The Handbook as a Mediator in LSP Communication

A Linguistic Approach to the Analysis of Computer Manuals

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With computers assisting in numerous activities like communication, education, manufacturing and business a wide range of documentation has become available for users with varying degrees of technical knowledge. Recently, the quality of handbooks has become the focus of attention in various disciplines. The article takes a linguistic approach to this text form and characterises its variants. A multi-dimensional model for the description and analysis of handbooks is introduced and its possible implications for further research to improve the comprehensibility of handbooks are discussed.

> If any single force is destined to impede man's mastery of the computer, it will be the manual that tries to teach him how to use it (W. Zinsser, cited in Blake/Bly 1993, 143).

1 Introduction

Computers have entered almost every human domain and find their use not only in offices, surgeries, laboratories and production site control rooms. More and more people from various professional backgrounds are forced to deal with them as part of their work. A great variety of software programs and technical equipment is available for a wide range of applications. Often the users have to get to know a (new) program very quickly but either cannot afford to learn the application extensively or have no need to study every single aspect of an already familiar system.

This development increasingly affects people in academic settings who want to publish their scientific work, search for new information in on-line databases or exchange ideas with fellow scientists via the Internet. Therefore, coping with the hardware and software of computers presents a first obstacle for the professional and semi-professional writer before s/he can concentrate on aspects of content and rhetoric.[1]

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1 Recent software products claim to make work easier by offering additional features like templates for various documents, automatic spell checks and formatting. However, the problem of understanding the software and knowing where and how to find the relevant information remains the same.

Handbooks and increasingly on-line documentation provide one way to help master the difficulties of the machine. But can they provide the answers to all the questions a potential user might have?

The present article attempts to shed some light on the overwhelming variety of handbooks available. From a linguistic angle it probes beyond the everyday understanding of this text form and discusses possible modes for a classification. Then an integrative model for the analysis of LSP texts is suggested which takes into account all external, internal and functional aspects of texts. This approach aims at singling out the variant and invariant elements of handbooks. The results can later be used to specify potential difficulties for the user. These would then have to be verified in comprehension or usability tests.[2] The subsequent findings will provide the basis for improving the quality of future handbooks.

2   Handbooks as Subjects for Investigation

Software companies generously provide technical documentation to accompany their products. Computer specialists in co-operation with renowned publishers (e. g. Addison-Wesley, QUE or Butterworth-Heinemann) publish a great variety of handbooks, the latter type aiming at compensating the shortcomings of the former.

It is generally agreed, however, that handbooks (or computer manuals) are often badly written and therefore incomprehensible. The major drawbacks have in the past been mainly put down to an excessive use of jargon, or to a sophisticated organisation which makes it difficult for the reader to find the relevant information.

Especially in the field of technical documentation this problem has been acknowledged and a lot of work has gone into making handbooks more understandable, visually attractive and better suited to users' needs (cf. Blake/Bly 1993; Schlager/ Ogden 1986; Steely 1983 who give advice on how to document software adequately).

Present research into this field incorporates aspects of text comprehension and text processing to find out why, when and how potential users consult a handbook and to what extent previous knowledge or familiarity with the topic effect understanding (cf. Krings 1991, 43-45).

A number of other disciplines have extended their areas of research into aspects of Human-Computer-Interaction and the quality of technical documentation. Human Factors specialists stress the necessity of adequate software documentation and increasingly take into consideration cognitive aspects (cf. Carroll 1989, 45-65).

Text linguistics and LSP (i. e. research into Languages for Special Purposes) research mainly concentrate on text forms and their characteristics as instances of

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2   Krings (1996, 121) discusses the role of LSP research and text linguistics in assessing the quality and comprehensibility of technical documentation.

specialist communication. A number of models have been developed to describe the semantic, syntactic and pragmatic aspects of communication in specialist settings. Empirical investigations of external and internal as well as functional aspects of texts could be adopted to the analysis of handbooks and therefore help draw the attention to those aspects which make comprehension difficult.

