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DOCUMENT DESIGN

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ABSTRACT

This article focuses on a fairly new discipline in the field of language and communication studies, i.e. document design. Document design is defined as the field of theory and practice aimed at creating comprehensible, persuasive and usable functional documents. The article discusses both its social and its academic mission. On the one hand, document design intends to meet the communicative needs of individuals and organizations in modern society; on the other, it fits in with a new view on language training and text research which is characterized by a close connection of theory and practice and a high degree of interdisciplinarity and social relevance.

After an introductory first section, section 2 briefly motivates why document design professionals are needed. In section 3, the social relevance of document design research is argued for and illustrated by describing the set up and results of one of the earlier Dutch studies into the effectiveness of government forms. Section 4 surveys the different types of knowledge and expertise a document design expert is expected to display. Section 5 goes into the academic training of document design professionals: how should document design training at an academic level be organized so as to achieve both its academic and social mission? Section 6 illustrates how document design gradually takes up its place as an interdisciplinary scientific discipline with its specific research goals and methods.

OPSOMMING

Die onderwerp van hierdie artikel is 'n redelik nuwe dissipline in die veld van taal en kommunikasie, naamlik teksontwerp. Enersyds is dit die strewende van teksontwerp om te voldoen aan die kommunikasiebehoeftes van individue en organisasies in die samelewing van vandag; andersyds pas hierdie veld in by 'n nuwe beskouing oor taalopleiding en teksnavorsing wat gekenmerk word deur 'n nuwe verbintenis tussen teorie en praktyk, 'n hoë graad van interdissiplinêre samewerking en sosiale relevansie. Na die inleidende eerste deel, word in afdeling 2 'n kort motivering gegee vir die behoefte aan professioneel opgeleide teksontwerpers. In afdeling 3 word die sosiale relevansie van navorsing oor teksontwerp beargumenteer en geïllustreer aan die hand van die resultate van vroeë navorsing in Nederland oor die effektiwiteit van vorms van die staat. Afdeling 4 gee 'n oorsig van die spektrum kennis en vaardighede wat van die teksontwerper verwag word. Afdeling 5 word gewy aan die akademiese opleiding van professionele teksontwerpers: Hoe moet 'n akademiese opleiding in teksontwerp daar uitsien om sowel die akademiese as sosiale doelstellinge daarvan te verwesenslik? Afdeling 6 illustreer hoe teksontwerp geleidelik besig is om sy plek in te neem as 'n interdissiplinêre wetenskaplike vakgebied met sy spesifieke navorsingsmetodes en doelstellinge.

1 Introduction

Over the last few decades, technological progress, social changes, economic globalization and political evolutions have resulted in what may be called the information society we are living in today. Within this new 'social order', which is symbolized by new means of communication such as the Internet and mobile telephony, communication has become more and more demanding, varied, complicated and crucial not only for all kinds of organizations (profit and non-profit, governments, etc.) but also for individuals both in their private life, and in their professional activities.

This evolution has urged communication and language experts to develop new areas of research and to broaden the traditional boundaries of training and research associated with language and literature to provide for the expertise demanded by the information society. One such area is that of document design, which - in short - can be characterized as the field of theory and practice aimed at creating comprehensible, persuasive and usable functional documents or texts.

In this article, we focus on document design as a fairly new discipline which, on the one hand, aims to meet the communicative needs of individuals and organizations in modern society, and, on the other hand, to fit in with a new view on language training and text research which is characterized by a close connection of theory and practice and a high degree of interdisciplinarity and social relevance.

As Schriver (1997:10-11) points out, document design is "the field concerned with creating texts (broadly defined) that integrate words and pictures in ways that help people to achieve their specific goals for using texts at home, school, or work". Document design is about "bringing together prose, graphics (including illustration and photography) and typography for purposes of instruction, information, or persuasion". In the field of document design, the terms 'text' and 'document' are used in their broadest sense; document design is not just restricted to texts on paper, but includes all kinds of digital information carriers like electronic forms, on-line help texts, hyper documents, web sites, etc.

In this article, we will primarily be focusing on one text type, the genre of instructional texts, which comparatively received much attention in the last decades in the USA as well as in Europe. The primary goal of instructional texts is not to inform readers on a given state of affairs, or to convince them of a certain point of view. Rather, they help readers (or users) to solve a concrete problem, or to execute a specific task. In general, readers will only consult them when they want information on how to work with a specific tool or how to solve a specific problem.

