person filling out the form the opportunity to establish a claim or to present a request;
- providing support (giving instructions) for filling out the form;
- motivating the person filling out the form to answer the questions accurately and completely, and to submit the form in time;
- providing general background information about the relevant regulations and procedures.

If one looks at forms as media for dialogues between organization and individual, and considers the differences with other dialogues, several characteristics become noticeable.

- The dialogue is entirely *controlled from one side*: the government agency. The agency does not only determine the topics of the dialogue, but it also restricts the freedom of response of the other party by providing pre-coded categories (multiple choice, yes/no questions) and by limiting the space where answers can be written down.
- The dialogue is *a-synchronous* since the parties communicate at different times. There is no feedback during the dialogue or the feedback is delayed. The organization does not get direct information about possible misunderstandings, uncertainties, or annoyance on the part of the people filling out the forms. On the other hand, these people do not receive any sign of approval or disapproval until the decision about their claim or application has been taken. And even then the feedback is indirect. If the decision is favorable, the situation of the client has apparently satisfied the conditions of the regulation and the form must have been completed in an acceptable way. If the decision is negative it often remains uncertain whether the cause lies in the situation of the claimant, or whether shortcomings in the process of form completion have led to the negative outcome.
- The dialogue is *not between two persons*, each with their own identity, interest, and role, but between an anonymous organization and a non-anonymous citizen. If something goes wrong in the dialogue, it is much easier for the organization to blame the citizen (“You gave the wrong answer”) than for the citizen to blame the organization (“Your question was unclear” or “You misinterpreted my answer”). It is usually difficult, and sometimes even impossible, to find out who within the organization is responsible for the final decision. And even if this official can be identified, he or she is never responsible as an individual.

Given this asymmetric nature of the situation, it is paramount that the underlying party has to be instructed carefully about the kind of information it is expected to give, and the way this information should be expressed. In our experience, taking an *instructional* perspective in looking at this type of communication, may lead to a better insight into form-filling problems, as opposed to merely regarding the form as a kind of dialogue. Therefore, we choose to regard a form primarily as a tool that *helps* citizens in fulfilling their task of providing the government with specific information.

### 3. Form-completion problems

In 1988 we conducted a study in order to gain more insight into the practical problems experienced by people using forms as tools for communicating with the government (Jansen & Steehouder, 1989, 1992a). We examined nine government forms, most of which were targeted at a substantial number of Dutch citizens. They included applications for social benefits, applications for study grants, income specifications, and a tax restitution form. Three forms were from the tax authorities, five from the Ministry of Education and Science, and one from the city council of Hengelo (details about the forms and the subjects can be found in Jansen & Steehouder, 1989, p.60). We asked 98 subjects to complete one or two of these forms. All subjects were given a situation sketch: they were asked to place themselves in the position of a Mr. or Mrs. X and they were provided with specific information about the financial situation of this fictitious person. The subjects were asked to think aloud while performing their form-filling task. Afterwards, the answers were discussed and the subjects were invited to comment on the problems they had encountered. The problems encountered by the subjects were registered and coded by trained observers; the same observers made abstracts of the interviews. Of course, the completed forms were analyzed as well.

Since we were not primarily interested in the course of the form completion process per se, but rather in the problems that arose during the task, we limited our analyses to the moments when a subject:

- made a mistake (indicating a problem of effectiveness);
- performed an unnecessary action (problem of efficiency);
- showed a lack of understanding of a regulation (problem of transparency);
- asked for assistance (problem of autonomy).

A variety of problems emerged that can be categorized as follows.

#### *Orientation problems*

Hardly any of the subjects started with attempting to get an overview of the form and of the explanations that they could find either in the form itself or in a separate brochure. Nearly all subjects ignored the advice to "Read the explanations carefully before filling out the form," which was at the top of almost every form. This lack of care for the "big picture" continued to exist during task performance. The subjects clearly tended to focus on local matters. Generally speaking: people filling out forms seemingly search for the next box to cross and

the next dotted line to write on; they look for cues indicating what has to be filled in, and as soon as they think they know what that is, they put down their answer. As a result of this lack of orientation, the subjects often did not understand the applicable regulations very well, and a number of questions were therefore answered incorrectly.

### *Routing problems*

We identified a number of problems related to the order in which the subjects processed the elements of the documents.

- Explanations and instructions were frequently ignored, particularly when they were printed separately and when there were no explicit references in the form itself. Ignoring these instructions gave rise to many incorrect answers.
- If the subjects did try to find information in the explanations, it often proved difficult for them to locate the relevant section, which led to confusion and unnecessary loss of time.
- Sometimes questions that had to be answered were overlooked, particularly when the dotted lines or the boxes were not immediately visible. As a consequence some forms were not completed in full.
- Sometimes, however, questions that *should* be disregarded were answered nevertheless. Routing instructions (such as “If yes, skip question X” or “If no, jump to question Y”) were frequently neglected. This led to unnecessary loss of time.