It is quite surprising though that those disciplines have not discovered the handbook as a text form in specialist communication deserving an exhaustive analysis. A number of text form or genre typologies have been developed which characterise and classify text forms relevant in science and technology and assign them a particular role in specialist communication (Sager/Dungworth/McDonald 1980; Göpferich 1995). Handbooks are subsequently described in relation to other text forms and according to their function. Other typologies, e. g. Gläser (1990) on text forms in the English language and Rolf (1993) on instructional genres, do not include the text form 'handbook'.

A few analyses into LSP texts include handbooks among other text forms in their corpora but concentrate on specific language features such as technical vocabulary and its implication for other aspects of the text (Lauren/Nordman 1996), collocations used in specialist communicative settings (Kißig 1995) or the role of implicit dialogue and meta-communication (Gläser 1996). They mainly rely on a general and intuitive understanding of this text form and do not define or characterise it.

2.1 Characteristics of Handbooks

It is generally understood that handbooks are written by specialists for the non-specialist reader who seeks information on a specific field or answers to particular problems which occur at a particular time. Therefore handbooks in the broadest sense could be described as a source of reference on an individual subject or aspect of a discipline which performs the role of a mediator between the specialist and the non-specialist.[3] Handbooks (like other works of reference such as dictionaries and grammar books) are not intended to be read from cover to cover but individual chapters or descriptions are referred to selectively whenever the need arises (cf. Storrer 1997).

Handbooks can be distinguished from dictionaries which provide knowledge about the *language* in the form of keywords following a strictly alphabetical order and encyclopaedias which 'contain extensive information on all *branches* of knowledge' (Oxford English Dictionary 1989). Furthermore, handbooks would have to be set against other established text forms such as anthologies and series (the articles of which are usually only loosely related to a common topic and lack a strict structure of references) and textbooks (which follow didactic principles) or, in the case of only one author, monographs.

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3 Krenn (1989, 347) assigns the handbook the role of a teacher. Her text corpus, however, only seems to include those texts which follow a sequential structure (see below).

According to Bhatia's approach to analysing an unfamiliar genre (1993, 22-26) we have to come to an understanding of what a typical representative of this text form is before we can attempt a detailed analysis of all the linguistic and non-linguistic features that constitute a handbook.

One possibility to find out what is currently understood by 'handbook' is to check the definitions appropriate dictionaries suggest.

Both the Oxford English Dictionary (OED 1989) and the Oxford Encyclopedic English Dictionary (OEED 1991) use 'handbook'', which was introduced in the 19th century from the German "Handbuch", synonymously for 'manual', 'guide(book)' and 'companion' to denote 'a small book or treatise, such as may conveniently be held in the hand' which is intended 'for guidance in any art, occupation, or study' (OED 1989, vol. VI, 1070) or, more specifically, a manual as 'a book of instructions, especially for operating a machine or learning a subject' (OEED 1991, 882).

In Great Britain people usually associate handbooks with *technical fields* (Walter 1996b, 362). Their purpose is to give practical information and instruction on how to operate machines, assemble components and repair faulty parts.

However, the Random House Unabridged Dictionary (RHD) assigns this text form a further role, namely that of 'a scholarly book on a specific subject, often consisting of separate essays or articles' (RHD 1993) thus making it a more theoretical genre which can be applied to both fact-based disciplines (i. e. natural sciences and technical fields) and text-based subject areas such as history and literature.

A further complication occurs when we contrast the English understanding of 'handbook' with the German concept of "Handbuch". Despite a common origin (see above) there are certain differences. The Duden (1979) describes Handbuch as "ein- oder mehrbändiges Druckwerk von handlichem Format, das den Stoff eines bestimmten Wissensgebietes o.ä. in systematischer u./o. lexikalischer Form behandelt".

Kluge's Etymologisches Wörterbuch (1989) notes on "Handbuch":

> bezeugt seit dem 15. Jh., wird aber wohl älter sein (vgl. ae. hand-boc); Lehnbildung zu 1. manuale (zu 1. manus f. "hand"), das seinerseits gr. encheiridon (zu gr. cheir f "Hand") wiedergibt. Ursprünglich war mit der Bezeichnung das Handbuch eines Geistlichen gemeint (das in die Hand genommen, nicht auf den Lesepult gelegt wird).

