

## **Customized Digital Books on Demand** **Issues in the creation of a flexible document format**

Karsten Lücke

Imagine you want to buy a book — not a bestseller that any bookseller has in stock, but something more special, maybe the latest title on a special subject like typography or a biography of a French poet, one that has been out of print for about forty years. Perhaps you are looking for anything written by a special author: books, articles, forewords for others' books or articles from technical journals. You enter a bookstore. You take a seat at one of the computers and type the subject, or a more or less complete book title, maybe the year of publication, or just the author's name, and at worst you're shown a number of titles with the one that you were looking for among them. (A well conceived, clearly structured and well designed graphic user interface is taken for granted.) Perhaps you can see on screen that there are still copies of the hardback edition left in stock that you may order. That's about what you can get today, though you normally must not touch the only computer in the store, at least in the little bookstores I know. Especially when asked for older books — the clerk often says: I'm very sorry, it's out of print for several years.

However, you scroll through the list of books and articles. More detailed information on each of them can be shown if wanted; moreover, you might have a look inside and leaf through the pages virtually, on screen, to judge whether the writing(s) would fit your particular needs. Imagine you find one or a few of them interesting enough for further study. You mark a book or an article or set up a compilation of some articles, choose one of many offered book designs, perhaps modify diverse layout parameters such as page format, margins, typefaces and size, paper, cover paper or kind of binding. You, as the reader, may to a certain degree of course, define what you want. Depending on these factors the book price is calculated, and if you still want to have the publication, you give the command for printing and binding.

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Of course, I do not want to hide my sources — a text influenced me. Some months ago I read Umberto Eco's *Das Buch, ein technisch vollendetes Meisterwerk* (*The book, a technically completed masterpiece*). Here is a quick translation of the relevant paragraph: "Let's assume all books of all great libraries would be scanned (and one might start with one, well

equipped library): its content, complete with typography and make-up, were stored in a central computer. First advantage: these books are protected from destruction of the paper they would have been printed on — many contemporary editions will turn to dust within a few centuries. Anybody who needs a special book simply goes into the next state library, studies the catalog, finds the desired book, and the computer advises a high-end printer to produce a copy that looks like the original, all within just a few minutes, including stitching or binding. If the original had been printed in small Fraktur or Textur letters, and you want to read it more easily, you give a command and the machine produces a copy set in any typeface you want. You pay for the print-out, plus automatically calculated percentages for author and publisher (this prevents piracy) and take your copy home. If there is a reference book with many volumes, you might print excerpts. And if you don't need it any more after reading, you just throw it away — you can print out a new one if needed.”<sup>1</sup>

Obviously, Eco was himself influenced by something he may have seen at Stanford University or at Xerox, I do not know; he introduces his own vision, quoted above, with: “At present, one innovation is studied at Stanford University in California and supported by Xerox. I do not want to discuss here the current situation, but what it could look like in the future, if some not inconsiderable technical problems are solved.” I cannot say how much of his writing is his own idea or how much he describes what he has seen.

Just recently, in Ruari McLean's *Typographers on type*,<sup>2</sup> I read an article by Roderick Stinehour describing something similar: “There are laser printing units using xerography that can print a complete book from the digitized type page stored in disk memory banks. Such a custom book printer can churn out pages, verso and recto, at the rate of a leaf every second. A complete book of 124 pages would be ready for binding in sixty-two seconds. It takes little imagination to envision a bookstore of a decade hence filled with ‘sample’ volumes only. One would need only to pick a title and the book would be printed and bound on the spot. Such a bookstore could readily keep on hand three or four times the number of titles now stocked at a fraction of present costs, since there would be no shipping charges, no overstock or understock problems and no returns.”<sup>3</sup> Today, I'd say such a bookstore could get you not three or four times as many titles immediately, but *any* title once digitized.

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The whole thing sounds interesting — never mind exactly what is real and what is fiction. I like the idea of a book printed on demand. Often it is not very easy to get a copy of an older book — even if it has been printed only nine or ten years ago. But if the model, the master copy of a book was digital, a copy could be made at any time and as often as it was needed. Alas, even the idea of printing documents on demand itself is nothing new — every layout created digitally is a document to be printed on demand.

(A short diversion) Today's copiers can stitch or glue sheets, to give them a booklet-like appearance. I am aware that it is not possible to automatically produce single or small numbers of hardbacks in acceptable quality at the moment. But in my opinion paperbacks will do as well, not just for the present, though the glueing quality of copiers must be improved. At this point, I just wanted to make it clear that I am talking primarily about paperback books.

