

Catalogues on CD-ROM: The State of the Art*

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Abstract

Electronic Product Catalogues (EPCs) have reached the market and are gradually displacing traditional paper catalogues. EPCs normally comprise multimedia presentations, lots of special effects, videos, audio, slide-shows, and images, besides the products being presented, their number ranging from a dozen to tens of thousands. A description of EPCs functions and EPCs components are given as well as a classification and a comparison of electronic vs. paper catalogues.

Keywords: Electronic Product Catalogues, Multimedia.

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 becomes a key factor in the marketing strategy of many companies. Most of them are testing the usage of electronic product catalogues as substitution of paper catalogues or as additional marketing and sales tool.

Today more than 10% of the Web-users shop on the WWW. The average purchase in mid 1995 was 10 US dollars and has risen to 14 US dollars in only the last six months, a 40 % increase. 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. [SNI96]

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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. The answer to this problem lies partially in putting easy-to-use tools in the hands of a small team of software professionals and marketing experts which together would:

- help to determine the requirements,
- reduce the design efforts,
- increment the quality testing speed,
- reduce the costs of producing and updating multimedia systems,
- simplify the maintenance of the information.

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). In this paper we will concentrate our attention only on this 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.

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

The first section presents a brief description of what an electronic product catalogue is. The second section describes the steps of EPCs production while an evaluation of electronic catalogue functions is made in section three. Section four classifies catalogues according to different points of view and in the fifth section its components are analysed based on observations of a selection of EPCs on CD-ROM existing on the market. In section six EPCs are compared against paper catalogues. Finally the aim of a specification language for EPCs is given in section seven and in the last section some conclusions are delineated.

1 What Is an Electronic Product Catalogue?

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.

EPC developing tools would be welcome in companies or institutions that want to offer its products or services on the Web or on CD-ROM. The catalogue design and development would be done by a team work of marketing experts, graphic designers, and programmers. The former necessarily belong to the enterprise, the later may be independent catalogue developers.

In each case there are different teams involved in the EPC business. First of all the person or group who makes the decision to go into the market with such a multimedia presentation for potential customers. We call them catalogue provider. They or their marketing people describe their wishes to the catalogue developer, who may design and produce it by himself or require the assistance of software and multimedia experts. EPCs are designed to be used by customers or users who are interested in the products or services that are being offered in the catalogue (we will call them users or end-users).

2 Electronic Product Catalogues 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 [RB95], [Bol94] and are:

- conceiving, developing, and evaluating an idea;
- budgeting and scheduling the work;
- assembling the media; and
- editing, testing, and delivering 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.

2.1 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 minimized just in case the idea fails to live up. Usually the initial design is realized with a prototype.

2.2 Production

During the production phase, the actual work of media development, generation, and integration takes place. Ideally, the exploratory design done in pre-production should lead directly into production without the need to re-plan the design. Unfortunately this is seldom the case.

- *Media-objects generation*

Assembling the raw materials for an EPC is similar to the production activities in a film. After the script has been completed, the elements of the design must be individually created, to then be assembled into the final product. They may be taken from a multimedia components library or designed from scratch. Text, audio, images, videos and animations are part of the results of this creation process.

Sound plays an important role in multimedia presentations, because in the future a multimedia information system without audio elements will be difficult to imagine. It may be used to create a mood or an accent with music, or it can be used to move part of the text information into narration. The audio quality requires special attention, perhaps it may demand professional assistance. Images may be photographs digitally scanned, logos, graphics, or any piece of illustration.

Together with video and slide-shows they not only make presentations more attractive, but also they are an effective tool for presenting information in full partnership with text and sound. Considering the text, the quality of the contents is as important as the structure. To migrate and adapt text from the product or service database or from other applications should not be a problem for the design of an EPC. That results in a collection of media-objects without any connection among them.

- *Embedding media-objects into design*

After media-objects have been generated, the next step is to combine them according to the designed layout. This process can be compared with the editing of a movie, after the different scenes have been filmed. The scenes must be assembled according to the script. The same happens in the production of an EPC. The products' or services' descriptions and presentations must be related to the menus, according to the initial design. Not only the decision of which objects will be used, but the art of how they will be combined, i.e. the election of a background color, the size of certain frames, the duration of an unstoppable video are relevant for the marketing success of an EPC.