Instructional texts have many sub-genres, such as

- software manuals, either on paper or on-line, tutorials or reference guides
- instructional brochures, e.g. for determining whether or not to apply for a government grant/subsidy
- explanations for filling out a form
- drug information leaflets
- instructions for consumer electronics, from lady shavers to VCR-recorders
- route directions.

What these documents have in common is the fact that they are very unpopular with the reading public. Users prefer tools and products that are self-evident and easy to use without any help, let alone written help. In addition, many instructional documents lack a minimum of

user-friendliness and are hard to understand, amongst other things because of an abundance of technical terms and complicated and long-winded sentences.

Overview

The structure of the article is as follows. In section 2, we shortly motivate why document design professionals are needed. In section 3, the social relevance of document design is argued for and illustrated by describing the set up and results of one of the earlier Dutch studies into the effectiveness of government forms. Section 4 illustrates what exactly a document design expert is expected to be able to do. Section 5 goes into the academic training of document design professionals: how should document design training at an academic level be organized in a way as to reach both its academic and social mission? In section 6, it is contended that document design gradually takes up its place as an interdisciplinary scientific discipline with its specific research methods and goals.

2 The need for document design professionals

No other phenomenon can better explain the growing importance of professional instructional communication than the revolution of the computer over the past few decades. From its humble beginnings as a mono-functional counting machine for only a few experts, the computer gradually developed into a basic and indispensable tool in performing a large number of activities and functions. One of the major challenges in successfully embedding the computer into society consists in providing adequate and usable information that helps an ever growing legion and variation of users - novices and experts, youngsters and the elderly, highly and poorly educated people - to get to work with an ever growing number of applications which cover an ever larger part of individual and social activities.

The scale of this challenge can be illustrated by a recent study on the distribution and the use of computers and other digital equipment in the Netherlands (Doets & Huisman, 1997). The study reveals that about 60 % of the population have a personal computer at their disposal. However, only half of them use it regularly; the other half can hardly work with it. The majority of computer owners experience a lack of knowledge and skills in handling the computer. For example, 70% of them feel they lack the skills to perform basic word processing tasks. In sum, computers provide users with an abundant set of functions and tools, which, however, are used poorly, insufficiently and inadequately.

There may be many reasons for this 'underutilization' of the computer's potential. The lack of adequate instructional material certainly is a major reason. In a survey of *PC Magazine* (mentioned in Steehouder & Jansen, 1997:19), 1200 computer users were asked what they thought were the major obstacles in learning to use new computer software effectively. Of them, 95% of them mentioned 'inadequate manuals' as an obstacle. Instructional documents often prove to be inaccessible, difficult to understand and written from the perspective of the designer instead of from the user's perspective. This translates to the fact that the information wrongly focuses on answering questions such as 'How does this programme work?' or 'Why did we make it this way?' instead of questions like 'How can I solve my problem?' 'How can I find my way through the programme' or 'how can I execute my task?'

Similar observations can be made for other areas of society where instructional information is pivotal. One such area is the communication between government and citizens. Sociological research carried out by Van Oorschot & Kolkhuis Tanke (1989) revealed a considerable portion of 'underconsumption' of social governmental grants or subsidies, which means that a large part of the target audience for which a subsidy is available does not receive what they are entitled to. Van Oorschot & Kolkhuis Tanke conclude that grants often do not reach their

target audience in the (European) countries they surveyed partly because of the complexity of the forms and the information on the regulations that apply to subsidies. These documents are much more focused on the regulations than on the way in which users have to act in order to ascertain whether they qualify for them and on how to apply for them.

3 Improving instructional documents by research: a case

The first significant attempt to meet instructional communicative problems can be located in the early seventies. In a number of English-speaking countries, such as the US, the UK, Australia and Canada, so-called "Plain Language Campaigns" were started. The campaigns were aimed at reducing communication problems by simplifying the language used in functional documents. The campaigns concentrated mainly on documents issued by the government (cf. Schriver, 1997:26-32 for an extensive overview). In a number of respects, the Plain English Campaigns have certainly been successful. Complying with the most compelling directives suggested in the campaigns, such as replacing technical jargon by simpler terms and rephrasing complex sentences, undoubtedly improves the accessibility and readability of instructional documents. But more importantly, the campaigns resulted in governments and other parties gradually realizing that to write high quality instructional documents asks for specific knowledge and skills which are not available within their own organization as a matter-of-course.