However, recent developments seem to work with fixed layouts — no wonder — today document format is static. Even Eco and Stinehour consider only a fixed layout in their descriptions. Eco writes about scanning existing books to set up a digital library and Stinehour about “digitized type pages,” whatever “digitized” means here.

*This is not too exciting.* But, almost incidentally, Eco mentions it could be useful to change the typeface, e.g., if “the original” had been printed in broken script. And this, though it does not fit the context of his writing (Eco speaks of scanned pages, and therefore of static pages saved as images only), could lead to a really fascinating and exciting invention: The layout of a book could be flexible, mutable. Or, more precisely: The layout of its digital model could be flexible — and, from the user's point of view, almost exchangeable.

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### Conception

To sum up the previous, it's necessary to distinguish between static pages, high resolution scans of book pages saved as pixel images, perhaps later converted into an outline format and static pages created digitally with programs like PageMaker or QuarkXPress on the one hand, and flexible and portable digital documents on the other one. There is not much to say about static documents. They exist. It is the future flexible ones that deserve attention.

I don't want to discuss the advantages of printing documents on demand in general. Here I want to roughly define a flexible document format by making some suggestions regarding such a format and its possibilities. I will start with the principal conditions for a flexible document format, and then go on with the consequences for the "user," the purchaser and reader of a Digital Book as I would call it.

Before this, I have to make one thing clear: I principally distinguish between a message and its presentation, between the text itself and its layout or book design, i.e., the arrangement of the text and other elements. This is essential for a better understanding of what follows.

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#### **Document Format**

The whole document format, and the environment to create and use it, must be oriented to design as well as to the text and its structure. I value the text structure more than the design, in that design, especially book design, is strongly based upon the structure of the text to be presented.

**The main text** In the center of all there is *one* main text object, the book. (For me, "object" is data and "document" is its presentation.) Primarily, this main text (data) is structured by the return at the end of a paragraph. Ordinary letters might have a structuring function. As in DTP (Desk Top Publishing) documents created with PageMaker, paragraph formats are used within the flexible document format. But here, more than in other DTP software, the purpose of such paragraph formats is to structure the text, indicating whether a paragraph is author/editor, book title, explanation, publisher, copyright annotation (all for title page), line in the table of contents, chapter number or title, chapter subtitle, motto, title or subtitle of a certain degree, text, list text and others. Then there are marginal notes, illustrations, captions, footnotes, running heads and feet, etc. — these do not directly belong to the main text, but are linked to it, i.e., to certain words or phrases within it. So the return at the end of a paragraph marks the beginning or ending of a collection of words or sentences. It is a hint to use paragraph format x or y, inserting an initial letter after a title, indenting the first line of a paragraph or setting a paragraph sign in running text. The last example shows that one must differentiate between groups of paragraphs: titles belong to one group, the main text paragraphs make a group and general information on the book, author, title, publisher, year of publication, ISBN and so forth form another group.

Of course, the most essential elements of such a flexible format is fixed: pure data (main text, other text elements, illustrations) must not be changed after the document has been entered and edited. Emphasizing single words or phrases by using italics, or setting small caps instead of the ordinary text setting, also belongs to the text level; here I mean an emphasis stipulated by the author (italics), or which is necessary to do justice to 'good typography' (use of small caps) — in no way should designers abuse such fixed formats for the sake of *design*.

By the way, the use of small caps for all-cap words or acronyms, as mentioned above, leads us to a general aesthetic problem. Does the person who enters and edits the text of such a Digital Book have the right to say: I want to see small caps! Or: I'd rather use regular text characters slightly reduced in size! Just to a limited degree, I would say: it is the reader who has to decide whether he prefers small caps or something else, if he *wants* to decide. So there could be a hint determining a word to be set in small caps or dropped to a smaller point size. Then the book designer makes a choice which the reader may alter later, *if the designer allows*. It is similar to the question of how to set authors' names throughout a book: in roman letters, or small caps with the initial letter being the ordinary roman letter. Maybe there can be a special hint for names, so that again the reader may have the final choice.