- *Incorporation of navigation*

From every frame or page belonging to the EPC the end-user must be able to jump to at least one other frame or page. There are different navigation models: a sequential model allows the access to the next and to the previous, while in the hierarchical model the information is organized as a tree and the user has additional access to the ancestor, succesor, and to the root. The navigation may be done through the database or the page structure, or through the historical information (already visited pages).

- *Testing and certification*

The test phase must not be considered as a separate final step. It is important that the tests will have been done along the whole creation process. After generation each media-object must be proved for correctness. Partial tests are possible, when objects are brought together to verify, i.e. that images are not overlapping or that text will have enough space flowing

around another object. After navigation has been incorporated the aim of the test is to look for erroneous links and assure that exit of the EPC is at each state possible.

2.3 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. A good interaction with the catalogue provider is necessary to adjust the final EPC to her or his initial idea, as well as the analysis of the reaction of potential end-users by the navigation through the catalogue. A lot of adjustments will be made in this step of the process. Before recording the final version on CD-ROM, the developer must perform some additional work to move the product from the development to the target environment. For any commercial production the developer must be sure to obtain full rights to use any media-objects included in the EPC that was not developed by himself. Copyrights and trademarks must be mentioned in the final edited electronic product catalogue.

3 Electronic Product Catalogue's Functions

The analysis of many EPCs produced during the last year 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, tests to verify if an updated version of the catalogue is required because the actual one is no longer valid, enquiries through telephone communication and fax, or on-line ordering.

Electronic product catalogues fulfill different functions for the catalogue provider and for the end-user. Some of them have been already proposed in [LBDB⁺92] but essential ones like sales, training and documentation functions are missing in that report.

For the provider they offer:

- *Sales function*

EPCs are used most of the times to offer and sell products or services. Without doubt it is the most common aim.

- *Advice function*

EPCs are useful in case of technical or complex products, which require an exhaustive explanation or a practical demonstration of their application. They result in a good complement or substitution for salesmen advise.

- *Presentation function*

Advertising should contain lots of effects and layout attractions to arouse the enthusiasm of the consumers. Products are presented more vividly with multimedia features like video, sound, animation and slide-show, complementary to images, graphics and text than only with traditional ones, that is with text and images.

- *Market research function*

If the provider can recover the details and frequency of the consultations in an EPC, this information may be used for market research evaluation.

- *Marketing function*

Products or services that are presented with multimedia features are easily remembered, because they are registered by both memories, the visual and the auditive. Not to underestimate is the fact that with a successfully EPC the provider's company improves also its image. On the contrary an EPC with malfunctions (files not found, etc.) or a poor design is the worst advertising for the company.

- *Training function*

Computer-based-training (CBT) is gaining importance at schools as well as in the commercial world. Examinations and statistics prove that with multimedia CBT a faster understanding and better remembering is achieved. Information about new products, their characteristics and application possibilities can replace a training course reducing also costs.

- *Documentation function*

Normally an EPC serves as documentation of the products, their characteristics and prices. Additionally some EPCs comprise information that traditionally is included in operating instructions manuals.

- *User model function*

The user's behaviour can be stored and this knowledge can be used to adapt the catalogue's functionality according to the user's profile. For example some product groups can be shown first if the user has chosen these groups very often, or a video can be dropped if he or she had always interrupted it.

For the end-user EPCs may have:

- *Information function*

They allow to learn about the existence of new products or services and their characteristics.

- *Search function*

Every electronic product catalogue offers different search possibilities. At least an index and a hierarchical search are provided. Other alternatives are alphabetical search, sequential search, search for related products, search by input, graphical query, query by example, or a query language with boolean operators.

- *Selection function*

Sometimes EPCs allow navigation through a subset of the offered products or services. This subset, called shopping list, is defined by the user itself according to her or his needs or interests.

- *Order function*

After the end-user has made a choice, she or he wishes to order the selected products and services in an efficiently way using either fax or on-line communication.

- *Training function*

Sometimes electronic product catalogues are used in the same way as videos for training purposes. The advantages of using EPCs for training have already been explained previously and are applicable to the trainer and to the trained person.

- *Documentation function*

An EPC serves as documentation of the products or services, their characteristics, and prices and very often the user can store information related to the orders she or he has placed.

- *Entertainment function*

For EPC this will be only a side effect. Some catalogues include a short game as part of the company's presentation, as an additional feature in the list of services or integrated in the products presentation ([Bos95],[BMW96],[Que95]).