### *Switching problems*

Readers of user instructions, coming along with, for instance, a VCR, have to switch continuously between reading the instructional text and performing the task supported by the text — i.e., operating the equipment they use. The same holds for people filling out forms: they continuously have to decide when to stop reading the question at hand and (possibly) the explanation that comes with it, and when to start filling in the answer that is asked for. We noticed that subjects frequently switched too early: many times they filled in their answers before they had read all the relevant information. This resulted, again, in a decreased effectiveness and efficiency of the form completion process.

### *Verifying problems*

The subjects hardly ever checked whether their answers were correct. Even in the case of complex calculations, where the outcomes were sometimes quite peculiar, these outcomes were rarely verified and calculation errors were

frequently overlooked. Apparently, the trouble anticipated in performing a re-run of a task already carried out, often outweighs the possible risk of providing an incorrect answer.

### *Terminology problems*

Many problems were due to incorrect interpretation of legal and technical terminology. These problems arose in particular with terms that at first sight do not seem technical at all, such as *level of education*, or *dismissal*. Their meaning in a specific government regulation often differs from their meaning in an everyday context, but the subjects often did not notice that these terms needed special attention. On the other hand, if the terminology used was clearly technical, we observed various strategies. Sometimes, subjects consulted the explanations to find the meaning of the term. At other times, they just copied the answer from their documentation, even without exactly understanding what it meant. In some cases, subjects just concluded that the question with the unfamiliar term had to be irrelevant for their situation, according to the maxim "If I have never heard of it, it cannot be applicable to me." Many misinterpretations were caused by a lack of understanding of the regulation's aims and logic. For instance, some subjects kept making errors in filling out forms from the Ministry of Education and Science, because they assumed that *studiefinanciering* (student grant) is only available to students at the university level. In fact, these grants were (at the time of the study) allotted to *any* Dutch citizen of 18 years and older who takes part in an educational program, no matter whether it concerned secondary or higher education.

### *Problems with syntax and graphics*

Although complex sentences and questions frequently occurred in the forms and explanations we studied, they seldom led to wrong answers. Rather, the subjects re-read a difficult sentence slowly and more than once, until they felt they had grasped its meaning. In the forms we investigated, it was only for one question that a number of wrong answers could be attributed to syntactic complexity. Forms do not only contain strings of words, however, but also graphical and typographical symbols meant to support the verbal information. These devices, used to indicate the route to be followed, for instance, were not always correctly understood by the subjects we studied.

All in all, we concluded that there were considerable differences between the actual behavior of the subjects in this experiment and the behavior that is

required to complete forms successfully. In total, 87.7% of the forms that were filled out contained one or more *fatal errors* as we called them: missing or incorrect answers that would lead to an incorrect decision after the form was processed or that would make it impossible to make a decision at all. However, it should be pointed out that this figure would probably be lower in reality. The situation sketches that were used in the study were not very familiar to the subjects, and they were rather complex in comparison with their own situations.

There seem to be three crucial factors leading to the problems indicated above: the attitude of many people towards form completion, their economy-driven behavior, and their lack of prior knowledge when it comes to important bureaucratic concepts.

### *Attitude*

Many people filling out forms apparently start working toward their short-term goals (answering the next question) without prior orientation. They seldom re-read their answers, and hardly ever verify their calculations. Most of them do not follow a specific strategy. They go straight for what they obviously view as the only goal: filling in the boxes and writing down answers on the dotted lines. To use a soccer metaphor, they have a *kick-and-rush* strategy, sometimes ending in satisfying results, but more often leading to an unorganized and unsuccessful course of action.

### *Economy*

People filling out forms tend to limit themselves to the minimum of what they consider to be indispensable for reaching their goal, and to ignore everything else. At first sight, this strategy may seem very practical. However, if, for instance, explanatory notes are ignored, missing essential information may result in a great number of errors. Striving for optimal efficiency then leads to a serious lack of effectiveness.

### *Lack of prior knowledge*

The prior knowledge of bureaucratic concepts often proves insufficient for an adequate interpretation of the questions and the explanatory texts. People filling out forms hardly seem to realize that knowledge of regulations and procedures is needed in order to understand the questions and come to the right decisions. But even if they do realize that they need more information, it rarely happens that they read explanatory sections to obtain it.

These conclusions are in line with the results of several other studies of forms performed (on a smaller scale) in other countries. Frohlich (1986), for instance, asked eight subjects in a thinking-aloud experiment to fill out a form used in the UK to apply for a supplementary benefit. Frohlich analyzed the routes the subjects followed through the form, and the mistakes they made in following these routes and in answering the questions. His conclusion is that the standard mode of form completion is apparently to limit oneself to answering the questions in the order shown in the form, unless explicitly instructed otherwise, or until an obviously irrelevant question is encountered. According to Frohlich, people filling out forms are easily tempted to overlook important explanations or routing instructions. The result is that they may provide incorrect answers to relevant questions, and run the risk of skipping irrelevant questions.

Obviously, Frohlich's findings are quite similar to ours. In his study, just like in ours, the subjects were so focused on what they considered their real task (answering the questions) that they often neglected the required preceding activities. Other small-scale studies into form-filling behavior, for instance, by Holland & Redish (1981), or by Lüdenbach (1984), sketch the same picture.