Word hints may also be of some interest for automated preparation of a register of names (or register of places or book references). To make such hinting easier for the typist, the name can be marked when it appears for the first time, the program will search for further appearances. Perhaps the typist's assistance is needed: if the author of a text calls someone by his or her first name (or family name) later on, and some people do have the same name, the typist is asked which one is meant — perhaps instantaneously while typing. Therefore first and family names have to be linked, but must be recognized when standing alone. There are other problems, e.g., indicating keywords for different purposes that may not be well thought over when creating such a document format. Whether a special register actually is created and printed later or not, depends on the needs of the reader.

However, to make clear what has been said above, perhaps the text must not be hinted to mark and define whether certain words are to be set in italics or small caps, rather words should be hinted to mean: "this is a title," "this word or phrase is to be emphasized," "a foreign word" (all to be printed in italics) and "this is an author's name," "this is a corporate

name" (may be set in small caps), perhaps even: "this word or phrase is a quotation." This procedure might seem too complicated and superfluous in terms of individual book design, but be of great importance for the later creation of registers or references — useful not within the single title only, but on a more general level if you were searching for any books dealing with, or just mentioning, somebody's name, then the system could test these keywords instead of searching through entire documents. This goes beyond today's ordinary DTP document format. Moreover, no concrete letters and signs to be found in a font can be used for the text — e.g., one should not type concrete quotation marks; one just might type general left and right quotation marks, regardless of whether the Swiss, French, German or English marks will actually be used.

Right at this early stage, I reach a point where text (the data that the publication is dealing with) and book design (the presentation of that data) meet. Both the text/illustration level and the layout level depend on one other, and they must be closely linked together. The text level itself cannot contain a special command such as "paragraph to be set in ITC Legacy Serif Book, in 10/12 pt; words x, y and z to be set in italics;" instead the command is: "paragraph to be treated as a whole; words x, y and z to be set in italics or (if the text is in italics) in roman."

Adjustment of paragraph formats, in terms of formatting the text, could be similar to PageMaker functions where you might say "format x to be the same as format y, but type size to be changed." But within a flexible document you must not demand "14 pt to be chosen here instead of 12 pt," but rather "two points more," or even better, "about 120-130% of the basic type size." Apart from a general structuring function, or better, as part of the construction of uniformity throughout a document, paragraph (and word/phrase) formats are organized for an overall identical appearance of different title or text levels, i.e., forcing a title to appear on a new page, or on a righthand (or lefthand) page only, or the first letter after a certain title to be an initial. Here one can recognize that layout functions are primarily text based or closely linked to the text at least.

**Other basic elements** Illustrations, like text, are in no way flexible. But perhaps there might be a function to suit line drawings to the typeface automatically by making the pen strokes thicker or thinner, following Tschichold who once wrote that the thinnest strokes of an illustration must not be thinner than the hairlines of a typeface, and the thickest not heavier than the stems.

Pagination is linked to the main text indirectly via the special book design or layout. When text and layout come together and the actual page make-up is done, general references to passages on other pages (just being hints on the text level) are replaced by actual numbers, e.g., from the register of names to the pages where the names appear, or from one page to another. So the page number in the sentence “for further information also read pages x and y” depends on the later layout and page make-up. The same is true for running heads and feet whose content is taken from special paragraph layouts as chapter titles or headlines and for hints to illustrations and their captions. (Illustration and captions will be returned to later.)

**The possible text-layout relation** When text and layout come together, they need a relation. I would suggest the following structure. a) The text is structured by hints. The simplest kind of a hint is the return after each paragraph; other hints indicate quotations, references, etc. b) Then there is typography which has to represent the structure of the text. Within typography, we can distinguish between micro- and macro typography. The first is about smaller units like letters, tracking, wordspacing and leading; the latter is about proportions and arrangement of paper format, type area, columns, titles and text. (Micro-typography is automated to a high degree. Nevertheless, both the designer and the reader might set up their own micro-typographic rules. And it's for the reader to say: Whatever the designer suggests, filter these out and replace them with my own specification: I always want indentations unless in the first paragraph after a title, put some space before ;!/? and so forth.) c) Without question, text structure and design are related to one another. To realize these relations, I can imagine a third instance which is to define the hints and thus the meaning of the hinted text elements (to be a head line or title, chapter, text paragraph, quotation, emphasis) — this is a 'semantics of typography.' It says *what* a certain text passage is or means, its function and gives rough instructions on *how to handle* it typographically. It pre-determines the means of handling text elements. (The designer gives these means a more concrete though not final form on the level of typography.)