Both concepts stress the aspect of practicality and portability but whereas the Anglo-American notion associates them with *technical fields* and *instruction* the German understanding implies a broader field of application. Indeed, a hypothetical survey in Germany would reveal that "Handbücher" are understood as being mainly common in theoretical disciplines to provide a scientific synthesis of a specific subject area's development. How and why those cultural differences evolved, however, cannot be pursued further in this article.

2.2   Classification of Computer Handbooks

A look at the shelves of Computer Science libraries or specialised bookshops reveals a cross-section of what types of handbooks are available in this subject area.

These handbooks can subsequently be classified into different groups according to various aspects, e. g.:

- With reference to the section of the subject area we can distinguish between 'theoretical' handbooks which are intended to give a synthetic overview or state-of-the-art of research in a particular field (cf. Helander 1989 or Salvendy 1987 on Human Factors) as opposed to 'practical' handbooks which accompany or complement software programs (e. g. Date 1993 on how to use a particular database).

- Another facet could distinguish those 'primary' handbooks which accompany the original software or hardware (e. g. *Getting Results with Microsoft Office for Windows 95*, 1995) from those which are written by computer specialists and generally considered more user-friendly since they try to anticipate users' needs by including more explicit information (cf. Winter/Winter 1995).

- A third criterion could be the macrostructure of the book. Blake and Bly (1993, 143-153) differentiate between a sequential approach where the information is arranged from the basics to more sophisticated aspects and a functional approach where the information is grouped around specific parts or concepts to provide quick reference or confirmation for the specialist.[4]

Further *formal* features could be:

- the number of authors (one author vs. a team),
- the size (one volume vs. several, e. g. Barr and Feigenbaum 1981) or
- the 'life cycle' of the publication (established knowledge about a field which 'lasts' vs. documentation of particular software products which are quickly outdated and therefore continuously updated).

All the examples and modes of classification randomly chosen here to illustrate the range of handbooks available elucidate the complexity of the phenomenon 'handbook'. Thus it seems realistic to speak of a heterogeneous text form. Its variants, in turn, may themselves integrate aspects of various other text forms, such as textbooks or scientific articles. This might even call for more than one definition and characterisation.

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4   It is quite common, however, for authors to include both aspects in one very thick volume (e. g. Potter 1992)

2.3   Text Declarations

Text form declarations such as 'prescription', 'book review' and 'scientific article' are intended to give a first clue about the communicative purpose (and/or content) of the text in question. Rolf (1993, 144) assumes that the particular label an author has assigned his text makes an interpretation of the text in terms of its function superfluous and can therefore be taken as a basis for subsequent text analyses and typologies. Gnutzmann and Oldenburg (1991, 103-1036) follow a similar approach and only include those texts in their corpus which provide a text form declaration in their titles.

Swales (1990) notes, however, that the labelling of texts by subject specialists is rather controversial and the title does not necessarily give sufficient information about the connection of a text to a certain text form.

The concept 'handbook' appears to denote a particularly complex phenomenon. As a text declaration it is used synonymously with 'manual' and 'guide' or 'companion' and referred to as 'textbook', 'encyclopaedia' or 'work of reference'. The prefaces of a variety of computer handbooks illustrate this point.[5]

Attributes like 'user' or 'reference' are used to emphasise different aspects. Thus a 'user manual' refers to a step-by-step introduction to a topic (and might include exercises at the end of each chapter) whereas a 'reference manual' represents an alphabetical list of all the functions, commands or other various aspects necessary to run the program.