It is interesting that the same types of problems found in studies of form-filling behavior have also been identified in studies of reading and using other instructional documents. The observations made by Carroll et al. (Carroll & Mack, 1983; Mack *et al.*, 1983; Carroll & Mack, 1984), which eventually led to the minimalist design principles, show that many novices in using software:

- prefer experimenting with the software rather than first reading the instructions carefully;
- only read what seems relevant to their actual task;
- make mistakes due to insufficient or inaccurate prior knowledge;
- sometimes meet local interpretation problems related to language and graphic design of the software and the manual.

#### *How to help citizens with their form-filling problems?*

The problems in dealing with government forms as mentioned above can be viewed from two different angles. From one perspective, the average Dutch citizen simply lacks the bureaucratic competence needed to deal with today's government forms, and subsequently, to participate in the bureaucratic system as it is. In this view, an adequate solution has to be found either in improving education, or in providing individual support through government or private organizations. Within this framework, the *Belastingtelefoon* (telephone helpline) established by the Dutch Tax Department is a laudable initiative, just as the

*Nationale Aangiftedag* (national income tax assistance day), when students from various universities assist people with filling out their tax forms. Of course, the government could consider even more radical measures, such as simplifying complex schemes and regulations, or using other ways of obtaining the necessary information. For instance, instead of asking citizens about their income in the previous period, a government agency might obtain these data directly from the employer. Such measures will undoubtedly improve the situation. Perhaps their effect will even outweigh the effect of optimizing forms, but they go beyond the competence of the document design researcher, who accepts the organizational setting "as it is."

From the document design perspective, another approach might be more appropriate. The behavior and competence of people filling out forms are taken for granted, as are the content of the regulations and the procedures. The communication problem lies in the forms-as-they-are, which support the needs of the intended audience insufficiently. From this perspective, optimizing forms by applying principles of good document design has first priority. But satisfactory results can only be expected if better forms are combined with organizational measures. A particularly good example is provided by the Dutch income tax forms: the *combination* of simplifying the rules and procedures, providing more support, and re-organizing the Tax Department has resulted in a much more effective and efficient income tax practice in the Netherlands over the past ten years.

#### 4. Investigating design options

Our interest in government forms does not end with understanding user problems. As a follow-up to the study we summarized above, we used our results to develop and test some design principles that could lead to improved forms: the scenario principle, the principle of strict control, and the principle of adequate background information.

According to the *scenario principle*, the questions and various kinds of explanatory notes should be drafted from the perspective of the actions to be carried out by citizens filling out the form (cf. Flower et al., 1983). As much as possible, the information should be presented in terms of specific conditions, followed by instructions for the actions to be taken in the situation at hand. The main goal of the document should, therefore, not be to explain the law or

regulation, but to help the clients in solving the problem they are facing in their individual situation.

The second principle is *strict control* of the behavior of the respondent. The form should make clear in detail what the readers are expected to do. They should be given clear instructions as to how they can find relevant information, and how answers should be coded. Routing instructions such as explicit instructions for skipping irrelevant questions and references to explanatory notes (and from there back to the right question) are particularly important.

The third principle is providing *adequate background information*. This is needed in order to compensate for the observed lack of prior knowledge. General background information may be restricted to a concise summary of the systematics of the law or regulation concerned, and to the purpose of the form. It should be encouraged that this general background information is read before beginning the form-filling activities. In view of the kick-and-rush strategy, detailed information should preferably be given at a local level, i.e. close to the question it refers to.

The next step in our research was to apply these general principles to the nine government forms we started with. We did so by taking a large number of specific design decisions derived from the general principles formulated above (discussed in detail in Jansen et al., 1989). The new versions of the forms were completed by another 90 subjects, using the same situation sketches as the first group of subjects did, and, once again, thinking aloud. The results are shown in Table 1.

Table 1. Correctly completed forms (i.e., without fatal errors) before and after revision

	Overall	Lower educational level	Higher educational level
Original forms	12.3%	6.9%	14.3%
Revised forms	52.2%	70.8%	47.0%

It proved that revising the forms had brought about a considerable improvement. In no more than 12.3% of the cases, decisions based on the answers in the original forms could be expected to be correct. The score for the revised forms was more than four times as high: 52.2%. Moreover, it turned out that people with a low level of education would benefit to a much greater extent from the revised forms than would people with a higher educational background. This may be an important finding, because many regulations involved in this study were primarily directed at people with low incomes, often corresponding with lower educational levels.

An important critical question regarding a study like this is whether it really proves that the principles developed account for the improvements found. After all, there are many ways in which these general principles can be elaborated on in concrete forms. Furthermore, as there are many differences between the original and the revised versions of the form, it is impossible to identify the effect of each of these differences separately. What is needed then is additional research into the effects of single characteristics of forms. We will discuss two of these studies on form characteristics below. The first focuses on one aspect of the local level of the form; the second involves the global level of the form.

