FUTURE RESEARCH

This paper briefly looked at changes in the marketplace to understand how the purchase decision process has been transformed by Web technology. Other conceptual differences in buyer behavior involvement between the Cognitive Buyer and the consumer, identified by Foxall (1992) as the Cognitive consumer, exist and should be considered in any subsequent discussions about these buyers.

Buyer behavior on the Web also will be greatly influenced by other mass marketing channels like advertising on television. Companies currently use this advertising build a brand awareness and attract buyers to their Web sites. With the eventual integration of television broadcasting and Web access the impact on buyers may reveal even more varied types of buyer behavior and styles.

Directed research on access methods like content menus and buyer's navigation patterns will most likely provide the most fruitful way to study how these forces will influence buyer behavior and generate different styles. Perhaps the most exciting aspect about these research methods is that they are essentially part of larger marketing and sales systems that can provide empirical results in real time. These developments will expand marketing research capabilities to a larger number of smaller companies and may have as much an effect on the development of Web marketing and sales as the study of technology-enhanced buyer behavior.

STATE OF THE ART AND CLASSIFICATION OF ELECTRONIC PRODUCT CATALOGUES ON CD-ROM

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INTRODUCTION

With the expansion of the services on the World Wide Web (WWW) and the distribution of information on CD-ROM, modern electronic support of advertising and sale of goods become a key factor in the marketing strategy of many companies. Information systems which focus their attention in multimedia presentation of products or services with functions that allow searching, selection, and ordering are called electronic product catalogues (EPCs).

EPCs offer the possibility to present basic product information with attractive multimedia techniques and to entertain the customer with features like games, animation, or videos. It is easier to inform the customer about all and every detail of products or services with an EPC. Electronic product catalogues are being tested as substitution of paper catalogues or as additional marketing and sales tool, with the additional effect of production training costs reduction. Today more than 10% of the Web-users shop on the WWW. In the United States, over 25 % of all business use the WWW to communicate with customers, potential customers, and other companies they do business with (SNIS 1996).

The technologies used to develop and deliver some multimedia systems like catalogues are still far from being easy and efficient and they show many weaknesses. Due to the significant degree of difficulty in developing, producing, and maintaining sophisticated multimedia software it is necessary to get the job done by large multi-disciplinary teams of programmers, graphic designers, media-experts, and quality control specialists.

We aspire to identify areas in need of research to resolve deficiencies in the current state of the art.

In this paper we will concentrate our attention only on one sort of information systems: EPCs on CD-ROM. All the same we are sure that most of our work will be useful for other information systems. In the first section a description of the EPCs production steps and an evaluation of electronic catalogues functions are made as well as a classification of catalogues is given. In the second section EPCs components are analysed, based on observations of a selection of EPCs on CD-ROM existing on the market. Finally in the last section new trends and some conclusions are delineated.

THE STATE OF THE ART

Electronic Product Catalogues are computer controlled information systems with an important multimedia (especially visual) product presentation and navigation facilities. They are almost always equipped with a shopping bag administration feature.

EPCs are an inexpensive alternative to paper catalogues, but a high quality design is still related to elevated costs, because there are no appropriate production tools available. In the catalogue design and development marketing experts, graphic designers, and programmers are involved. First of all there is the catalogue provider who makes the decision to go into the market with such a multimedia presentation. Second, the catalogue developer designs and produces it by himself or requires the assistance of software and multimedia experts. And finally the users or end-users, who are those interested in the products or services that are being offered in the catalogue.

EPC Production Process

Developing an EPC, the same as any multimedia presentation, is a creative process during which an idea is transformed into an informational and visual experience. Multimedia productions follow the same logical steps as other visual arts. These steps are very precisely described in Rogers and Breland (1995) and are:

♦ conceive, develop, and evaluate an idea;
♦ budget and schedule the work;
♦ assemble the media; and
♦ edit, test, and deliver the final product.

The knowledge of other creative processes therefore can be used to improve existing tools and develop new ones for the creation of EPCs.

The production process can be divided into three steps: *pre-production, production* and *post-production*. At each step different groups will be working with different tools.