As an illustration of this development and its concomitant effects on document design, we will discuss one of the early experimental document design studies in the Netherlands (Steehouder & Jansen, 1982; Jansen & Steehouder, 1984; 1989:36-40). It can be regarded as a key example of the social relevance of document design research and it illustrates how document design research can contribute to the effectiveness of documents. Furthermore, it demonstrates that using plain wording and style alone is insufficient to create effective and usable instructional documents.

In 1981 the Dutch Ministry of Housing decided to issue a new version of a brochure that was distributed among tenants of houses and apartments who might be eligible for a so-called 'Rent Rebate Grant'. The aim of this rather complicated regulation was (and still is) to provide financial help - which amounts on average to approximately 400 Dutch guilders each month - to tenants whose income is relatively low while their rent is relatively high. In order to receive the grant, however, tenants have to apply for it. According to data available at the Ministry in 1980, about 750,000 tenants were entitled to the rent rebate. However, only 450,000 of them actually claimed it. Since it is unlikely that all these tenants simply were not interested in receiving the grant, there must be other reasons for this 'underconsumption', one of which may well be the complexity of the regulations and the quality of the communication about the grant.

By issuing a new official version of the brochure on the grant in 1981 (henceforth referred to as version 2) the Ministry tried to overcome the criticisms of the earlier 1980 brochure (henceforth referred to as version 1). Almost all differences between version 2 and version 1 had to do with wording and style: a number of difficult terms were replaced by allegedly simpler words, sentences were shortened, and some (but not all) notorious syntactic constructions like passives and nominalizations were replaced by easier readable alternatives.

To find out if the changes in the brochures had been real improvements, Jansen & Steehouder compared the versions 1 and 2 in an experiment, together with two more versions of the same brochure, which they developed themselves. Version 3 was written in conventional prose, and incorporated a number of relevant recommendations taken from

existing document design literature. Version 4 had a totally different design concept: it consisted of twenty related flowcharts which presented the information on the basis of a large number of questions connected by yes- and no- arrows. These questions were intended to guide each user from his/her own starting point to the appropriate outcome.

Each version of the brochure, accompanied by a brief description of the situation of a fictitious typical Dutch family, was presented to approximately 180 subjects. The subjects were asked to find out whether the fictitious family was entitled to the rent rebate, and if so, to what amount. The results showed that the number of completely correct answers was strikingly low for all four versions: on average only 6.2% could determine the correct amount of monthly rent rebate. The three prose versions 1, 2 and 3 scored extremely low: on average 3.4% (version 1: 1.1%, version 2: 3.2%, and version 3: 6.1%). The only version that led to significantly better results than the others, was the flowchart version (version 4) with on average 15.1%.

A number of conclusions can be drawn from these results, the most important of which are the following:

- The communication about the Rent Rebate Regulation suffers from serious problems which are not easily solved.
- Applying conventional guidelines with respect to wording, syntax, style and structure is no guarantee for the success of documents such as these, whether the guidelines are implemented by unskilled civil servants, or by trained communication specialists.
- The results of the study show that it is possible to improve the communicative quality of functional documents by resolutely changing their design.

This last conclusion was corroborated by the results of an additional experiment (Jansen & Steehouder 1984:13-16; 1989:228-232) in which a fifth, electronic version of the brochure was tested: i.e. an interactive computer programme based on the series of flowcharts in version 4. Version 5 was presented in a computer lab to 35 subjects who were asked the same question as in the previous experiment: find out whether the fictitious family is entitled to rent rebate, and if so, to which amount. The results show that 34.4% of the subjects succeeded in finding the correct answer. Of course, this percentage is not satisfactory at all yet, but it proves that a radical change in presentation format and medium can yield a more efficient use of complicated functional information.

These experiments do not only show the relevance of document design research, but they also raise a number of new questions and hint at new areas of attention and research:

- Are the results obtained in these experiments typical of what can be achieved by improved document design?
- How can design improvements be related to and explained by observations and theories on how readers use instructional documents?
- What are the crucial conditions of use which determine how readers use instructional documents?
- Do various subgroups basically differ in the way they use documents?
- What are the consequences of design improvements for the organization?

It would be strongly exaggerated to conclude that document design research has thus far resulted in definitive answers to these questions. But, as we hope to show in the remainder of this article, progress has been made.