#### 4.1 A design variable at the local level: answer spaces for open questions

One of the issues related to the general principle of strict control of the form-filling process concerns the layout of answer spaces for open questions in the form. The place where the answers have to be written can be marked in many ways (Figure 1). Moreover, the form may instruct the user to write in block letters or capitals. Apparently, in such a case it is assumed that block letters or capitals would enhance the legibility of the handwriting, which in turn would reduce the time and the number of errors when they are fed into the computer. Another assumption is that using boxes will force people to write in block letters or capitals.

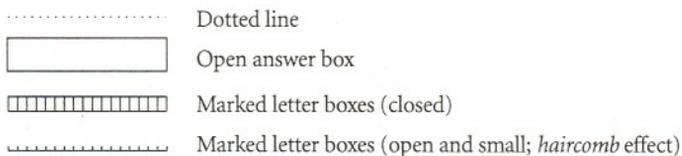


Figure 1. Some options to mark answer spaces

Experiments by Barnard & Wright (1976) and Barnard, Wright & Wilcox (1978) have shown that graphical restrictions slow down the writing time: answers are filled in faster in open answer boxes than in marked letter boxes. But does this slowing down also improve the legibility of the answers? According to both studies the perhaps somewhat surprising answer is: no, it takes significantly more time to read answers in marked letterboxes.

The experiments referred to here were performed in highly artificial, laboratory settings, which limits the external validity of the results. Moreover, in these experiments, only the reading *speed* was measured, not the *accuracy* in

decoding the answers. Some more detailed conclusions can be drawn from an experiment by Jansen & Mulder (1998).

Twenty-eight subjects (18 women, 10 men) were asked to complete the *Aanvraag Voordeelurenkaart* (application for a reduced-fare pass), issued by the NS, the Dutch Railway Company. After they had completed the forms, the subjects were asked to complete a receipt form for a small reward they were to receive for their cooperation. Both the form and the receipt asked for name-and-address information. In the application form, no instructions for handwriting were given, and dotted lines were used to mark the writing space. The receipt, however, contained the instruction to use block letters, and marked letter boxes were used to indicate the writing space.

The completed forms and receipts were processed by five professional secretaries, who were highly experienced in text processing. They were given the completed forms and receipts in a random order that varied among the five secretaries, and they were asked to copy the name-and-address data into a text-processing file.

The results of the experiment indicated that neither the answer space nor the handwriting instruction had any significant effect on the accuracy or the speed of processing. The only significant effect that was found was caused by the person of the subject; this variable highly influenced processing accuracy and speed. The reasons for this are rather trivial: some people have a much clearer handwriting than others, and some names are considerably shorter than others.

The lack of significant differences in the two forms that were tested can be explained quite simply. It proved that most subjects were not influenced by the instructions on the receipt form. Twenty of the 28 subjects used block letters anyway, and of the others, only four changed their handwriting according to the instructions.

It is not easy to draw firm conclusions from an experiment like this, and it is even more difficult to deduce indisputable practical consequences. To mention only a few of the difficulties:

- Only name-and-address data were processed. It is unclear what results would have been found if numerical data had been used.
- In this experiment writing spaces were not marked by a different color.
- The number of subjects in the data processing experiment (five secretaries) was small; as a consequence, only rather large differences in the sample could lead to statistically significant results. However, in practice, where thousands of forms have to be processed, even small differences may be important. Such small differences can only be noticed in large-scale experiments, though.

These limitations, particularly the first and second, reveal the most serious problem with this kind of local-level research: there seems to come no end to it. Controlled experiments yield only limited answers, and usually generate more questions than they can answer.

How about the relevance of such experiments for the practice of form design? Rather than providing form designers with clear and direct advice, they attribute to the knowledge base in the field and thus to the professionalism of the designers. In this case, the conclusion for designers may be that instructions and marked answer spaces do not always have the intended effect on the form-filling behavior. And even if they do, the effect may only be of very little importance, since there are no indications that block letters or capitals improve the performance of data typists.

#### 4.2 A design variable at the global level: positioning of explanations and instructions

One example of a design decision at the global level of the form concerns the ordering of explanations and instructions. In our study of form-filling behavior reported above, we found that people filling out forms

- often need explanations because they lack the knowledge necessary to understand and answer the questions appropriately;
- tend not to read the explanations, because they regard completing the questions as their primary, if not their only task, and do not realize that they need background information or instructions.

Given this behavior, it seems important to present explanations in a way that encourages people to read them. In Steehouder & Jansen (1989), we proposed design heuristics based on a taxonomy of functions of the explanations.