4 Classification of Electronic Product Catalogues

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 organizations, automotive industry, software houses, etc.*

We observed that working with these electronic product catalogues mainly can be divided into the following steps:

- *Installation:* In this initial step the access component of the EPC is installed onto the computer, configuring it to match the installed multimedia hardware, i.e. resolution of the screen, memory available, disk space, printer, on-line services, etc.
- *Presentation:* The user is presented with publicity messages about the company and its offers and perhaps a demo of navigation facilities through the catalogue will take place. During this phase the potential customer is a passive user, who is shown how the catalogue works other than in the next steps where he interacts with it.
- *Search:* Here the user enters the selecting criteria according to which the EPC then locates the matching entries. Textual or graphical queries, or hierarchical search may be allowed.
- *Selection:* Alternating with the previous step the desired products are marked, thus creating the order list.
- *Order:* The list created is formatted and forwarded to the services' or products' provider.

Depending on the relative importance of the presentation, the searching, the selection and ordering steps, we distinguish between the following catalogue types:

- *Presentation catalogues (P)*

This kind of catalogues are produced to introduce to the market expensive products such as cars [Mer95, Vol95, BMW96, Por95], software [Mac95, Obj95], or complex equipments [Gro95]. 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. Services like rental or leasing calculation are sometimes included.

- *search catalogues (S)*

These catalogues offer information services. Examples are stamps catalogues, museum catalogues, yellow pages [DeT95], etc. They could be seen as a graphical front-end of a database.

- *order catalogues (O)*

Order catalogues are produced to achieve the sales function. They may include many thousands of products, at least presented with images and description. Usually the information is organized in a hierarchical way. Some of them have search capabilities via a query language or the user is at least allowed to navigate to the next and/or previous product of the hierarchy. The most important functionality is the possibility to place an order, dialing a telephone number via modem, via fax and in some cases with an on-line communication through a public net, i.e. [OTT95, Que95, RS].

5 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.

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

Thus, we observed that electronic product catalogues 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. And navigation to a help window, to the next frame in the structure, or back to the last visited page is possible as well.

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 Berlin [DeT95], Bosch [Bos95], RS Components [RS], Weka [WEK95], Klöckner Moeller [Klo95], Marlboro Design [Ate95], BMW [BMW96], Quelle [Que95], Otto [OTT95], Microsoft technet [Mic95], with abbreviations GS, B, RS, W, KM, M, BMW, Q, OT, MTN respectively.

Table 1 shows some general characteristics of catalogues, as a classification, configurability, user and market type identification. We considered three different catalogue types: presentation (P), search (S), and order (O) catalogues. We analysed for what kind of user the catalogue was developed, thus we distinguished between experts (e) in catalogue or hypermedia applications, users with some basic knowledge about navigation (k), and beginners (b). As possible market segments we have looked at catalogues from technical (tec), public information (inf), automobile (au), mail-order (m-o), editorial (ed), and art (art) sectors. We also annotate whether the catalogues can be configured and if errors appear while using them.

General characteristics										
Catalogue	GS	B	RS	W	KM	M	BMW	Q	OT	MTN
Catalogue type	S	O	O	S	O	P,O	P	O	O	S
Market	inf	tec	tec	ed	tec	art	au	m-o	m-o	ed
Configuration					√		√			
Errors	√	√	√	√			√			
User	k	e	e	k	b	k	k	b	b	k

Table 1

5.1 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. For every page there is at least one layout element defined. The aggregation relation of these components can be seen in figure 2. 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. The interacting components observed are grouped in catalogue structure, layout, and multimedia elements, database component, 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.