4 The profile of document design experts

The communicative problems with instructional documents - as illustrated in section 2 - and the different ways in which these problems can be alleviated - as demonstrated in section 3 - ask for new expertise in the field of professional instructional communication. The scale and complexity of the problems require document design experts to be much more than 'simply' good writers and ask them to be experienced in a large number of skills and knowledge domains (see also Schriver, 1989a).

A fictitious example might demonstrate the multifunctionality and interdisciplinarity of document design expertise. Suppose a software company needs an expert to develop technical documentation for a new software product, let's say a bookkeeping programme for hospitals. A comprehensive profile for such a document design (henceforth DD) specialist would most probably include the following.

Technical writing

The DD specialist must be able to write technical material in a logical way, in a 'sharp' style, and using adequate terminology.

Product technology

The DD specialist must be able to

- understand the product
- communicate with product developers
- decide on the interaction between product and information.

Psychology - ergonomics

The DD specialist must be able to

- analyze the users' needs and demands, their world knowledge, their attitudes, their information seeking behavior, and their learning strategies
- decide on the interaction between user and information.

Project management

The DD specialist must be able to

- organize the life cycle of the information product (concept - draft - evaluation - review - update)
- orchestrate the input of different experts.

Medium expertise (new media, graphic design)

The DD specialist must be able to

- evaluate the merit and interaction of different relevant communication media (hotline, offline manual, online, hypertext, Internet, web site, etc.)
- map types of media onto the information demands of different types of users
- evaluate the merit of offline graphical tools and techniques (graphical support, sophisticated printing, custom-made printing, etc.)
- plan when/why to use text, visuals or both
- implement online technology (online help, HCI-systems, hypertext navigators, graphic user interfaces, etc.).

Training

The DD specialist must be able to train new writers/specialists for participating in information projects.

Documentation automation - computer technology - knowledge management

The DD specialist must be able to evaluate and decide on the way in which documents are to be electronically organized, related to each other, managed, and updated (information storage and retrieval).

Document evaluation

The DD specialist must be able to

- evaluate the quality of document drafts and predict their effectiveness
- evaluate the effectiveness of documents-in-use
- investigate the effect of particular document characteristics or variables
- develop ways of testing and evaluating documents.

Multilingualism

The DD specialist must be able to organize the process of conceptualizing, translating and relating different language versions of the same document for worldwide use.

Multiculturalism

The DD specialist must be able to adapt versions of documents to cultural backgrounds, habits and assumptions of different target audiences.

Although this agenda cannot be realized by one and the same individual, the different areas of expertise have to be part of a training programme as it is outlined in the next section.

5 Academic training for document design experts

The ambitious tasks that the field of document design has set for itself requires new ways of training document design specialists. Starting from the expert tasks contained in the ideal profile given above, three main training areas can be distinguished:

Document expertise:	writing, translating (linguistically as well as culturally), medium choice, new media technology, audience analysis, graphic support, document evaluation
Technical expertise:	product knowledge, user interface technology, database technology
Management expertise:	managing the documentation process, managing the information flow, training

If the task of training document design specialists is left to an academic language or communication department, it is clear that these areas could not be represented equally in the curriculum. Although crucial in the practical field of documentation, technical and managerial expertise can hardly be considered to be the core of a linguistic academic schooling in document design. It would, therefore, be justified to restrict the curriculum to the skills and the knowledge directly connected with document design itself.

Training in document design should be guided by an *academic* and a *social* mission. Being a part of an academic curriculum in language or communication, document design should exceed the level of practical skill learning such as genre specific writing or translating. Instead, document design scholars have to meet basic academic standards and have to approach documents as an object of study and research. This includes different activities, which will be elaborated on in this article:

- DD scholars have to reflect upon documents on the basis of recent relevant literature in the field of DD.
- They have to relate DD issues to research issues relevant to other areas of (psycho)linguistics and communication studies.

- They have to formulate and answer new research questions which are focused on variables or components of documents which are assumed to be relevant in effectively using documents.
- They have to develop and evaluate scientific methods of assessing the quality and testing the effectiveness of documents, both user-centered and text-based.

The social mission of document design training implies that DD scholars should be able to put themselves in the perspective of a communication specialist acting in a specific organization, who is asked to analyze the communicative needs of an audience and to design, revise or evaluate documents, taking into account all relevant contextual parameters and technological demands.