It is obvious that heuristics like this is not very strict, and leaves the designer who wishes to apply it with a number of options to choose from. One advantage, however, of such "liberal" heuristics is that they can be used in many different situations. The challenge for researchers is to test the value of heuristic schemes like those proposed here. How can this be done? Extensive experimental validation would require a large number of studies. The independent variables in this example would be "type of explanation" and "location." The heuristics in Table 2 (p. 26) encompass 8 types of explanations, and at least 6 possible locations (brochure, letter, close to question, integrated with question, instructions for use, end of the form), so that many different

Table 2. Design heuristics for explanations

What kind of explanation?	Where to locate?
General background information about the regulation	In a separate brochure or an accompanying letter
Explanation of the functions of the form and the procedure to be followed	In the accompanying letter
Instructions on how to fill out the answers	In the form, close to the answer space; if possible, integrated in the question. General instructions in an "instructions for use" section or in the accompanying letter.
Motivations that explain why a particular question is asked	Close to the question, or in a separate document (brochure).
Explanation of the meaning of a question or term	In the form, close to the question or the term itself.
Routing instructions that guide the users through the document, such as instructions to skip questions, and references to explanations on separate sheets or brochures	There where they are actually relevant, e.g. just after an answer space ("continue with..."), right before a question ("skip if..."), or both.
Instructions for enclosures to be added with the form	As a part of the notes, and recapitulated at the end of the form.
Outcome-information that enables the people completing the form to anticipate the effects the form will have (e.g. how much they will have to pay)	In a separate brochure.

possibilities could be included in an empirical study. This is not to say that we think that by implication all kinds of experimentation with design options at a global level would be useless. Even though a limited number of experiments is clearly not sufficient to completely validate heuristics such as in Table 2, it can be useful to try and find out if applying the heuristics-as-a-whole to a specific form does or does not lead to acceptable results. Furthermore, in an empirical study, it may be expedient to compare the effects of a small number of different options which are not easily differentiated on theoretical grounds. This is what was done in a study that we will shortly discuss below.

The purpose of this project, carried out in 1991 on request of the Informatiseringsbank (an agency of the Dutch Ministry of Education and Science), was

to improve two related forms (mentioned in the introduction of this chapter) that were notorious for their complexity, with reprocessing costs of approximately Dfl. 180,000 a year (see Jansen et al., 1991a, b). Both forms had to be filled out by parents of students applying for an extra loan. Both forms asked the parents to provide a lot of information as to their financial situation.

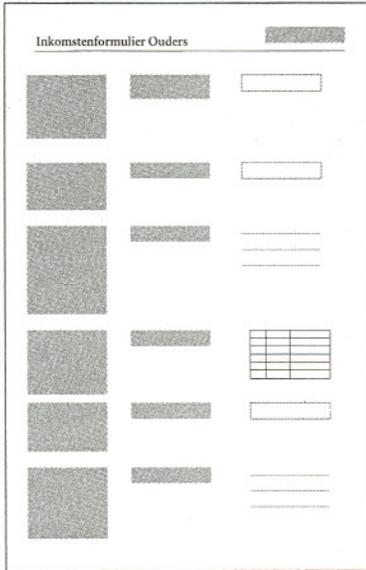
The assignment included redesigning the two forms, taking in consideration a number of legal and organizational constraints, in order to reduce the reprocessing costs as much as possible. For this purpose, a large number of changes were made. We will restrict ourselves here to the explanations.

Whereas most of the explanations in the original forms were given on a separate sheet without clear references to the questions concerned, in the new forms

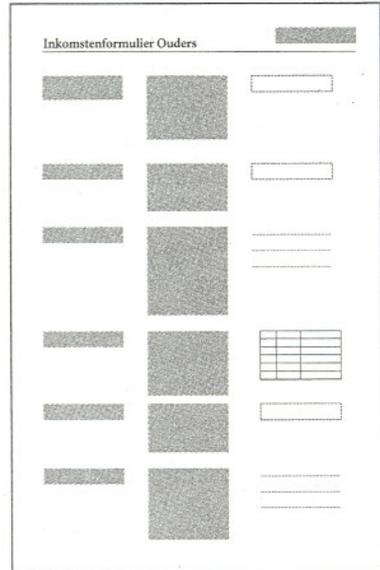
- background information was given in an accompanying letter;
- explanations of specific questions and terms were given close to the question concerned;
- routing instructions were given explicitly where they were relevant;
- instructions for enclosures were given as part of the notes and recapitulated at the end.

However, there was one aspect of the heuristics in Table 2 that was given extra attention: the location of explanations concerning the meaning of difficult questions and terms. To achieve that the distance between difficult questions and explanations would be as small as possible, thereby hopefully enlarging the chance that the people filling out the form would consult the relevant explanations, a "three-column layout" was applied. To be more precise: two different versions of a three-column layout were developed. Figures 2 and 3 provide a schematic representation of these two versions.

It was expected that both arrangements would enlarge the chance that the people filling out the forms would at least notice, and hopefully also read, the explanations. There was no clear expectation, however, which of the two options would be more successful. *The explanations-first* layout (Figure 2) might have the advantage of being more conventional in the eyes of the readers, in that it really kept questions and answers together. *The questions-first* layout (Figure 3), on the other hand, would perhaps have the advantage of tempting the readers to take more notice of the explanations, which they would literally find on their way when going from questions to answers.



**Figure 2.**  
Three-column layout: explanations on the left, questions in the middle, answers on the right



**Figure 3.**  
Three-column layout: questions on the left, explanations in the middle, answers on the right

In the experiment, 120 subjects were observed, all belonging to the target group of the forms. Their assignment was to complete, while thinking aloud, either a newly designed form with an explanations-first or a questions-first layout, or an original form with explanations as notes on a separate sheet. Table 3 shows for each condition how many subjects did *not* examine any of the explanations.