An example: When the reader creates his actual layout, he defines paper format and margins, thus automatically the column width and height — *macro-typography*. He chooses a typeface and size, automatic leading, which is then fine-tuned in interaction with column height — *micro-typography and macro-typography*. Typeface, size and leading cause a special tracking and wordspacing, and in interaction with the

column width, they determine the number of characters per line — *micro-typography and macro-typography*. Now the resulting line break produces too many widows (last line of a paragraph at the head of a page) and orphans (first one or two lines of a new paragraph at the bottom of a page) throughout the text — *text and micro-typography*. Then leading is automatically altered, and type size (and automatic tracking, leading, etc.) and line breaks might help — *micro-typography*. As internal references are updated with each page make-up, the changing numbers (sometimes two, sometimes three figures long might cause further make-up — *text and macro-typography*. The 'semantics of typography' then insist that a title is distinguished from the normal text setting, i.e., space, typeface, size or weight. It says that there must be even more emphasis on a title of a higher degree. Or, that footnotes should visually subordinate to the text. This also means that the actual typographic form of each text element needs a reference: you cannot determine one without affecting the others; a possible title or footnote setting depends on how the ordinary text typography is set, or the other way round. It is the 'intelligence' of the system which limits the means of possible designs once a choice is made. This quick and not very detailed example might give an impression of the complexity of "cause and effect," if one might still use this paradigm. It's a real texture of interdependencies between the levels.

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Here another distinct aspect appears: the software needed for creating text and design (book publisher), and for searching for — and compiling — books and modifying them in terms of layout (bookseller and customer). For each purpose there's a different program or module.

**Flexible document (development) tools** Text is entered and edited within a special editor. For creating layouts there has to be another module. It is obvious that both of them belong together: with the text editor hints are set that have an effect on the layout, and the layout effects the actual page number that a passage may refer to. So the modules have to be developed in close connection, perhaps as *one* program first. But for later use, related but separate programs for author and book designer — or at least a special stand-alone program limited to text editing functions for the author who should be forced to concentrate on his text and must not play typographer. Maybe the author can create a simple "private layout" to get a proper overview of the text and its structure, but that's it. Being able to link sentences or words to others is useful for the author

who, during the process of writing, may more easily find passages that are related to others. The layout module might have full control over the text, so that the book designer can change incorrect hints or inconsistently structured text or title levels. This layout (and editing) module may also be available for designer-writers.

Next there has to be a book browser/purchaser for the customer, which is connected to a layout browsing and modifying module. (Perhaps the browser can be distributed to everybody at no charge, as Adobe Acrobat is now. People might download it from the Internet or a CD ROM to search for a title and, after paying for it or promising to pay, order a copy.) There might be ambitious people who want to design books on their own. For them one could create a layout module limited to page layout without access to any text.

**Text editor** As already mentioned, the text is edited within a special editor. Here any modifications are made that should be globally evident, independent from the later layout; e.g., book titles are indicated to be set in italics later, all-cap words are set in small caps to better fit the rest of the text; a more precise description of this has been made earlier.

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In the text editor, footnotes and marginal notes (marginalia) are displayed to the right and left side of the main text, perhaps in color to stand out from the main text. The first line of a footnote should be on the same height as the footnote number in the text, and the first line of a marginal note is on the same height, as is the appropriate keyword or phrase. This is all for greater clarity in the writing stage.

In the same way, figures or illustrations are bound to their corresponding text passages. If possible, they will appear on the same page later;

and if this is not possible, the text itself may refer not only to the figure number, but also to the page number (this addition is to be avoided when both are on the same page). In the editor, illustrations are displayed by a symbol, within the main text or to the left or right side of the column and can be opened with a double click.

The numbering of footnotes and figures must be automated. (Whether numbering is started anew in every chapter or not is defined by the chosen layout.)

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In principle, everything should be as easy to handle as possible for the author. His writing activity differs from that of today only in that he does not click a button for 'italics' or 'small caps,' but a button for 'emphasis,' 'title' or 'quotation' after he has marked the text passage concerned.

If he inserts a quotation, he clicks a button 'footnote' and a routine opens asking for whether the source is a book or article and requests other bibliographic details. After input the footnote is shown beside the main text and can be altered with additional comments on the citation given in the text. (In an advanced edition of Digital Book, the quotation might be taken via drag and drop from another Digital Book and all the information fit automatically.)

**The browser** The book list shows authors, titles, information on the publisher, the year of publication, edition, etc. in small caps, italics and roman. Additionally, for better recognition, the different kinds of information could be colored, e.g., author in blue or green small caps, book or magazine title in red italics, article title in red roman with the rest in black roman.