Within this dual agenda, the key activities of document design specialists can be surveyed as in figure 1 (see for more details: Maes, Ummelen & Hoeken, 1996:179-236).

Figure 1. Key activities of training for document design specialists

	from practical relevance.....
DD analysis	analyzing information needs, users' profiles, communicative contexts
DD design	designing documents (writing, translating, revising, etc.)
DD evaluation	testing and evaluating individual documents
design research	collecting empirical (experimental) evidence on the effect of design characteristics of documents
cognitive research	collecting empirical (experimental) evidence for theories on the functioning of human cognition and on the mental processing of (instructional) texts
to theoretical relevance

In the remainder of this section, we will take a brief look at what each of these activities entails.

5.1 DD analysis

Before information can be designed or evaluated, the communicative context has to be analyzed in order to determine the needs of specific users in specific functional communicative situations. The skills which play a part in this analysis involve determining:

- the information-seeking behavior of the user
- the relevant information sources available to the user
- the comprehensiveness of the information needed
- the type of information needed
- the medium used to access the user

These analytical skills largely depend on psychological and sociological research methods. The information seeking behavior of users can be determined by observation at the workplace as well as through interviews and questionnaires (see e.g. Kern, 1985); available

information sources can be detected by analyzing organizations in which documents are used. The most important point here is the analysis or the prediction of the users' behavior and the relation between users' characteristics and document design options.

On the basis of recent DD literature, a number of user's behavior determinants present themselves, which may guide DD specialists in their design decisions:

- Document users may have *different degrees of task experience and product experience*. Someone who uses WordPerfect in order to write a letter, may be experienced in writing letters (task experience) or not, he or she may be acquainted with word processors in general or with WordPerfect in particular (product experience). Different levels of experience influence the amount and the type of information needed.
- Readers use instructional information differently, depending on the characteristics of their *cognitive style*. They can be explorative or receptive, have a visual or verbal orientation, or they can have a preference for procedural or declarative information (see e.g. Teurlings, 1993).
- Readers of instructional documents may have *different goals in using information*: execute a procedure only once, solve a problem, learn or apply a procedure, understand the function or the mechanics of a device, looking for arguments in order (not) to perform procedures. For example, a simple feature like the table function in a word processor may raise many different user questions, as is illustrated in Figure 2.

Figure 2. Different types of user questions about the table function in a word processor (see Maes et al. 1996:132)

identification	What is a table, what are cells, rows and columns?
task oriented	How to make a table in this word processor?
system oriented	How does this word processor handle tables? What 'happens' when you use tables?
function oriented	When and why are tables useful?
problem oriented	What kind of problems can be caused by the use of tables?

Readers' goals determine the type of information needed, as well as the way in which it is accessed and used. For example, learners need much more declarative and conceptual information than readers who only use information to execute an installation procedure once. Different psychological models can be used to predict the 'informational' behavior of users with different goals, such as Guthrie, Bennet & Weber's (1991) model of task performance, Anderson's (1983) theory on learning skills and Fishbein's (1967) model of persuading users (not) to perform actions.

5.2 DD design

Translating user variables into design variables is not a straightforward activity. As it would be unrealistic to design a single document for each individual user, document designers have to try to design information in such a way that different goals and preferences can be met in one document structure. This requires the implementation of (and training in) design variables which allow multifunctional use of documents:

- a task-orientated (as opposed to a system oriented) organization of information. This means an ordering of information on the basis of the relevant main and subtasks;
- a user-centered style, which starts from the perspective of the user;
- a modular structure, which allows users to access documents wherever they want to. This includes recognizable modules on different hierarchical levels with a fixed structure, predictable content and supportive labeling. In this way different types of information can be recognized and accessed from different user perspectives.

These and other variables are implemented and discussed in relation to different style formats for instructional documents, such as Information Mapping (Horn, 1985; 1992) or the Minimal Manual (Carroll 1990; 1998; Van der Meij & Carroll, 1995).

5.3 DD evaluation

Document design specialists should be acquainted with different ways of improving the quality of professional documents. From a practical point of view they have to be able to investigate and evaluate the quality of individual documents, which is one of the basic tasks of communication experts in organizations. From an academic point of view, they have to be able to analyze relevant variables of instructional documents and to investigate the effectiveness of these variables by using research methods which are commonly used in social and cognitive sciences. DD evaluation can be set up to collect different types of data which reflect different types of effects a document or document variable may have, as Figure 3 shows.