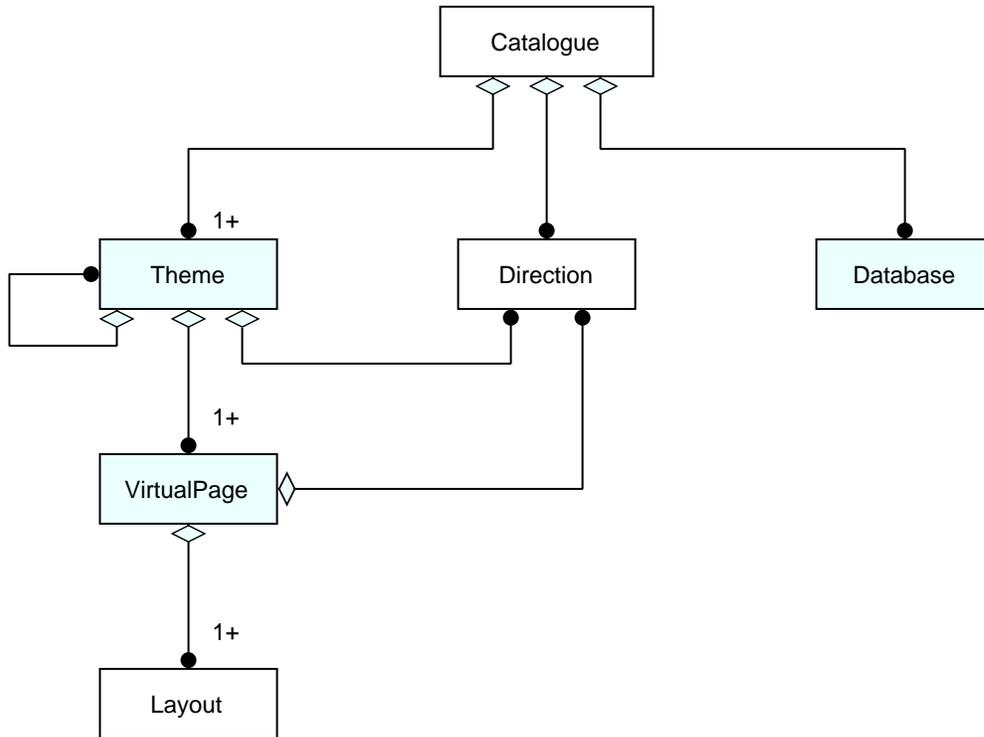


Figure 2: The catalogue structure

- 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 the dynamic aspect. 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.

5.2 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 3 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.

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

Table 3

Only few catalogues are designed with windows, although the utilization of windows makes them more flexible. The RS catalogue [RS] uses the advantages of this feature, its windows are iconizable, moveable and also fixable. We found out that pop-up-menus and pull-down-menus (mentioned as menus in table 3) 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 [DeT95] or [Bos95] 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.

5.3 Multimedia Component

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. Some multimedia elements are listed in table 4.

Multimedia										
Catalogue	GS	B	RS	W	KM	M	BMW	Q	OT	MTN
Audio	✓				✓	✓	✓	✓	✓	
Video	✓	✓		✓	✓	✓	✓	✓	✓	
Images	✓	✓	✓	✓	✓	✓	✓	✓	✓	
Animation	✓	✓	✓			✓	✓	✓		
3D/ Virtual reality							✓			
slide-show		✓	✓			✓			✓	
Demo		✓	✓	✓		✓		✓		
Game		✓					✓	✓	✓	
Special effects	✓			✓	✓	✓	✓	✓	✓	

Table 4

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

For example a video may have associated buttons to start, stop, interrupt it or jump to the next mark, as we can see in [Bos95]. 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. The first one shows a guided tour, a facility mainly useful for beginners or for catalogues with a complex structure. Games are merely included with entertainment purposes.

5.4 The Database Component

Products or services offered by an EPC are stored in databases and usually hierarchically organized with different depth in the tree structure. Examples for deep structures are the [Mic95] and [RS] catalogues. Some EPCs organize their products like a graph allowing the access through different identifiers, other EPCs help the users offering them related products. The [RS] catalogue additionally allows product comparison through the window fixable capability.

Two different aspects of the database component are shown in table 5: different types of search and data organization.

The access to the stored information may be realized through a:

- *lexicographic search*: the search will be supported by a ruler or slider that accompanies the alphabet, as shown in [DeT95].
- *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 permitting again a selection.
- *query language*: standard query language as in [RS] or graphic query language with two kind of queries: point query and window query as in [DeT95] 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.

		Database									
Catalogue		GS	B	RS	W	KM	M	BMW	Q	OT	MTN
Search	Lexicographic	✓			✓	✓		✓	✓		
	Input		✓	✓	✓	✓		✓	✓		✓
	Query language			✓							✓
	Hierarchical	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Organization	Graph				✓	✓	✓				
	Related prod.	✓		✓		✓	✓		✓	✓	
	Hierarchy	✓	✓	✓	✓	✓	✓	✓	✓		✓
	Ordered prod.		✓	✓		✓			✓	✓	
	Comparison			✓							

Table 5

5.5 The Direction

The selection of the word direction needs a few more words: 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 [Mac95].