**Table 3.** Effects of locating the explanations

Location of explanations	Subjects <i>never</i> examining explanations
Explanations as notes on a separate sheet	30.0 %
Three-column layout, explanations first	12.5 %
Three-column layout, questions first	10.0 %

These figures suggest that a three-column layout enhances the chance that users read the explanations, although it does not provide an absolute guarantee. The

location of the explanations (left or right of the questions they belong to) does not seem to make a serious difference.

Apart from the issue of locating the explanation, the study also aimed at optimizing other aspects of the forms. As a whole, the forms turned out to be considerably improved; the number of forms that had to be re-processed dropped from 60,000 to 20,000, which resulted in a saving of Dfl. 120,000 on a yearly base. The costs of the study could be recouped within a year.

#### 4.3 Research and design practice: a complicated relation

The two examples summarized in Sections 4.1 and 4.2 show that experimental research can reveal useful insights into the effects of certain design options. However, they also show the difficulty of establishing a research program that would enable us to formulate clear guidelines for form design:

- The number of options is very large.
- Since each option can be put into operation in a large number of ways, the number of experiments needed to test the options would grow exponentially.
- Since the effect of a single option may depend on other decisions made in the design process, it is very difficult to draw general conclusions on the effect of such a single option.

Given these complications, it is not surprising that designers take a relative view of scientific research. What is the practical use of research that produces only tentative results with many restrictions, and usually concludes that "more research is needed"?

To avoid this problem, a different approach may be chosen. What we need is a more exhaustive understanding of *strategies* that people apply when completing forms. Understanding the "logic of the user" enables form designers to anticipate mistakes resulting from inadequate design options. Wright's (1987) analogy of a nautical chart is still very to the point. Using the results of studies into user behavior, researchers may contribute to a nautical chart of the "design space," indicating some safe routes as well as a number of shipwrecks and sandbanks. Designers have to feel their way with the use of these charts, but also need to make their own decisions.

How do we come to a reliable chart with a sufficient level of detail? Of course, experiments can help us find some courses of navigation, even though the captain (the designer) has to decide whether the route is navigable for his

particular ship. On the other hand, it is very important to share knowledge. If designers know what routes have been found navigable by others, and where others have stranded, this might help them to find safe routes.

Leaving the analogy aside, we would like to argue that evaluative research will become a regular part of the design process, and that the results of this research will be made available to others. Regrettably, it is not yet common practice that forms are tested before they are put into circulation, nor is it usual to evaluate forms when they are used in practice. In the rare cases that forms are tested or evaluated, the results are poorly documented and usually not published. We know of at least two instances where researchers were asked to test a government form that had already been tested before — in both cases the organization was not aware of the previous research, let alone that the results had been implemented.

## 5. Electronic forms

In the sections above, we focused on research into government forms printed on paper. However, paper is now evidently no longer the only data carrier used by government. A number of Dutch agencies have started using computer technology for collecting data from individual citizens. The *Belastingdienst* (Tax Department), for instance, has been using electronic forms for the income tax declaration since 1996, initially distributed on diskette (Figure 4), and since 1998 via its web site (see <http://www.belastingdienst.nl>). The downloadable electronic *T-biljet voor jongeren* (restitution form for young taxpayers) is particularly remarkable (Figure 5). Its simple language and revolutionary youngish graphic and interactive design have led to positive reactions.

Obviously, an important motive for using electronic forms is the expected increase of efficiency in the processing of data by the agency itself. The transport of data from paper form to computer system can be skipped when electronic forms are used. But electronic forms may also have several advantages for the citizens who have to complete the forms. Applying quite common software features may prevent many of the problems we found in our earlier study (Section 3). To give only a few examples.

Aangifte Inkomstenbelasting/Premie volksverzekeringen

Belastingdienst 1998

Persoonlijke gegevens

Naam: M. Steehouder  
 Adres: Kaalberland 15  
 Woonplaats: Enschede  
 Beroep:   
 Telefoon thuis:  Telefoon werk:

Sof-nr: 0267.95.887  
 Postcode:   
 Geb.datum:

Uw persoonlijke gegevens op de begeleidende brief zijn onjuist  
 Uw rekeningnummer voor teruggaaf wijkt af

Heel 1998 ongehuwd  
 Heel 1998 gehuwd  
 Een deel van 1998 gehuwd

Datum huwelijk:  - 1998  
 Datum (echt)scheiding:  - 1998  
 Datum overlijden echtgenoot:  - 1998

Moet u aangifte vermogensbelasting doen?  Ja  Nee

Voor meer informatie, kies 'Hulp' of toets <F1>

Hulp  OK  Annuleren

Aangifte van M. Steehouder

Belastingdienst 1998

Specificatie: beroepskosten

Omschrijving kosten:  Bedrag:

Meer beroepskosten

Ontvangen vergoedingen:

Kies 'Specificatie' als u me...