A linguistic approach to the analysis of handbooks would have to be based on a representative text corpus and have to consider the following aspects (Bhatia 1993, 23-36):

* the situational context (characteristics of the communicative setting, e. g. the author's and recipient's background and their relationship),

* institutional context (subject-specific conventions, methodologies and traditions),

* functional aspects (the communicative purpose of both the text form and the particular language means),

* text structure and choice of specific language means (lexico-grammatical features) and

* the structural organisation of the text (typical cognitive patterns or 'moves' used in texts to realise the author's intention).

The following chapter suggests a possible approach to this analysis.

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5   However, in the field of car manufacturing and maintenance for example a stricter distinction has been established between a handbook which tells the car owner how to operate the various components and a manual which gives clear instructions on how to repair and mend parts should the need arise.

3   A Linguistic Analysis of Handbooks

Texts are constituted through external and internal as well as functional factors. External aspects seem to exert a significant impact. These are the communicative setting (who interacts with whom), the cognitive presupposition of both the author and the recipient, their cultural bonds and the specific subject area where the communication takes place. It is generally agreed that the communicative purpose or the function of texts determines the choice of text forms as well as the appropriate language means or internal factors (Swales 1990, 10; Brinker 1992, 121; Bhatia 1993, 13) across different subject areas.

In order to include all linguistic and non-linguistic means and their interrelation appropriately an integrative model of investigation is required. Current analyses in LSP research favour interdisciplinary approaches which use a comprehensive set of methods and procedures (Möhn/Pelka 1984; Gläser 1990; Brinker 1992; Lauren/Nordman 1996; Ramm/Villiger 1997).

Baumann's multi-dimensional model for the research of texts in specific subject areas (1992 and 1994) provides a suitable starting point because it approaches the analysis of LSP texts from various angles to take into account the complexity of specialist communication. For this purpose he incorporates methods from various linguistic and non-linguistic disciplines. He assumes a complex set of hierarchically organised 'knowledge systems' or dimensions which are relevant for text production and comprehension. These dimensions are the following, starting from the text's vicinity, in ascending order: *semantic, stylistic, textual, subject-specific, functional, cognitive, social and intercultural levels*.

Baumann's model is primarily concerned with the description of various degrees of technicality (Baumann 1994) which he achieves by applying statistical methods.

The present analysis of handbooks is integrated in a broader linguistic research on text forms from different disciplines (cf. Walter 1996a and b) to investigate the influence of the subject matter or topic of a text on the shaping of selected text forms. In order to suit the purpose of the research outlined here Baumann's model has to be modified and the hierarchical sequence of the levels might have to be reconsidered.

A hierarchy, by its very nature, points out those levels which are closely related to the language material (semantic, stylistic and textual aspects) and those which are further removed from the actual text and therefore have a greater influence on the choice of the appropriate language means (functional, subject-specific, cognitive, social as well as intercultural levels). It cannot, however, give a realistic picture of the interplay and mutual dependence of external, internal and functional factors of texts.

The present investigation assumes that specialist communication is characterised by the specific methods, conventions and traditions used in that particular subject area (i. e. the subject-specific dimension). The domain produces a specific constel-

lation and interaction of the participants (the social dimension). The participants, in turn, develop certain preferred patterns or styles in dealing with their subject matter (cognitive dimension) and choose those text forms and language means which they consider appropriate to suit their communicative needs (functional, textual, stylistic and semantic dimensions).[6]

 After having established *which* specific functional, external and internal aspects of texts are frequently used the model will also attempt to explain *how* they are used. Or, as Bhatia puts it:

> The [...] statistical significance of a particular linguistic feature in a specific genre, by itself, is less interesting. However, it becomes more significant if it is possible to say what aspect of the genre it textualizes (Bhatia, 1993, 27).

This way the influence of the subject matter on text production and comprehension can be described. It should be noted though that all dimensions are closely interrelated and have to be seen as part of the whole phenomenon of specialist communication. They are analysed individually here to provide clarity.