Figure 3. Different types of effects in document design evaluation

<i>type of effect</i>	Evaluation or research question
<i>attention</i>	Do users pay attention to this document (or variable) and are they motivated to read or use the document?
<i>evaluation</i>	How do experts or users evaluate the quality of this document (or variable)?
<i>appreciation</i>	How do users appreciate this document (or variable)?
<i>performance</i>	Does this document (or variable) result in efficient task performance?
<i>accessibility</i>	Does this document (or variable) help the user to find the relevant fragments efficiently?
<i>motivation</i>	Does this document (or variable) motivates users to execute procedures?
<i>comprehension</i>	Is the user able to build a coherent mental representation of the task or the product on the basis of this document (or variable)?

Communication consultants or specialists are frequently asked to give a substantiated judgment about the quality of documents. Quality judgments of individual documents can be based on many different methods, mainly of two types: *text-based* as opposed to *user-*

centered methods (see e.g. Schriver 1989b). In the first case, documents are investigated on the basis of expert judgments; the second type is based on real user data. The most common methods, together with their basic characteristics are schematized in the following table (adapted from Maes, Ummelen & Hoeken, 1996:186)

Figure 4. Different research methods used in evaluating documents

<i>Name of the method?</i>	<i>Who supplies the data?</i>	<i>What is the core of the method?</i>	<i>What is the main result?</i>
text-based evaluation methods	DD experts	experts investigate the document from behind their desk	qualitative evaluation of the document
internal or external evaluation	expert from within or outside the organization	experts evaluate the document with or without checklist	qualitative evaluation as input of revision
try out	design team	designers execute all instructions as they are written down in the document	evaluation of completeness and correctness of the document
user-centered evaluation methods	users in a particular role	subjects perform an experimental task	
plus-minus method	user as evaluator	users put positive (+) and negative (-) markers in the document and explain them; researcher interprets the explanations	qualitative evaluation (comprehension, acceptance, appreciation) as a basis for revision
(interactive) work-aloud method	'verbalizing' user	users execute tasks while they are thinking aloud	qualitative evaluation of (the relationship between) document (and product)
(interactive) instruction method	user as instructor	users explain the instructions to others	qualitative evaluation of the mental representation of document and product
performance method	normal user	users perform tasks as 'normal' users	quantitative and qualitative evaluation of the effectiveness of the document

5.4 DD research

Compared to DD evaluation, the aim of DD research is more academic in nature: on the basis of relevant linguistic or psychological literature, DD researchers formulate questions and hypotheses on the effects of particular design variables. In an experimental set-up, these questions are answered, thus adding to the scientific basis of document design as a subdiscipline of language research.

In the area of document design, a large number of research topics present themselves, pertaining to different aspects and levels of documents. All these topics contribute to a better understanding of the intricate relationship between design variables in documents and different conditions of use and users in order to arrive at reliable design decisions. As an illustration, we will present a (far from complete) list of recent research topics, each with a few typical research questions:

- The effect of adding specific information types in instructional documents
 - How minimal should documents be? (Van der Meij & Carroll 1995)
 - What is the effect of declarative information in learning to use computers? (Ummelen, 1997)
 - What is the effect of 'preview information' (advance organizers) in instructional documents (Mayer & Bromage, 1980, Maes, Goutier & Van der Linden, 1992)
- The order and structure of information types in instructional texts
 - How to order different types of information (goal, action, result) in instructions (Jansen & Steehouder, 1996, Dixon, 1987).
 - How to structure problem information in manuals (Lazonder & Van der Meij 1994).
- Medium choice in instructional texts
 - How can text be visualized most effectively? (Marcus et al, 1996; Mayer et al. 1996, Boekelder & Steehouder, 1998, Maes & Lenting, 1999)
- Hypertext and using information
 - What kind of navigation strategies and problems can be found in using hypertext? (Van Waes 1998)
 - How does the structure of hypertext interact with the user's knowledge and experience? (McDonald & Stevenson, 1998)
- The mental representation of text and task
 - Which metaphors help users build adequate mental models? (Halasz & Moran, 1984, Kieras & Bovair, 1984.)
- Methods for assessing text quality
 - How can text quality be evaluated? (Lentz & De Jong, 1997; Renkema & Schellens, 1996)
 - How can testing and improving software manuals or government forms lead to increased users' productivity and hence to considerable savings for the organization (Redish, 1995; Jansen, Klatter & De Vet (1991a; 1991b).
- Problems and solutions in the use of instructional documents by specific audiences
 - How do elderly people deal with user instructions? (Van Hees, 1996)
 - How do people with different cultural backgrounds respond to document variables? (Jansen & Van Erkel, 1996; Warren, 1994)

Experiments aimed at answering these questions do not automatically result in clear-cut quality evaluations and design options. As is the case in other scientific disciplines, different arguments can be put forward to explain why sound and generally applicable conclusions on the effect of textual variables are difficult to come up with.