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Now I will say a few words on the layout itself which before was mentioned only when affected by the text and its structure. While the text is the "object" as defined earlier, the real data or the message to reach the reader, the layout is the "document," the container of the data, determining the kind of presentation (film and sound are examples of other kinds of presentation). I do not think well of technology that conflates the function of both "object" and "document." By defining the roles of message and presentation carefully, giving it all a clear structure, the conception or technology of a flexible document becomes possible — at least it simplifies the whole matter. So the unchangeable text is

the object and the flexible layout is the document in which the objects (and related objects such as illustrations and their captions marginalia, footnotes) are embedded.

**Flexible typography** I think of a hierarchical structure of layouts and layout elements. On top of all there is the relation-based principal layout structure; holding information on general relations between typeface, size, length of line, word and letter spacing, leading and so forth. Next come pre-prepared (but still relation-oriented) principal layouts for different classes of printed matter such as books and journal/periodical articles. These principal layouts make several relations more concrete, e.g., by defining relations between book page and type area (as the 2:3:4:6 or 1/9 - 2/9 rule) more specifically. The different layout aspects such as single micro-and macro-typographical relations needn't be put in one layout on this level; they might be independent from each other first, but depend on each other in the completed layout — it might be useful to set up a kind of construction kit. Now the first really concrete layouts putting these diverse elements together, leading to prepared sample layouts using the actual typeface names and number measurement happens. In this way one moves from the general to the specific as a tree is structured with a trunk, branches and twigs — vaguely defined relations take concrete shape.

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The page layout should be as flexible as the printer allows, so the weight and size of paper to be processed or the number of colors are limited only by the equipment. Nevertheless, within all typographical flexibility or mutability, typographical correctness — I think Tschichold once called it “good typography” — is a must, and can be achieved, primarily by restricting the number of parameters the reader may alter; and secondarily, by carefully hinting the document format for a broadly automated calculation of the parameters that the reader normally doesn't even recognize, e.g., the adjustment of micro-typography to the actual page make-up.

Principally, any aspect of page make-up might be altered, e.g., paper format and relation between paper height and width (paper height first, then its relation to paper width), model of margin relations, size of text area (roughly — to be refined for avoiding rivers), indentions or not, initials or not, setting of headlines, marginal notes or comments or running head or feet, type styles and sizes of different kinds of text elements and other factors. This is just to get a picture of how flexible a layout could be and by virtue of what changeable elements.

Just to avoid misunderstandings: I want to offer a system that allows individual layouts, but this does not mandate that anyone who wants to buy a book must create his own layout. I think rather of readily prepared layouts (with the abstract relation-based principle layout structure here made concrete through actual numbers) that may be altered. Of course, one may create his own book design using free software tools and basic layouts as described later in this text. Too much freedom in terms of book design might confuse the customer and the reader. Too much influence over the printed matter should be avoided, rather the reader might be free to alter a few parameters and even then only choose from about three to five alternatives which best fit his or her particular needs. Choices might include: paper format, margin proportions, hidden or viewable marginalia, position of marginalia if viewable. The designer's task is to offer means (and limits) for possible designs.

To realize the above mentioned "good typography" now, all the named and unnamed factors have to relate to each other — changing one factor affects many others. If you have determined the book size and margins, and therefore the size of the main body of text, the number of typeface sizes is limited. Depending on the chosen typeface, type size (optical sizing), length of lines, etc., parameters such as tracking, wordspacing and leading are adjusted, i.e., less tracking for shorter lines and larger type sizes and so forth. For automatic calculation of optimal leading the character of the typeface is important and needs consideration. Moreover, for the purpose of automated micro-typography, the internal measurement of typeface size should be perfected — a relative type size ought to be calculated considering x-height, H-height, ascenders and descenders. Any micro-typographical refinement such as slightly letterspacing the small caps, must be done automatically without frightening the reader (or the publisher's book designer) with such "minor" problems that he perhaps is not aware of — and doesn't want to be. Everything should be as simple to handle as possible. The customer of flexible book technology might make his personal choice and get what he wants without recognizing anything of the underlying technology.