Pre-production

The *idea* is the essential element of this step, because it is the key of an EPC presentation. After the idea is born, a catalogue specification must be written describing the details of the contents, layout, and functionality. As a first step a requirement analysis with a feasibility study must be prepared. According to the results of this analysis the decision to go into the production phase can be made. Efforts must be minimised just in case the idea fails to live up. Usually the initial design is realized with a prototype.

Production

During the production phase the actual work of media development, generation, and integration takes place. It comprises media-objects generation, embedding media-objects into design, incorporation of navigation, testing, and certification. The navigation may be done through the database or the page structure, or through the historical information (already visited pages). Different tests must be done along the whole creation process.

Post-production

Just like any software development process, the production of an electronic product catalogue requires many iterations before a consistent, coherent, correct, and user-friendly EPC is finally obtained.

Functions

The analysis of about 40 EPCs has demonstrated that they go much further than paper catalogues with cross references. They offer services like search features, demos to show how to use the catalogue, games, query language, enquiries through telephone communication and fax, or online ordering. Electronic product catalogues fulfil different functions for the catalogue provider and for the end-user. Some of them have been already proposed in Lödel et al. (1992). We additionally analysed in detail some essential functions like sales, training, and documentation in Koch and Mandel (1996).

For the provider they offer products or services *presentation, marketing,* and *sales* functions. They also fulfil an *advice* function in case of technical or complex products, which require an exhaustive explanation or a practical demonstration of their application. EPCs are used to replace traditional *training* sessions for salesmen

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with the already known advantages of multimedia computer-based-training (CBT): faster understanding, better remembering and lower costs. If the provider can recover the details and frequency of the consultations in an EPC, this information may be used for *market research* evaluation. EPCs serve also as *documentation* of the products, their characteristics and prices. They comprise information that traditionally is included in operating instructions manuals. Last but not least, EPCs have a *user model* function if the user's behaviour is used to adapt the catalogue's functionality according to the user's profile.

For the end-users EPCs may have an *information* function, because they learn about the existence of new products or services and their characteristics. A *search*, a *selection*, and an *order* function allow the users to find and to buy what they want. Every electronic product catalogue offers different search possibilities, at least an index and a hierarchical search are provided. Sometimes EPCs allow navigation through a subset of the offered products or services, called shopping list. The selected products and services may be ordered using either fax or online *communication*. Additionally EPCs fulfil a documentation function if the users can store information related to the orders they have placed.

Classification

According to the kind of services or products the provider offers, one can distinguish between catalogues from: *parts suppliers, commercial enterprises, banks* and *insurances, editors, tourism organisations, automotive industry, software houses,* etc.

We observed that working with these EPCs mainly can be divided into installation, presentation, search, selection, and order steps. Depending on the relative importance of the presentation, the searching, the selection, and ordering steps (see Koch and Mandel 1996) we distinguish between the following catalogue types:

Presentation catalogues are produced to introduce to the market expensive products such as cars (Mercedes-Benz E-class, BMW 5-line (BMW 1996)), software (Macromedia Showcase), or complex equipments (Siemens Sireskop SX). Normally they present only few products or just one with many options. They include videos, explaining the use of the product, images, 3-D views, audio, and many multimedia effects.

Search catalogues offer information services. They could be seen as a graphical front-end of a database. Examples are books and journal catalogues (Springer Verlag 1997), museum catalogues, yellow pages (DeTeMedien GmbH 1995/96), software (ObjectStore), etc.

Order catalogues achieve the sales function. They may include many thousands of products, at least presented with images and description. Usually the information is organised in a hierarchical way. Some of them have search capabilities via a query language or the navigation to the next and/or previous product of the hierarchy is allowed (Quelle Schickedanz AG & Co. 1997, RS Components GmbH 1996, Kloeckner Moeller GmbH 1995, Springer Verlag 1997).

EPC COMPONENTS

Problem analysis requires in this case a detailed study of the components of electronic product catalogues, the needs of potential users, and understanding the constraints of these information systems.

As a result of the inspection of example catalogues we made a list of the main features of an EPC as well as a list of major functions. An exhaustive navigation through the catalogue structure was done to find out the system's behaviour in response to different users' stimuli. The contents of these lists were then checked systematically against many catalogues to determine even slight differences in common features.