3.1 The Subject-Specific Dimension

Each subject area is characterised by its methods and cognitive styles which have been adapted to suit its particular nature and underlying structure.[7] Lauren and Nordman (1996, 51) assume that those factors are reflected in the specific language of the domain. According to Hoffmann (1987, 53) a language for specific purposes comprises all language means used in a specific communicative setting to communicate effectively about the subject. This includes technical terms to denote the underlying (hierarchical) conceptual system of the subject area but also stylistic principles and textual features. The subject matter seems to determine the conventions used (e. g. which text forms are suited best for its purposes) and shapes its tradition.

Computer Science is a very young and dynamic domain which has its roots in mathematics (algebra and computability of specific problems) and electrical engineering (circuit design). Established as a field of study in its own right in the 1960s it deals with theoretical and practical aspects of computers as well as their possible applications. Its methodology and terminology are not fixed yet and underlie influences from other disciplines with which it shares a scientific interest (depending on

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6   Since the present research concentrates on English language texts, in particular handbooks, the intercultural level of Baumann's model is irrelevant within this framework. Considering, however, that computer companies work globally, on the one hand problems of non-native authors writing in English (cf. Skudlik 1990) and possibly adopting an Anglo-American style and on the other hand of a multi-cultural readership appear challenging (cf. Galtung 1985 and Clyne 1987 on different culture-bound cognitive styles).

7   Snow's controversial lecture on the 'two cultures' (i. e. the sciences and arts) illustrates the fact that preferred cognitive styles and methods may differ greatly across subject areas (Snow 1959 in Kreuzer 1987).

the application domain these could be linguistics and cognitive science, logic or economics).

The widespread use of computers affects nearly every sector of society. New computer applications are developed to suit various professional needs. On the other hand more and more people acknowledge the necessity and benefits of solid computer knowledge. The vast amount of computer literature and especially handbooks illustrates the situation. A whole market has evolved not only for software handbooks but also for advice on how to document software products effectively. Context-sensitive on-line documentation opens up new possibilities to make software more user-friendly. Aspects of Human-Computer Interaction play an increasing part in Computer Science and its applications.

3.2   The Social Dimension

The social dimension describes the relationship between the participants in communication and takes into account the different experiences of both the author and the reader as well as their attitudes towards each other and the text between them. On the part of the author these are assumptions of the potential readers' knowledge, his or her own knowledge of the subject area and possible ways of selecting and structuring the relevant information. The reader, in turn, has certain expectations of the information s/he would like to get from the text and the background knowledge at his or her disposal which might differ greatly from that of the author. This is particularly relevant in specialist-to-non-specialist communication.

Publishers, aware of the demands and constraints of the market, ask handbook authors to aim their text at a broad audience which includes both the expert and general reader. This intention is usually stated in the preface. However, most handbook authors require their readers to have at least some basic knowledge of or familiarity with the relevant field. It could be argued though that the restriction of the potential audience is used to avoid writer responsibility for the difficulties the general reader might encounter. Therefore, it is more likely that the uninitiated reader will find the book too complicated to use. The general rejection of those handbooks that accompany the actual software is a case in point.

A combined approach (cf. Potter 1992) could be one possibility to incorporate different users' needs. Here the first part of the book acts as an introduction to the topic (Visual Basic) and moves from basic to more complicated applications. The second part represents an index with a complex set of references for a quick access to the information the user requires.

Other authors (e. g. Date 1993) give a detailed description of the content in the introductory preface and recommend a certain sequence or entry point to the reader according to his or her previous knowledge of the subject.

3.3   The Cognitive Dimension

The cognitive dimension investigates the differences in the cognitive presuppositions of experienced or expert users and lay people. Research in cognitive science has shown that experts approach tasks relevant to their field differently to the uninitiated and complete them faster due to their specific knowledge of the subject and the subsequent mental models in which their knowledge is organised (Carroll 1989, 45-65).

One possibility for a linguistic approach to those differences in mental models could be an analysis of the inferences the reader/user has to draw to understand what is being communicated in a particular text. Inferences, as one form of indirect anaphors (Schwarz 1996, 404) are used when the information is not explicit enough to produce coherence and the reader has to access his or her knowledge of the world (which includes knowledge of text form conventions) to complement the missing information. Background or expert knowledge has to be activated especially when technical terms or specialist vocabulary are not explained adequately. However, they do not have to be explained to experts who have the relevant explanatory context at their disposal (Kalverkämper 1987).