What is necessary is not just a flexible document format, but a program behind it all that, based upon the actual modifications, automatically changes the whole page make-up including line breaks, syllabication, etc., a program that can handle titles of one line or more (the main text must always fit the grid), or the embedding of initials. Especially creating a program to do a proper line break without producing rivers all over the text or incorrect divisions seems to be a problem that has to be solved;

common DTP programs and word processors do not do a good job here. Also inconspicuous things have to be respected, such as increasing paper width towards the inner margin depending on the number of pages of the publication and on the weight of paper used. What is needed is fully automated typography — and this means more than typesetting with the computer.

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### **User (Reader) Consequences**

With such a flexible document format, and with a digital library offering anything that ever has been published, one might have easy access to the books one wants to read, and even an influence on the form of these books. Does one read at home sitting at a desk, or does one read in bed or in the train while traveling? Does one demand broad outer margins for personal notes? Is a larger typeface needed to read without glasses?

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**Digital book formats** At the beginning of the last section, I mentioned two basic forms of Digital Book: the static and the flexible. To be more precise in terms of the last one: there are, from the reader's point of view, two kinds of flexible books: the first uses the publisher's design, wearing an unmistakable cover layout and more or less unmistakable interior layout, and is only as flexible as the publisher allows; the second uses the original text and illustration data, but not the publisher's layout. Publishers might be free to submit as many layouts as they want, but the customer, or reader must be free to choose the layout wanted. (If no particular layout is desired, then the publisher's basic layout is automatically used.)

**Protection of data** It must be guaranteed that both bookseller and customer cannot change text or illustration data, or make illegal copies of a whole text or extracts. Any printout must carry a copyright note and information on the original publication, whether in the form of footnotes or an extended running head or foot. Especially when single articles are printed at home, it must be impossible to copy the text into a wordprocessor. Perhaps a copyright note is shown on every sheet of paper.

Moreover, text itself may be edited by authorized parties only and is locked against tampering once completed. Even when creating a new edition, the original text cannot be changed, here an authorized copy is opened to be corrected or enlarged. At any rate, manipulation of original material must be impossible.

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**User interface** The whole thing asks for a suitable (graphic) user interface for all modules — text editor, layout editor and browser. The browser/purchaser could be divided into special parts: a list of all books available and a search tool, a list of books chosen and a tool to compile them, then a tool for choosing and adjusting the layout. Proper presentation of all functions is one of the most important factors in a complex system like this. The browsing/purchasing and layout software (customer layout software) does not allow access to basic text and illustration data. It should be as plain as possible.

**How to use** Finally the whole thing could work as follows: with the browser/purchaser program you choose a book, modify its layout and print it out with the bookstore or library printer, or with your own printer at home if you need just a short article and do not mind perfect binding. If you have advised the central digital library via the Internet, the book will be printed, bound and covered at your nearest library or bookstore and posted to your address.

The advantage is first that you might print books and articles from books or journals/periodicals on demand. Second, you might give these books, journals, articles or compilations of articles forms that fit your purpose. Moreover a book, if available at any time, cannot be out of print. Once all books are digitized, one could have access to all existing knowledge. From a publisher's perspective there is no overproduction. And for scientific work, students won't need to waste their time copying page by page from a printed model. This also protects old or rare volumes from getting damaged or destroyed. (Old and typographically extraordinary titles also should be available as scanned reproductions of the original.) One could create one's own series of books using an identical or similar design, perhaps just changing the cover paper. Therefore one might be allowed to save book designs on a disk to carry home, or within a public database.

**Book and screen** Though marginal, there is one more thing I would like to touch upon here. The Internet will be a medium to allow access to a central digital library one day. This leads to reflection on the relationship between Digital Books and the general use of the Internet, or more generally, the difference between page and screen.

As Eric Gill, in his *Essay on typography*, plainly states: “A book is a thing to be read,”<sup>4</sup> and this is valid even today — at least I hope so (there are some books that obviously are produced to make one doubt this). The medium “book” is totally different from the medium “Internet,” or should I say from the medium “screen,” provided by the sources Internet and CD ROM. Internet and CD ROM sites, perhaps because presenting data in the lowest resolution on a flickering screen, are not really to be read, but to be looked at. Recently, I obtained a copy of *How to submit a typeface* PDF file from a major font supplier — forty-five pages with a lot of illustrative elements repeated on each page but surprisingly little text in too large a size, looking nicely on screen but wasting paper and toner when printed out. (I feel personally offended when I have to read body text in sizes as large as 16 pt and more.) However, this example shows clearly that screen layouts and print layouts do not have much in common in terms of presentation of data, and this of course has an influence on the data that is carried. Text offered by screen often is not more than a caption or a marginal comment in a book (real information is rarely found on the Internet). In some way I am sorry about this.