Thus, we observed that EPCs have a structure, present layout and multimedia elements, make use of database information, offer services and navigation facilities. We analyse these components separately, but naturally they are interacting during the catalogue run. At each step different layout elements as frames, buttons and menus are presented and multimedia elements as sound or animation may complement them. The product information the user is seeing at the same time in the frame has been retrieved from the database. Navigation to a help window, to the next frame in the structure, or back to the last visited page is possible as well.

THE CATALOGUE STRUCTURE

The catalogue structure is given by a collection of themes, every theme may be composed by one or more other themes, each of them having one or more virtual pages associated. The aggregation relation of these components can be seen in Figure 1. For each theme and for each page interaction possibilities with the user and navigation capability can be defined to jump from one theme to another, we called it direction. The information on the pages is kept in databases separating the design from the content.
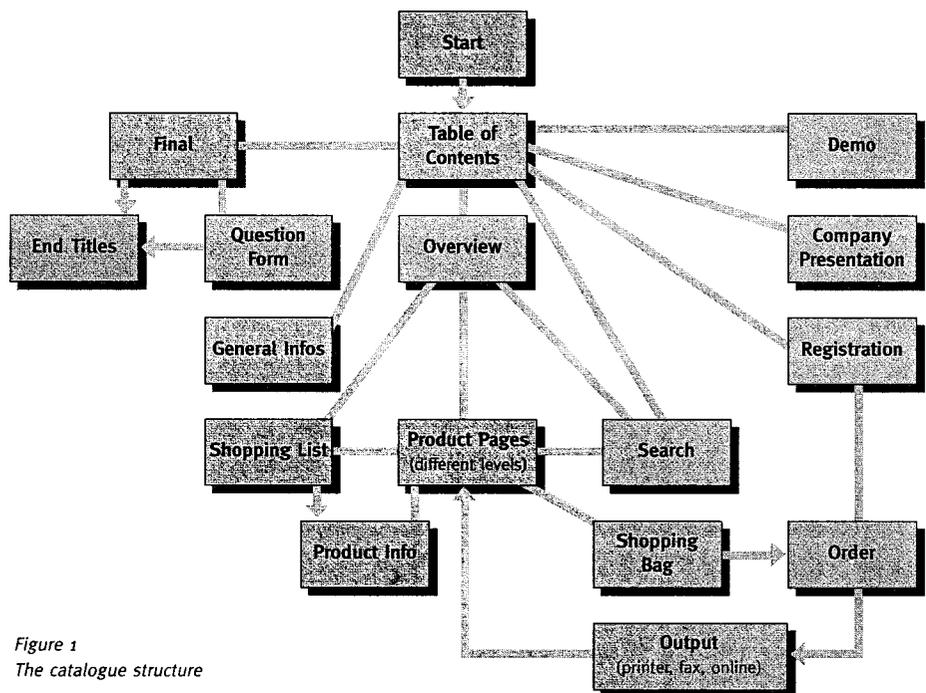

Figure 1
The catalogue structure

The tables displayed below and in the following sections show the results for a small collection of catalogues. We have chosen catalogues which have an attractive design or include a lot of interesting features. These catalogues are: Gelbe Seiten (DeTeMedien GmbH 1995/96), Bosch (1995), RS Components GmbH (1996), Weka Handels GmbH (1995), Klöckner Moeller GmbH (1995), Marlboro Design (Atelier für interaktive Medien 1995), BMW (1996), Quelle Schickedanz AG & Co. (1997), Otto (1995), Springer Verlag (1997), with abbreviations GS, B, RS, W, KM, M, BMW, Q, OT, SP respectively.

The interacting elements, we observed, are grouped into the following components: catalogue structure, layout, multimedia, database, direction, and services.
- The *structure* is the skeleton of the catalogue, based on themes and pages.
- The *layout* is the static description of frames, windows, and their contents.
- The *multimedia* component includes the time dependent elements as videos, sounds, and animations.
- The *database* component supports all the information about the products offered, in such a way that it can easily be searched, exchanged, and maintained.