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 [OTT95] catalogue, where a page number can be chosen moving a slider; it is organized like a paper catalogue.
- *temporal*: the numbers and a brief description of each page that had been visited is stored in a list. Therefore the user can select an entry from the history list and jump to an already visited page.

As it can be seen in table 6 one property we have searched for is the drag and drop facility, but we could not find it at any selected catalogue. The multiple selection is also poorly supported.

Navigation											
Catalogue		GS	B	RS	W	KM	M	BMW	Q	OT	MTN
Mouse	Mult. selection					✓					
	Drag & Drop										
Navigation	Local										
	Regional	✓			✓		✓				
	Global		✓	✓		✓			✓	✓	✓
	Temporal							✓			✓

Table 6

5.6 The Services

Many services can be mentioned, some are shown in table 7, but 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 on-line communication.

To fulfill 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 [OTT95].
- *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 organized as hypertext.

Services											
Catalogue		GS	B	RS	W	KM	M	BMW	Q	OT	MTN
Help	Active	✓				✓	✓		✓	✓	✓
	Context sensitive	✓	✓	✓	✓		✓			✓	✓
	General	✓				✓		✓	✓		✓
	Hypertext		✓	✓		✓					✓
Output	Fax			✓							
	Print	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	On-line								✓		
Functions	Company pres.		✓	✓	✓	✓					
	Shopping-bag		✓	✓		✓	✓		✓	✓	
	Shopping-list					✓			✓		
	Table of cont.	✓	✓	✓	✓	✓	✓	✓	✓	✓	
	Regist. form	✓	✓	✓	✓	✓	✓		✓	✓	
	Question form	✓		✓							

Table 7

6 A Comparison with Paper Catalogues

Traditional sales techniques are gradually being improved with multimedia features.

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, which complemented with the work of a salesman or adviser is the perfect combination. It has the additional effect that it reduces the personnel training costs and time.

Production's cost of EPCs is in several cases lower than paper catalogue's, because the cost of recording information on a CD-ROM is less than that of the printing the same number of paper catalogues. Postage for an EPC is lower than that for a several hundred pages thick paper catalogue. Nowadays the design and development costs are still high, with appropriate and easy to use tools in the future they will be reduced.

EPCs on CD-ROM offer not only advantages, they need a computer to run on. This is a disadvantage against paper catalogues, which are a stand alone medium and for some people not used to computers, EPCs are too complicated to install and to navigate through.

7 The Specification Language epkml

The study in detail of the properties of EPC on CD-ROM as special information systems, was made with the aim of defining a specification language for electronic product catalogues. This language is used to develop tools that allow catalogue designers an easy and low-cost production

of standard catalogues, but that are on the other hand, flexible enough to design more sophisticated ones. Maintenance and proof of correctness are also important subjects that have been considered. We arrive to the conclusion that a specification language for electronic product catalogues has to:

- support multimedia elements,
- incorporate control constructions to permit interaction with the user and navigation through the catalogue,
- allow simple handling of catalogue standard operations like user registration, product searching, order forms, and question forms,
- be easy to implement and to test,

As another conclusion of our analysis we grouped the EPC functional requirements to be considered in the design of a specification language, as follows:

- *Static requirements*

Here we find all layout elements, such as window, frame, button, check-box, pull-down menu, slider, text, paragraph, heading, listing etc.

- *Dynamic requirements*

This group includes every interactive situation, such as starting or stopping an animation or a video, navigating by clicking on buttons, selecting help functions, sending an order, scrolling in a browser, etc.

- *Data requirements*

These are primarily products, companies, and customers information, help text or help windows, navigation sequences, orders, and multilingual text for the pages. All this information has to be stored in files or databases.

The definition of this specification language, called `epkml`[KKMW96] is part of the project EPKfix. The goal of the project is the definition of the language and development of the tools for the design of electronic product catalogues. These tools are a requirement assistant (RASSI), a specification assistant (SASSI), a generation assistant (GASSI), and a test assistant (TASSI).

8 Conclusions and Further Steps

What we achieved with this work is to establish the current state-of-art of the electronic product catalogues on the market as a base in the requirement analysis for a comfortable specification language for EPCs on CD-ROM. Through the features and services observed and tested, we decided the components and characteristics of the language `epkml` with the goal that the development of a catalogue becomes an easy and inexpensive task for companies of any kind and size. The additional tools of the EPK-fix-project will improve on this further.