A flexible document format is not only useful for printed matter, but also for creating special layouts that allow *reading* a text from the screen without scrolling to the upper or lower half of the page lying somewhere behind the glass — unfortunately, most ordinary books use the portrait format which does not do justice to ordinary landscape monitors. Publishers, especially those who principally don't sell books but information (reference books or catalogues), could offer two basic layouts once such a flexible document format was realized: one for printing and one for display on a monitor. Depending on the medium the reader uses, the correct layout could be chosen automatically. Perhaps with the help of the flexible document format, printed matter and displayed matter could come closer together.

**Future book, library and bookstore** Two kinds of books evolve: the book produced by the publisher and the Digital Book. The first is the beautifully printed and bound object. More than now, publishers will have to ask themselves: Could this special item be of lasting value? Is it something that readers also value by its material representation, its fine paper or special cover? Or: Can we expect sure sales? Diverse titles seem to be designed to become best sellers.

The Digital Book, as the second kind of book, may not be for those who buy books in a supermarket, somewhere between soap and food on

the shelves. But it is for those who know what they want, especially as it regards the subject, or those who have the time to browse through entire lists of titles in search of an older title from their preferred author. You can do that in a bookstore as well, but the one title you are keenly looking for they usually don't have in stock.

Bookstore and library have similar purpose then, at least they come closer together in their task. As before, the library preserves knowledge and makes it available, and the bookstore sells books as goods, but both allow access to commercial and rare material. Now both rely on the same source, the Digital Library. Is there a difference between bookstore and library in this scenario?

What remains is the social aspect of the library — the general idea that people can borrow what they cannot buy, either for reasons of access or due to cost. The access problem might be solved to a large extent with the Digital Library, for both bookstore and library. What about the financial aspect? Today you go to a library, and either borrow the books for a minimal fee, if any, or you make photocopies and pay your copyright fees. But when you use the Digital Library, it does not make a difference technically whether you enter via bookstore or public library. The result is the same: you are supplied with a printed and bound book that is produced especially for you to keep and thus you have to pay for it. The only difference in the output might result from the printer they use or the paper they offer. This might be one key to the problem: special copies, in cheaper materials, using an economic, though flexible typography with smaller type and margins. Or copies could be marketed as educational versions with wider margins. Otherwise the library in its recent form is not affected at all. The Digital Library might be seen as an addition, one that of course questions the classical roles of bookstore and library.

What is 'book' in the context of a Digital Library? So far in this writing, the word 'book' stands for the printed and bound item, for its visualization on screen and for the rather abstract digital model of the book. The Digital Book denotes the digital model (the information and first vague layout advice) as well as its representations via media on paper and screen.

Bookstore and library would get CD ROMs containing the publishers' series, or have direct access to a central digital library. Often requested material may be copied onto the bookstore's own data carrier. How this actually looks is a matter of the financial situation of the bookstore or library. As an advantage, the flexible document would not need too

much memory for storage because it consists of text and hints only; the layouts are saved independent of the data, the text information.

The central digital library is nothing but a large pool of publisher's data — centrally organized for easy access to any title and for an overview. Special organizational software could be developed not only to handle the database, but also to automate the embedding of new material into existing lists or updating editions (showing older editions in the second line). A very important aspect is that older editions always *must* be available.

Customized Books on Demand

**Paperback and hardback** The Digital Book means a “paperback book” first of all. Producing single exemplars would not pose a problem with slightly improved copying or printing machines. I think of covers like that of some publications of the Gutenberg-Gesellschaft<sup>5</sup> in Mainz, Germany, as there were *Gutenberg-Preis der Stadt Mainz und der Gutenberg-Gesellschaft verliehen an Hermann Zapf, Darmstadt, am 24. Juni 1974* and Hermann Zapf: *Schrift und Buch in der Welt von morgen*,<sup>6</sup> or Hermann Zapf and John Dreyfus: *Classical typography in the computer age*.<sup>7</sup> I prefer the covers of the first two publications because they have an additional paper jacket covering the actual paperback.