3.4   The Functional Dimension

This dimension examines the interaction of text function and subject area in more detail. According to Werlich's classification of texts (Werlich 1988) handbooks are characterised by an instructional text function. However, instructional texts are mostly found in fact-based disciplines (the sciences and technical subject areas). Text-based disciplines seem to favour other types of texts to communicate their subject matter.[8]

Göpferich (1995) points out that handbooks (here in the field of car maintenance and repair) are first of all referred to in order to find a particular piece of information but can also provide instructions.

After having established the global text function it seems important to describe more specifically which communicative acts are used when and why to transmit certain intentions. Obviously, handbooks comprise a great variety of communicative acts. Information has to be explained, exemplified or referred to across various chapters. The reader has to be trained through instructions to use the features of the particular program and made aware of certain advantageous characteristics or warned about the consequences of his activities. More detailed analyses might reveal certain sequences or patterns of communicative acts. These would have to be set against the structure of the text to find a possible correlation.

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8   Lauren and Nordman (1996, 81) note the possibility for PhD theses to become works of reference in the study of Law. On practical handbooks in History cf. Walter (1996b).

3.5   The Textual Dimension

Texts are constituted by their macrostructure (sequence of distinct text parts) and their microstructure (structure within text parts or paragraphs). As mentioned above, handbooks can either follow a sequential or a functional structure. The former approach seems suitable for didactic purposes which might be prevalent in handbooks which assume a broader audience with varying degrees of previous knowledge of the subject matter. The user is guided by the handbook (author) and first learns to master basic concepts or those which are considered vital to get going with a certain program. These concepts are then expanded to more complex applications (e. g. Passens/Schöll 1992).

A functional structure concentrates on different aspects of the subject matter. The chapters of handbooks following this structure might be grouped around different components of a particular program. This approach benefits the expert or experienced user who is familiar with the individual applications and interested mainly in improvements (or updates) of the program. Winter and Winter (1995) devote a whole chapter to each part of the *Microsoft Office* suite. As is stated in the introduction this handbook is aimed at the experienced *Microsoft Windows* user.

Both types of text structure are characterised by a complex structure of references. References seem to constitute a unique feature of texts with reference character (e. g. handbooks, dictionaries and encyclopaedias). They can be directed to chapters/information mentioned before (anaphoric references) or to come (cataphoric) or other sources like on-line documentation (cf. *Getting Results with Microsoft Office for Windows 95* 1995) but can also draw the attention to illustrations and highlighted or boxed areas. They can be explicit, e. g. " In the Word online index look up: pictures, frames" (taken from: *Getting Results with...* 1995, 147) or realised through icons (Winter and Winter (1995) use little black arrows in the margins to indicate where in the handbook additional information is located).

3.6   The Stylistic Dimension

Illustrations (e. g. graphs, flow charts, diagrams as well as pictures and icons) are seen here as specific stylistic means to present information in a highly condensed form. They provide clarity and quick access for the expert and serve as an incentive and an aid to understanding for the lay reader. Visual displays focus attention on specific aspects of the subject matter (e. g. trends in economic developments, details in plans of construction, etc.).

Illustrations represent a typical stylistic aspect of many computer handbooks. Software manuals often also include boxed areas to highlight important information (usually including markers like 'Note') and draw attention to problems that might occur when using a specific feature of the application ('Caution'). Furthermore, printouts of actual screen displays are frequently used to illustrate the steps suggested to accomplish certain tasks. The use of wide margins which can include tips for more efficient use of certain features or icons which facilitate the search for

particular information in the text seems to be almost unique to text forms of reference character.

Kalverkämper (1993, 215-238) discusses the interaction and interdependencies of verbal and visual code in specialist texts. He distinguishes three semantic relationships between text and visual code:

a) integrated (the visual code illustrates the information in the text and offers comparable information through a different mode),

b) dominant (the illustration provides more information than the verbal code can offer) and

c) complementary (here the purpose of visual code is mainly to illustrate the text, it has no effect on text comprehension).