5.4.1 Different types of effects do not necessarily run parallel

Figure 3 illustrates that the effectiveness of documents may show up in different types of effects (in technical terms: different dependent variables). In many usability experiments, different types of effects (performance data, appreciation data, comprehension data, compliance data) yield different, sometimes even contradictory results. This makes it difficult to deduce unambiguous guidelines from experimental results.

For example, Magilsen & Maes (1996) discuss the adequacy of two modes of presenting information on a computer screen, i.e. the alternating screen presentation in which information is presented 'screen by screen' and the simultaneous screen presentation which shows different sources of information simultaneously on the same screen. Subjects, using either a simultaneous or an alternating screen presentation, had to perform short writing tasks, half of which required the use of one online document, the other half required two documents. The subjects' task performance as well as their appreciation of the task and the presentation mode were measured. The results showed that while all subjects clearly preferred a simultaneous mode of presenting information on the screen, performance data were much more varied and less clear-cut; when reading, subjects performed significantly better in the alternating mode; when producing a text, subjects slightly benefitted from simultaneous screens. If interface designers have to draw useful conclusions from these experiments, they have a hard job: do they listen to the appreciation results or to the performance data, each resulting in a different design decision?

5.4.2 Conclusions cannot be generalized over all users and situations of use

The interplay of characteristics of users and conditions for use can never be covered by one experimental design in such a way that the results can be generalized over all other users and situations. This is why most of the experimental work on DD variables restricts itself to one particular type of subject, mostly naive users. For example, the work which is focused on the effect of the minimal manual or information mapping is predominantly focused on non-experienced users, which of course restricts the generality of the conclusions.

5.4.3 Design characteristics cannot always be reliably investigated without a serious loss of 'ecological validity'

An ingrained complication of DD research is the delicate balance between ecological validity and experimental validity. Experimental designs have to provide researchers with reliable data and at the same time provide experimental subjects with an ecologically valid situation, i.e. a natural situation that they might run into in their every day use of instructional documents. A researcher who would like to know what the effect is of warning information in patient package inserts, should in fact follow patients in their daily life in order to see whether and how they comply with the warnings, which is impossible a task. In DD research real life situations have to be stripped in order to fit it with a feasible experimental setting.

5.4.4 The effects of different design variables often interact with each other

A further complication is that the effects of two different design variables may depend on each other. For example, Maes & Simons (1997) and Maes (1997) found out that the effect of warning markers (*Warning!*) depends on the (general vs local) scope of the warning information: general warning information was defined in this study as warning information of which the scope exceeds the section in which it is embedded; local warning information was information that was relevant only within the topic of the ongoing section. The results of the experiment showed that general warning information benefitted much more from a warning signal than local warning information. It was thus not possible to come up with a general conclusion on the effect of warning signals in instructional documents as the effect was dependent on another textual variable, i.e. the location and scope of warning information.

In sum, design research hardly ever results in one general, robust and relevant conclusion. Rather it results in conclusions of the following type: given these use conditions and these users, design variable x has a facilitating effect on the dependent variable y, and a negative effect on variable z. These methodological complexities put document design into perspective, and illustrate its delicate and precarious position in between theoretical research and practical application. At the same time, it stresses the academic and challenging nature of this type of document design research.

6 Document design as a scientific discipline

Document design is not only to be regarded as a training and education programme for professional communicators, but - as section 5.4. demonstrates - it also gradually develops into a full-fledged scientific discipline which is characterized by a high degree of interdisciplinary work, and by a typical research development cycle.