EPCs on CD-ROM are displacing traditional paper catalogues and in the future EPCs on the World Wide Web probably will displace EPCs on CD-ROM.

With the explosive growth of the Internet companies are establishing their online presence in the World Wide Web (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.

In the future, the challenge in the field of EPC-development is not only to make the distribution of catalogues on the WWW possible, but also make it as easy as the specification of a catalogue on CD-ROM in epkml. For this purpose, 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.

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References

- [Ate95] Atelier fuer interaktive Medien. Marlboro design cd-rom: Die kunst und das schöne ding, 1995. Made with Macromedia.
- [Bal95] Heide Balzert. *Methoden der objektorientierten Systemanalyse*. BI-Wissenschaftsverlag, Mannheim–Leipzig–Wien–Zürich, 1995.
- [BMW96] BMW. Bmw 5-line. CD-ROM, 1996. Made with Macromedia, Virtual Reality Quick Time.
- [Bol94] Dietrich Boles. Das IMRA-modell. Diplomarbeit, Carl von Ossietzky Univerät Oldenburg, September 1994.
- [Bos95] Bosch. Wir bewegen Ihre Welt. Bosch–Pneumatik — Das Kompletprogramm auf CD-ROM katalog nr. 15, May 1995. Made by telemedia interactive software (Bertelsmann).
- [Dav90] Alan M. Davis. *Software Requirements*. Prentice Hall, Englewood Cliffs, N. J., 1990.
- [DeT95] DeTeMedien GmbH. Gelbe Seiten Buch 1995/96 für Berlin. CD-ROM, 1995.
- [Gra95] Ian S. Graham. *HTML Sourcebook*. John Wiley & Sons, New York–etc., 1995.
- [Gro95] Siemens AG. Medical Engineering Group. SIRESKOP SX. CD-ROM, 1995.

- [KKMW96] Alexander Knapp, Nora Koch, Luis Mandel, and Martin Wirsing. Die Sprache EPKML. Interner Bericht 1:96, LMU München, March 1996.
- [Klo95] Kloeckner Moeller GmbH. Automatisieren und Energie verteilen. CD-ROM, 1995. Testversion.
- [LBDB⁺92] D. Lödel, I. Büttel-Dietsch, J.S. Breuker, M. Ponader, P. Mertens, and S. Thesmann. Elektronische Produktkataloge: Entwicklungsstand, Einsatzmöglichkeiten und Anwendungsbeispiel. Interner Bericht 1:96, FORWISS, July 1992.
- [Mac95] Macromedia. Macromedia Showcase CD 4.0. CD-ROM, 1995. Made with Macromedia.
- [Mer95] Mercedes-Benz AG. Die neuen E-Klasse Limousinen von Mercedes-Benz auf CD-ROM, 1995. Made with Macromedia.
- [Mic95] Microsoft Corporation. Microsoft technet, Technical Information Network. CD-ROM, May 1995. Vol 3, Issue 5.
- [Obj95] Object Design Inc. Presenting Objectstore. CD-ROM, 1995.
- [OTT95] OTTO. Shopping Interactive. CD-ROM, 1995. Made by Feldmann.
- [Por95] Porsche. Die 911 Familie. CD-ROM, 1995. Made by procom.
- [Que95] Quelle Schickedanz AG & Co. Easy Shopping per CD-ROM, 1995. Made with Macromedia.
- [RB95] Steven A. Rogers and Mark A. Breland. Hypermedia Authoring - An Experiment, jan 1995.
- [RBP⁺91] James Rumbaugh, Michael Blaha, William Premerlani, Frederick Eddy, and William Lorenzen. *Object-Oriented Modelling and Design*. Prentice Hall, Englewood Cliffs, N. J., 1991.
- [RS] RS Components GmbH. RS: Der Katalog. Das Original (september 95 – februar 96). CD-ROM. Made with Virtual Page.
- [SNI96] SNIS. Business on the Web. Siemens Nixdorf Informationssysteme, 1996.
- [vH94] Arthur van Herwijnen. *Practical SGML*. Kluwer Academic, Boston, 1994.
- [Vol95] Volkswagen AG. Entdecken sie die Welt des neuen Sharan. CD-ROM, 1995. Made by BBDO Interactive.
- [WEK95] WEKA Handels GmbH. Weka-info: Ihre aktuelle Datenbank zu Fachliteratur und Software. CD-ROM, 1995. Made with Toolbook(Asymetrik).