- The *direction* describes dynamic aspects. We can distinguish between macro-direction for the *navigation* through the catalogue and micro-direction for the activities within a frame or window.
- The *services* add some comfort to the EPC allowing for example the administration of orders, the user registration, the access to help functions, and online communications.

LAYOUT ELEMENTS

All kinds of layout elements can be found in EPCs like frames, windows, lists, tables, buttons, scribbles, sliders, dialog-boxes, browsers, etc. In table 1 only two major groups of layout features are represented, grouping elements that may contain other layout elements and active ones that allow interaction with the user through mouse-click or keyboard-input. Some of them are present in every catalogue like buttons, because they play an important role for navigation; transparent buttons are also quite common, hidden beyond images, videos, or animations.

Only few catalogues are designed with windows, although the utilisation of windows makes them more flexible. The RS catalogue (RS Components GmbH 1996) uses the advantages of this feature, its windows are iconisable, movable, and also fixable. We found out that pop-up-menus and pull-down-menus (mentioned as menus in table 1) are more frequently used features than check-boxes, radio-buttons, and flow-boxes. The presentation of a list of selected products is usually done by a browser allowing the view of no matter how many items.

Some catalogues like Gelbe Seiten Berlin (DeTeMedien GmbH 1995/96) or Bosch (1995) use a big pallet of different layout elements. The designer has chosen for each step the most appropriate layout elements, while other catalogues are designed in a more standard way, each frame is similar to the others in the design just with different content.

Catalogue		GS	B	RS	W	KM	M	BMW	Q	OT	SP
Grouping	Window		♦	♦		♦				♦	♦
	Frame	♦	♦		♦		♦	♦	♦		♦
	Lists		♦	♦				♦	♦	♦	
	Tables		♦					♦			
	Flow-box						♦		♦		
Active	Button	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦
	Menu	♦	♦	♦			♦	♦	♦		♦
	Radio-button						♦	♦	♦		♦
	Check-box										♦
	Slider	♦	♦	♦		♦			♦	♦	♦
	Scribble	♦									
	Dialog-box	♦	♦	♦	♦	♦					♦
	Browser	♦	♦	♦	♦	♦	♦		♦		♦

Table 1   Layout

REFERENCES

Atelier für interaktive Medien
"Marlboro design cd-rom:
Die Kunst und das schöne Ding", 1995.
Made with Macromedia.

BMW "BMW 5-line. CD-ROM",
1996. Made with Macromedia and
Virtual Reality Quick Time.

Bosch "Wir bewegen Ihre Welt.
Bosch-Pneumatik: Das
Komplettprogramm auf CD-ROM",
Katalog Nr. 15, 1995.
Made by telemedia inteactive software
(Bertelsmann).

DeTeMedien GmbH "Gelbe Seiten Buch
1995/96 für Berlin", CD-ROM.

Kloeckner Moeller GmbH
"Automatisieren und Energie verteilen",
CD-ROM, 1995.

MULTIMEDIA COMPONENTS

Multimedia objects like animation, video, slide-show, 3D-images, etc. together with the navigation capability mark the difference between an electronic and a paper product catalogue.

Images, audio, video, and animation are present in almost all EPCs, but important differences can be found regarding its quality and the user interaction facilities.

For example a video may have associated buttons to start, stop, interrupt it, or jump to the next mark, as we can see in the Bosch (1995) catalogue. With audio something similar happens, it makes sense that at least the volume can be varied. The most frequently special effects observed are fade, zoom, blink, and morph and they can be applied to the whole frame or just to one layout element.

Demos and games are very popular features (see Table 2). The first one shows a

Table 2   Multimedia

Catalogue	GS	B	RS	W	KM	M	BMW	Q	OT	SP
Audio	♦				♦	♦	♦	♦	♦	♦
Video	♦	♦		♦	♦	♦	♦	♦	♦	♦
Images	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦
Animation	♦	♦	♦			♦	♦	♦		♦
3D/Virtual Reality							♦	♦		♦
Slide-Show		♦	♦			♦	♦		♦	
Demo		♦	♦	♦		♦		♦		
Game		♦					♦	♦	♦	
Special effects	♦				♦	♦	♦	♦	♦	♦

guided tour, a facility mainly useful for beginners or for catalogues with a complex structure. Games are merely included with entertaining purposes.