The typical development cycle of document design research falls apart in the following steps:

- Research topics and programmes are triggered by observed problems in the use or design of texts, the way it is illustrated in section 3.
- Textual problems are explored and analyzed in a desk research study, first of all from a user perspective; content, information order, style and format are described and evaluated; possible text problems are highlighted.
- Causes and explanations of these problems, as well as hypotheses about the effect of particular design variables are developed on the basis of an eclectic collection of relevant theories and models. In this way, problems in the design of functional documents are relevantly linked to and explained in terms of theories on human cognition, information/text processing and information ergonomics.
- On the basis of these theories, hypotheses are constructed about the effect of particular variables and their contribution to the solution of the practical problems.
- These hypotheses are tested empirically, the way it is discussed in section 5.4.
- The results of these experiments are translated into solutions of the practical problems but they may also enrich and amend the theoretical models used.

During the past decades, a large number of theories have been shown to be relevant in covering and backing issues in the field of document design:

- psychological theories on the storage of information and their implications for the presentation format of instructions, such as the dual coding theory (see e.g. Mayer et al. 1996), the cognitive load theory (Marcus et al. 1996) or Anderson's ACT*-model (Anderson 1982).
- theories on reading and learning

- explanatory pragmatic theories on the use of language, such as Ducrot's polyphony theory (see Ducrot, 1996 and Van der Mast 1999 for an application in a document design context) or Brown & Levinson's politeness theory (Brown & Levinson, 1987 and Steehouder, 1997 for an application to instructional texts)
- theories on spatial cognition (see e.g. in Maes & Lenting, 1999)
- theories on mental models and their implications for the way in which users process information (for an overview, see e.g. Noordman & Maes, 1993)
- theories on attitude and persuasion, such as Petty & Cacioppo's Elaboration Likelihood model, or Fishbein's attitude theory on how human cognition works (Petty & Cacioppo, 1981, 1986; Fishbein 1967; and Hoeken, 1998 for an extensive discussion of the applicability of these theories to the design of persuasive documents)
- Procedures for determining the optimally efficient algorithms on learning and instruction (Landa, 1974, applied to document design problems in Jansen & Steehouder, 1989; 1996.)

Although the quality level and methodological rigorousness of document design research vary considerably, it takes up a natural place in more and more scientific environments, and gradually finds its way in a variety of conference proceedings, edited books and (international) journals (see also Steehouder & Jansen, 1997:277-285). The list of references below demonstrates the interdisciplinarity of document design, as it contains contributions in the field of (cognitive) linguistics, pragmatics, ergonomics, document design, user interface, technical writing, cognitive psychology.

As far as the Netherlands and Dutch-speaking Belgium are concerned, document design research is hosted predominantly within the discipline of "Taalbeheersing", which literally translates as "Language Proficiency". But this translation does not do justice to the orientation and the content of the discipline. "Taalbeheersing" refers to a large domain of linguistic and communication research at Dutch and Flemish universities, and covers such areas as theories of language production and processing, research on reading and writing competence, the study of (rhetorical) argumentation, the study of functional, effective and qualitatively adequate documents, conversational analysis, organizational communication. "taalbeheersers" of different universities are assembled in a national research organization VIOT ("Vereniging voor Interuniversitair Overleg Taalbeheersing"), with a triennial conference acting as a kind of 'natal review' of the discipline.

Apart from this national organization, almost all "taalbeheersers" participate in international research activities and they are (almost all) members of the national research organization for linguistics LOT (Landelijk Overleg Taalwetenschap), which is the umbrella for a number of local or semi-local research institute hosts for 'taalbeheersers':

- CLS, Centre for Language Studies (Tilburg, Nijmegen)
- IFOTT, Instituut voor Functioneel Onderzoek van Taal en Taalgebruik (Institute for functional research of language and language use, University of Amsterdam, Free University of Amsterdam, Leiden)
- UIL, Utrechts Instituut voor Linguïstiek (Utrecht institute for linguistics)
- CLCG, Centre for Language and Cognition Groningen (which does not participate in LOT.)

7 Conclusion

Document design is a challenging and interesting new field, not only from a research point of view, but also from an educational and a societal perspective. In a country like South Africa, where the need for effective and efficient professional communication between specialists and laymen, and between government and citizens is paramount, document design results obtained so far might be helpful in overcoming some actual communication problems. As we see it, however, a more significant and longer lasting contribution to the solution of communication may be expected from developing new education and research programmes at South African universities where document design is a major subject and where both designers and researchers can be trained. That is an ambitious goal, but we hope to have shown that the results achieved in other countries justify a realistic degree of optimism.

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