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### Conclusion

The development of a flexible document format, the Digital Book, could be similar to the development of typefaces. At the very beginning there is the written hand, its form a result of the pen and the movement of the hand — any piece of writing, any letter, any stem and any shoulder is unique. The first printing with movable punches imitates handwriting, but here the model of the letter, finding the essence of the letter, is important. The printed matter, though manufactured in lots, still can be seen as an original because the typeset model gets destroyed after the act of printing. Photosetting imitates setting with movable type; the whole process becomes more abstract, but that's all. Hell's scanned typefaces increase the level of abstraction by translating the actual letter into digital points. Likewise it is possible for the first time to store a book model digitally for further use. As the momentary peak of development, letters are described in points and curves in between, irrespective of what kind of curve description is actually used; letters can be distorted, interpolated, etc. The digital letter is the model — the ideal — that slightly adjusts its actual face depending on the printing method in use. (Perhaps the Metafont idea marks the latest step, allowing the

highest degree of abstraction, bringing factors like pen width and movement together. Mr. Knuth makes the computer do what the calligrapher does.<sup>8)</sup> The main principles did not change even with digital type. (So I was surprised and disappointed when I used font production software for the first time and realized that font formats are already working with bearing marks to determine letterspacing — though this couldn't have been more than a make-shift done by the first printers when using lead type, instead of working with generally defined distances within letter groups and their combinations.) Digital typography can offer more than just an imitation of traditional techniques. Layout and page make-up need not be fixed, they can be as mutable as type. Flexibility in typography might be helpful: typography itself has to serve the reader, and if it is flexible to fit the reader's needs, so much the better.

Typographic form and its arrangement does influence the reader's mood and prepares him for what's coming. But unless he is a type designer or typographer, once reading has started, attention to the typeface and its arrangement tends to evaporate. Now legibility and readability of typeface and its setting or comfort in reading is important. Whether a book has a large or small size, whether its margins are broad or not, or whether marginalia is present, depends on the reader and his motivation for reading the book. Therefore, typography must be flexible; there is never just one solution for the typographic presentation of a text, unlike some typographers' proclamations.

Among the articles on the documents on demand idea, I found not one author claiming among the idea's assets that of a flexible layout. Everyone thinks only of scanned book pages (those might be more than sufficient for thoughtfully typeset books). But a flexible or mutable book design, as book design in general, is never really touched upon, perhaps because most of the people who work on and with documents on demand are "ordinary readers" — not typographers. And maybe they are not readers at all — or have no particular purpose to their reading.

Creating a unique layout is not the principle idea, but it may become an important factor in the future. Books and journals may get layouts conceived by the producer of the document format; following basic structural rules limits choice and makes sure that the user later might choose a different layout to suit the printed matter to his needs or aesthetic habits. For non-publishers' layouts, classical typography should be the first attempt at systematic work. Classical typography doesn't mean glorifying and thoughtlessly imitating anything older

than a hundred years or so, but structuring the text optically with a simple but aesthetic layout — turning the inside of a text out. As Bernard Newdigate wrote in his *Book production notes*: “Good printing is sane printing, and sane printing is plain printing.”<sup>9</sup> The structural basics and therefore the layout will be simple in the beginning, but — in close connection with publishers and typographers — should be improved and extended as soon as possible.

All parties — authors, designers, publishers, and customers — must understand and accept that with the Digital Book system they won’t deal in touchable, sensible goods. The participating producers will only see proofs. It is the reader who will choose his books and a design appropriate to his reading habits and demands, and will receive his personal sensible piece of printing. It is his responsibility to make the possible into the actual.

Customized Books on Demand

The text itself is an untouchable good. Only the design is adaptable to the reader’s needs. The designer does not offer one best design solution anymore; rather he determines the means of design; he offers possibilities and thus limits possibilities. It is the designer’s task to support the author in structuring his thoughts and finding possible ways of typographic representation. The Digital Book allows for contingency regarding the actual design of a book, but this actual typographic form must show continuity and certainty — and here it is both the programmed rules and the designer’s care that limit means in order to keep continuity and clarity in design.

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is studying communication design  
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A B S T R A C T

This paper describes two experiments that explore the effect of line length (a factor influencing the legibility of print) and paging versus scrolling on reading from screen. Long lines (100 characters) were found to be read faster than very short lines (25 characters), while comprehension remained constant. People's judgments of the ease of reading different line lengths did not correlate with their performance. The long lines were considered least easy to read, and moderate line lengths (55 characters per line) easiest to read. When scrolling, people adopted various reading patterns which influenced reading rate. These results could not be predicted from literature on the legibility of print and suggest that designing for screen may need to be approached in a different way. The potential effects of differences between screen and paper need to be carefully considered.

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