THE DATABASE COMPONENT

Products or services offered by an EPC are stored in a database and usually hierarchically organised with different depth in the tree structure. An example for a deep structure is the RS catalogue (RS Components GmbH 1996). Some EPCs organise their products like a graph allowing the access through different identifiers, other EPCs help the users offering them related products. The catalogue mentioned above additionally allows product comparison through the window fixable capability.

Two different aspects of the database component are shown in Table 3: different types of search and data organisation.

The access to the stored information may be realized through a:
- *Lexicographic search:* the search will be supported by a ruler or slide that accompanies the alphabet, as shown in the Yellow Pages catalogue (DeTeMedien GmbH 1995/96).
- *Input search:* a dialog-box allows the user to enter the selecting criteria according to which the EPC then locates the matching entries. These entries will usually be listed as the content of a browser allowing again a selection.
- *Query language:* standard query language as in RS Components GmbH (1996) or graphic query language with two kind of queries: point query and window query as in Gelbe Seiten (DeTeMedien GmbH 1995/96) catalogue are not very frequent.
- *Hierarchical search:* the user reaches the desired product going down step by step in the product tree. This kind of search makes sense when the user is familiar with the product names and knows which products belong to which group. It is the most popular search in EPCs on CD-ROM.

Catalogue		GS	B	RS	W	KM	M	BMW	Q	OT	SP
Search	Lexicographic	◆			◆	◆		◆	◆		◆
	Input		◆	◆	◆	◆		◆	◆		◆
	Query Langage				◆						◆
	Hierarchical	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	Graph				◆	◆	◆				
Organisation	Related Products	◆		◆		◆	◆		◆	◆	◆
	Hierarchy	◆	◆	◆	◆	◆	◆	◆	◆		
	Ordered Products		◆	◆		◆			◆	◆	
	Comparison				◆						◆

Table 3 Database

THE DIRECTION

The selection of the word "direction" needs a brief explanation: the choice follows the idea of directing a film. The contemplation of a catalogue can be compared to the action of seeing a movie. The viewer of the movie has no chance to modify the sequence of the scenes while the catalogue user develops his own screenplay making use of the navigation facilities. This concept is supported by authoring tools like Director from Macromedia.

Knapp, A., Koch, N. and Mandel, L. "The Language EPKML", Technical report 9605, LMU München, November 1996.

Koch, N. and Mandel, L. "Catalogues on CD-ROM: The state of the Art", Technical report 9610, LMU München, December 1996.

Lödel, D. et. al. "Electronische Produktkataloge: Entwicklungsstand und Anwendungsbeispiel", Interner Bericht 1:96, FORWISS, July 1992.

OTTO "Shopping Interactive. CD-ROM", 1995. Made by Feldmann.

Quelle Schickedanz AG & Co. "Easy Shopping per CD-ROM", 1997. Made with Macromedia.

Mouse navigation may be:
- *Local:* only back to previous page and forward to next page is allowed.
- *Regional:* previous, next, and first page of the same theme or group and the main menu can be reached.
- *Global:* jump to any page of the catalogue is possible. For example in the Otto (1995) catalogue, where a page number can be chosen moving a slider; it is organised like a paper catalogue.
- *Temporal:* a listed of visited pages is administered. Therefore the user can select an entry from the history list and jump to an already visited page.

THE SERVICES

Many services can be mentioned, some are shown in Table 4. Those very closely related to every EPC are shopping bag and shopping list, registration and question forms, company's presentations, table of contents, different kinds of help assistance, and ordering through an output media as fax, printer, or online communication.

To fulfil the order function the catalogue must include a registration form and a shopping bag. The first allows the user to identify herself or himself entering at least name and address. The second is nothing else than a list of products to be ordered, selected during the catalogue navigation.

A shopping list is a list of products that have been chosen with the purpose to visit their related pages. A table of content includes the different sections a catalogue is divided into and which are navigation entry-points to the product structure and to additional services. Question forms are used if the provider wants to evaluate the catalogue acceptance.