Belastingdienst Aangiftekette: Fiscale Hulp

Bestand Bewerken Bladvolgen Drukken Help

Info/dooropgeven Zoeken Volgen Afdrukken Programmahulp

**Werkelijke beroepskosten**

Als uw werkelijke beroepskosten in 1998 hoger waren dan het vaste aftrekbare bedrag, kan het zijn dat u de werkelijke kosten mag aftrekken. U moet dan wel voldoen aan drie algemene voorwaarden:

U kunt niet alle beroepskosten aftrekken: een aantal kosten is helemaal niet of slechts gedeeltelijk aftrekbaar. In het overzicht beroepskosten staan kosten die vaak voorkomen. Bij elke soort kosten staat of zij wel of niet als beroepskosten aftrekbaar zijn.

Als u van uw werkgever of opdrachtgever een belastingvrije vergoeding heeft ontvangen voor bepaalde beroepskosten, dan moet u deze vergoeding van de gemaakte kosten aftrekken. Het aftrekbare bedrag bestaat dus uit de werkelijke beroepskosten verminderd met de eventuele belastingvrije vergoeding.

Hulp  Verzamelstaat  OK  Annuleren

Figure 4. Two pages of the electronic income tax declaration form. Some questions appear only if the answer on a previous question calls for extra information. Brief instructions are given in a special bar below (left). Explanations about the regulation are given in online documentation, which can be accessed context-specifically via the Help-button (right).

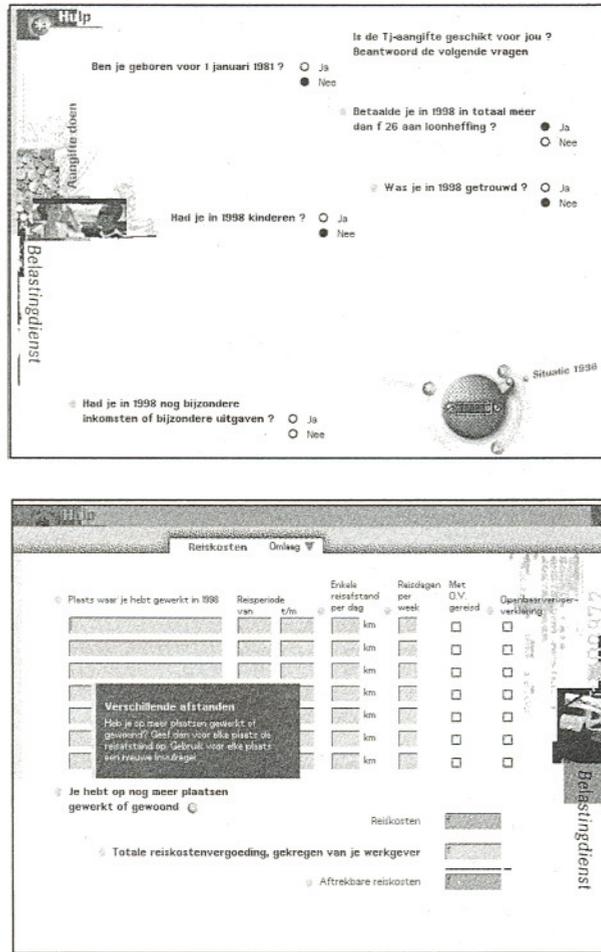


Figure 5. Two pages of the *T-biljet voor jongeren*. Questions appear successively after the previous question has been answered, but they seem to be scattered over the screen rather randomly (left). The number of rows in the table can be extended by the user as much as needed in his or her particular situation. Pop-up windows provide explanations of technical terms (right). The form is in color (blue and yellow, the house style of the *Belastingdienst*).

- Routing problems may be eliminated by using a branching program that only asks questions that are really needed given the answers to previous questions.
- Verifying activities may become less important since the computer does all the computation. Moreover, computer programs may contain “built-in”

checks that are able to detect implausible or contradictory answers to questions, and warn of possible errors.

- Terminology problems may be solved by providing pop-up definitions and explanations.
- Explanations may be available via online help. Some explanations may even be replaced by "wizards" that do not explain how to find an answer to a question, but guide the user to the right answer step-by-step.

However obvious these advantages may seem, it is not completely clear whether such features really have the intended effects. For instance, do people really use online help in electronic forms more often than they read explanatory material in paper forms? In addition, new problems may occur. It is, for instance, not unthinkable that explanations on online forms will lead to even more serious orientation problems, since the complete form may be not visible at one glance. And despite the decline in computational errors, a larger number of typing errors may reduce the reliability of the answers.

Only a few studies of electronic form filling have been published, and they provide no more than tentative answers to the question of whether electronic forms really help. Frohlich (1987) performed a small-scale experiment as a continuation of his study of form-filling behavior with paper forms (Frohlich, 1986; see Section 3 above). He asked eight subjects to fill out — thinking aloud — a computerized version of the same (supplementary benefit) form that had been filled out by eight other subjects in his previous study. Essentially, the behavior of both groups of subjects proved to be governed by the same principles, of which the most important seem to be:

- the *principle of least reading effort*: "only read what seems to be necessary to maintain form-filling progress";
- the *principle of logical progression*: "work through the questions in the order they appear." In the case of a paper form, "logical progression" is synonymous to "linear progression." Frohlich's subjects typically started at the first printed question and considered each new question in turn until routed elsewhere. In the electronic medium, the subjects in this study worked through the questions in the order in which they were recommended by the software (Frohlich, 1987: 124).