Thus visual code offers various possibilities of transmitting relevant information in specialist communication. The particular choice depends on conventions of the specific subject domain. It has to be argued though whether illustrations always improve the reader's/user's understanding of texts, as is frequently suggested in instruction guides on how to write effective software documentation (cf. Sheppard 1987, 1542-1584). The appropriate embedding of visual code into verbal code appears to be more vital for an effective understanding.

Stylistic means such as metaphors or analogies (to illustrate complicated facts) and certain syntactic constructions can also influence the comprehensibility of texts. One syntactic means favoured in handbooks is a parallel sentence structure. Blake and Bly (1993, 71) list the benefits of parallelism for technical documentation, namely: "an economy of words, a clarification of meaning, a sense of symmetry, and a sense of the equality of each idea in the sentence" and possibly in the paragraph.[9]

3.7   The Semantic Dimension

The semantic dimension is the closest to the actual text material and elucidates the text meaning which is, according to Hoffmann (1987, 124), in the natural and technical sciences mainly constituted by technical terms and specialist vocabulary. The semantic dimension would, therefore, have to analyse the particular difficulties connected with the use of terms to denote subject-specific concepts and their relationship to others. Computer Science is characterised by the use of metaphors or, as Van Dyke (1992, 383-405) puts it, 'recycled words' to denote its rather abstract concepts such as *platforms, toolkits, protocols* and *front ends*.[10] The uninitiated user of a particular software program might find it either difficult or confusing to

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9   Hüllen (1989, 93) puts the success of Butler's practical handbook of bees (1609) down to a simpler sentence structure following a certain pattern and the use of examples from users' everyday experience.

10   Dunbar (1995, 140) describes a similar approach to technical terms in the field of quantum physics.

distinguish between the literal meaning he is familiar with and which usually describes solid objects *and* concepts of a virtual world to which the particular metaphor is applied (cf. Johnson 1994). (The following examples are taken from Winter/Winter 1995, 28).

(1)   Windows applications are designed to accommodate users coming from different *platforms* and possessing different skills. Just as with other Windows *procedures*, you can *launch an application* in several different ways.

        To start a program in Windows 95, you begin by clicking the Start button on the bottom left corner of the *desktop* (screen). A *menu list* appears. Simply point to the Program *folder*, and a *submenu* appears listing the program groups or programs not in groups.

This problem is further aggravated by the fact that those terms are often not introduced or explained appropriately. Whereas in most academic texts of scientific and technical disciplines technical terms are frequently explained to provide clarity and to illustrate the (hierarchical) structure of the concepts underlying the specific subject matter this does not seem to be the case in computer handbooks although they usually address a much more heterogeneous audience.[11]

4   Summary

There is hardly any other contemporary product which affects the (professional) life of so many people with varying degrees of technical knowledge than the computer. Software and hardware documentation in the form of handbooks seems to still represent the main text form of communication between expert and users. The book market reflects this situation through a great variety of handbooks under a wide range of titles.

The strains put on handbook producers are manifold: Their readers, not always familiar with the subject matter, have different needs and therefore different ideas of what they want to get from the book. They might also have difficulties using this (unfamiliar) type of reference. Those handbooks that document and accompany a particular software or hardware product are often produced under enormous pressure and have to accommodate a great variety of user needs. 'Secondary' handbooks attempt to compensate the drawbacks of the others by targeting specific user groups, offering more detailed information and focusing on particular aspects of the application.

A complex linguistic analysis of the variant and invariant features of handbooks in computing (and preferably also other domains) and how they are used to communicate a particular subject matter will verify general assumptions of what constitutes a good handbook. The results can be used to develop adequate tests to see which aspects influence specific users' comprehensibility under which circumstances.

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11   McCurry (1991) found that in science courses at university level up to 80% of the lesson time is devoted to defining and explaining technical terms.

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