A few words to the different kinds of help:
♦ *Active help:* small frames with explanations, which are highlighted when the mouse passes over a button or menu. Generally the experienced user can disable or disconnect the active help like in the Otto (1995) catalogue.
♦ *Context sensitive help:* frames with information related to the functionality of that page can be invoked. Sometimes then it is possible to navigate to other help pages.
♦ *General help:* an independent help structure with index, keyword search, and navigation is provided.

Context sensitive and general help are often organised as hypertext.

NEW TRENDS AND CONCLUSIONS

With the explosive growth of the Internet companies are establishing their online presence in the WWW not only presenting themselves, but also offering their products or services. This way they create an alternative channel to traditional systems for product purchase and distribution, dissemination of information, and document publishing.

EPCs present products or services with attractive multimedia techniques and aim to inform and entertain customers with games, animations, and videos. Production costs of EPCs are lower than printing paper catalogues. Postage for an EPC is also lower than that for a several hundred pages thick paper catalogue. Nowadays the design and development costs are still high, but in the future they will be reduced making use of appropriate and easy-to-use tools.

Catalogue		GS	B	RS	W	KM	M	BMW	Q	OT	SP
Help	Active	◆				◆	◆		◆	◆	
	Context sensitive	◆	◆	◆	◆		◆			◆	
	General	◆				◆			◆	◆	◆
	Hypertext		◆		◆	◆					◆
Output	Fax			◆							
	Print	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	Online								◆		◆
Organisation	Company presentation		◆	◆	◆	◆		◆			◆
	Shopping-bag		◆	◆		◆	◆		◆	◆	◆
	Shopping-list					◆			◆		◆
	Table of content	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	Registration form	◆	◆	◆	◆	◆	◆		◆	◆	◆
	Question form	◆			◆						◆

Table 4   Services

EPCs on CD-ROM are not a stand alone medium as paper catalogues are. They need a computer to run on and for some people not used to computers, EPCs are too complicated to install and to navigate through. In some cases EPCs on CD-ROM are replacing traditional paper catalogues and in the future EPCs on the WWW may displace catalogues on CD-ROM assuming that the end-user has a reasonable bandwidth access. Up to now electronic catalogues were classified into catalogues on CD and catalogues on the internet. There are only few examples for hybrid catalogues (net and CD-ROM) as the Quelle (Quelle Schickedanz

Rogers, S. A. and Breland, M. A. "Hypermedia Authoring: An Experiment", Technical report, Microelectronics and Computer Technology Corporation, Austin, Texas, January 1995.

RS Components GmbH "RS: Der Katalog, Das Original (1996)", CD-ROM. Made with Virtual Page.

SNIS "Business on the Web", Siemens Nixdorf Informationssysteme, 1996.

Springer Verlag "Springer CD-ROM Catalogue", CD-ROM 1997. Made with Adobe Acrobat and Quick-Time VR.

WEKA Handels GmbH "Weka-Info: Ihre aktuelle Datenbank zu Fachliteratur und Software", CD-ROM, 1995. Made with Toolbook (Asymetrik).

AG & Co. 1997) and the Springer (Springer Verlag 1997) catalogue. Currently the net connection makes the online ordering possible, in the future it will be used to maintain a continuously updated distributed database. Prices of products will be obtained online whereas images, videos, and sound files will be loaded from the local CD-ROM. With the current bandwidth it is not possible to download such files at a reasonable speed. New offers, like on-sale events, will also be presented as links to the online server. A sound basis must be given through the definition of a client/server-model for database accesses, especially including security aspects. Additional features for a flexible billing model together with a secure credit card processing system must be included to allow ordering and paying online.

In this paper we presented the current state of the art of electronic product catalogues, we described properties and functions of EPCs, and we made a classification of catalogues. We used the results of this study to define a high level specification language for EPCs called EPKML (described in detail in Knapp, Koch and Mandel 1996). The language EPKML was defined within the scope of the EPK-fix project, whose goal is the development of methods and tools for the production of EPCs. This work was supported by the BMBF project EPK-fix.