Bergen et al. (1992) compared three versions of a form issued by the city of Eindhoven. New inhabitants have to fill out this form to get connected to the gas, water, and electricity mains. Besides the existing paper form, two new

forms were designed, one on paper, the other electronic. Both new forms were graphically identical.

Each form was filled out by a different group of 20 subjects, who were asked to think aloud. The results showed that the new paper version led to considerably fewer errors (on average 1.6 errors) than did the original paper version (on average 10.5 errors). The electronic version also led to a relatively small number of errors: 2.9 per subject. But it was clear that it did not outperform its paper counterpart.

The thinking-aloud protocols showed an interesting difference between the paper and the electronic version of the new form. Whereas the subjects using the paper version faithfully followed the routing instructions on the form, those working with the electronic version ignored these instructions many times. There was an obvious explanation for this phenomenon, though. The electronic version did not show any routing instructions unless the user clicked on a help button. Only then explanations appeared on the screen, including routing information. In conformity with Frohlich's principle of least reading effort, the users of the electronic form hardly ever asked for explanations, thereby sometimes missing essential routing instructions. As a consequence, they did not always answer questions they should have answered, and lost a considerable amount of time submitting information that in their case had no relevance.

Although both studies discussed here contribute to our insight into the essential characteristics of form-filling behavior, their significance as investigations into the effects of implementing electronic forms is limited. In both studies the forms used can now be considered rather outdated. Both Frohlich and Bergen et al. used electronic forms that did not solve the selection problems for the user. Recent electronic forms, however, such as the *Aangiftebiljet* and the *T-biljet voor jongeren*, "automatically" lead the user to the next relevant question or information block.

In the electronic form in Frohlich's study, the subjects could always decide for themselves which information they wished or did not wish to read. No "hard" selection decisions were made by the software. Only implicit recommendations were offered: the cursor moved into the answer area of the next relevant question after the user had answered the question displayed. The subjects could still mistakenly choose to ignore recommended questions, and to pay attention to irrelevant information.

In the study by Bergen et al., the electronic version confronted the user with even more selection tasks than the paper version. Whereas the routing instructions were constantly available in the paper form, users of the electronic version

could only make adequate decisions as to which question had to be answered next, if they first had made the correct selection decision on a lower level: whether or not to read the relevant help information.

The conclusion must be that, in both studies, an important difference between paper forms and most modern electronic forms has not, or not fully, been taken into account: the support electronic forms can offer the user in making the right routing decisions. It would be worthwhile to undertake new studies with forms in which this advantage of automatic selection is explored. Possible candidates for such studies would be, for instance, the electronic Dutch tax forms. But there is, of course, an abundance of existing forms that could be used. An obvious question for new empirical studies would be: Under which conditions can electronic forms be expected to reduce (or enlarge) the various types of problems that users are confronted with when filling out paper forms? The results may sharpen our picture of form-fillers' behavior and help government agencies and others to improve their communication with their target groups.

## 6. Conclusions

Having completed the studies summarized in this chapter, we feel that our understanding of the text genre of the government form has grown, and that we are able to support form designers better than we could before.

From a research point of view, we think that we now understand more of the strategies that people apply when completing a form. Their behavior is particularly characterized by their attitude ("kick-and-rush"), by their striving for optimal efficiency, and by their lack of prior knowledge. Since these characteristics have also been found in studies of other types of instructional documents, we think that our study has contributed to a more general insight into the way people use instructional documents in everyday situations.

Another result of the studies summarized in this chapter is a clearer insight into the "design space" of form designers. The research makes clear what decisions have to be taken, and which options are worth considering. The example of explanations may illustrate this point. By studying the problems of people filling out forms and using explanations, we became aware of the different sorts of explanations that are used in forms, we were able to describe their functions, and we could make predictions about their most appropriate locations.

Finally, the experiments we conducted with regard to design variables, both

at local and at global levels, yielded some interesting data about the effect of textual elements on the performance of people who fill out forms. These results can supply building blocks for constructing models and theories of text processing in practical situations.

Another, perhaps more substantial, effect of studies like those discussed above may have been that they helped putting usability of forms on the agenda of designers. Until the 1980s, the leading Dutch textbook on form design (Oltheten & Steenwijk, 1979) focused almost entirely on issues of graphic design and on organizational aspects. From 1980 on, in the Netherlands, as in other countries, researchers emphasized the importance of "plain language" and usability as a criterion for the quality of forms and other documents (for a recent overview, see Sless, 1998). It seems fair to say that, as a result, the requirement that forms should be easy to complete is self-evident nowadays.

We believe that our studies also proved that the process of usability testing and revising can really help to improve forms. Moreover, the research offered a useful method for usability testing, combining thinking-aloud protocols, observations, interviews, and error analysis. It also provided some heuristics for analyzing protocols. Nowadays, it is not unusual (although regrettably no common practice either) to conduct a usability test and to revise new forms before printing, and releasing them in a million copies or more.