XML-STRUKTURIERTE MUSEUMSINFORMATION –
GUT AUFGELEGT FÜR VERSCHIEDENSTE AUSGABEMEDIEN

EMBRACING THE MUSEUM PUBLICATION –
XML-STRUCTURED CONTENT FOR MULTIPLE OUTPUT CHANNELS

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Zusammenfassung

Der Aufsatz stellt ein Informationssystem für Museumsbesucher vor, das gegenwärtig für das Sächsische Industriemuseum in Chemnitz entwickelt wird.

Während Informationssysteme in Museen bisher vorrangig beim Sammlungsmanagement eingesetzt werden, richtet sich dieses Projekt auf die Vermittlung von Inhalten. Es soll ein XML-basiertes Informationssystem geschaffen werden, mit dem das Museum seinen Besuchern aus einer einzigen Datenquelle heraus Informationen in verschiedenen Formen anbieten kann: multimediale Bildschirmdarstellungen im Museum und im Internet sowie individuell zusammengestellte Druckprodukte.

Der Aufsatz stellt das Konzept dieses Publikationssystems vor und skizziert dessen Entwicklungsschritte: die Dokument-Modelle, das Metadaten-Design und die Stylesheets. Dabei ist stets zu erwägen, wie ein solches System 'maßgeschneidert' werden kann, um die unterschiedlichen Ansprüche der Museumsbesucher und der Museumsbetreiber zu erfüllen.

Abstract

This paper deals with a document management application which is being developed for and implemented in the Industrial Museum of Saxony.

Whereas most of the common museum documentation projects focus on the issue of collection management, this project is content-centered. It intends to establish an XML-based visitor-information-system, which enables the museum to provide on-screen visitor information "on-the-floor" and in the internet as well as print-output (PoD) from the same data source.

The paper will sketch the system's architecture and take a closer look at the conception and development of the document models, meta-data and stylesheets, which allow to create rich and diverse multimedia presentations. The discussion will outline some key demands of a publication system which is tailored to the needs and expectations of museum visitors as well as the museum staff.

0. Introduction

The information system presented in this article is designed to provide museum visitors with online information as well as printed information from the same digital document source. This system is based on XML.

Establishing an XML application still is complex and time-consuming. It requires a thorough examination of the material which has to be handled and processed, and a conception of the system functions, tools and workflows. It also has an effect on the environment where it is implemented. Establishing an XML application involves the staff and their routines. In the case of the Chemnitz Industrial Museum, documentation and publishing practices will have to be reorganized and tuned to a new overall strategy. And, most obviously, the first period of such a project takes quite a number of meetings with little 'visible' outcome and it can be challenging to keep the staff involved. Establishing an XML application is real effort. Thus, it must be justified by a reasonable vision of the utility and advantage of the designed system.

1. Tailoring a Concept

The visitor information system outlined in this article will be implemented in the Chemnitz Industrial Museum. The museum was founded in 1991. Its origins are closely related to the historical context of the collapse of the political and economic system in former Eastern Germany. On one hand, this situation was auspicious for gathering a collection of industrial history when hundreds of companies shut down and gave away their remains for free. On the other hand, this radical turnround called for an institution like an industrial museum. Chemnitz had been a center of engineering and textile industries for about 200 years and it was bad enough for the people in the region to see their working equipment rendered in items of cultural heritage. The Chemnitz Industrial Museum preserves (and reflects) the reminiscence of a cultural identity many people have lived with.

This close link to the roots and fate of a region led state and municipal politicians to giving the museum more prominence. Therefore, they funded the reconstruction of an old foundry building which will be the new site of the museum. It is due to re-open in 2003 with a broader mission as the Industrial Museum of Saxony.

When the museum executives asked the Institute for Print and Media Technology to support them in establishing a visitor information system in their new residence they already had designed the framework of the exhibition concept.

First, the new exhibition will be grouped into seven topic areas.[1] Second, the exhibits are intended to be the predominant physical objects on the exhibition floor, presented in a very purist manner without decorative wrapping or furnishing. This vision, which is inspired by the idea and appearance of an art exhibition, goes that far that it does not want to have information displays, charts or text boards along with the exhibits except from very small tables which only give a short description of each exhibit. All other information should be condensed into POIs (*Points of Information*) which are placed prominently in the center of each of the seven topic areas of the exhibition (*landmarks*). The POIs were expected to be multimedia kiosks, which present rich and diverse information and tell the whole 'museum story'.

Given this determination to rely on electronic information, we had to consider the following issues:

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[1] These are: The Saxons, the working people, the entrepreneurs, the family, the creators, the people from Karl-Marx-Town and the consumers. The design of the topics express the intention of the Museum not to focus on technology but on people in different roles and classes.

1.1. Information should be available and accessible

In the second place, this does concern the physical measurements and design of the kiosks and their devices. In the first place visitors will have to find a kiosk which is not occupied by someone else.

We did not conceive of *stand-alone* kiosks which display one certain presentation related to their neighborhood, but rather to establish an overall museum *information network*: the kiosks, no matter where they are located should give access to the entire information bases. The relation towards a topic area could be displayed according to a fish-eye principle: the 'default' presentation on every kiosk will focus on the topics of the area where it is located but all other branches of the thematic structure can be reached through some clicks of navigation.

With kiosks as outlets of a coherent Visitor Information System (*VIS*) we hope to make sure that users will disperse smoothly across the whole exhibition floor.[2]

1.2. Information should be rich and multiple

As the presentation of the exhibits is deliberately purist and sober the information supplied through the kiosks would have to be rich, manifold and compelling. It should not only describe the exhibits but also give a lot of additional and contextual information. In a nutshell, it should 'tell the story' of industrial development and culture in Saxony.

Information should be attractive for different types of visitors in terms of different ages, interests, educational levels, and different familiarity with electronic information devices. Therefore, we outlined a dual level structure of mainstream and deepening.

The *mainstream* is the core sum of information we intend to bring about to most of the visitors. On the surface level it presents a movie-like trailer for each of the seven topics of the exhibition; this trailer is presented in the default loop of every kiosk, so that a very unexperienced user can follow them without even touching a single button. Next, the mainstream presents a nicely narrated walkthrough of five to seven aspects of each topic, often in the form of portraits of people (*historical agents*). The mainstream orients towards a level of *common understanding* and makes intensive use of multimedia (graphics, audio, video, interactive games and models). The mainstream is organized horizontally like a guided tour, which leads the user from one issue to the next. Every narrative in the mainstream should appear as 'complete in itself' and give the visitor the opportunity to come to an end.

The *deeper level* contains all kind of further information: the description of special aspects, details, documentation. This level addresses to visitors with special interests or educational purposes. It is accessible through reference and navigation, but also through request and retrieval. The quantity of documents on the deeper level is virtually infinite.

To sum up, the VIS will contain more documents than the user can consume and comprehend within a visit. User tests measured the average time spent at a POI ranging from 3 to 7 minutes.[3] This will just be enough time to go through two or three mainstream articles.

From here it was close at hand to think of a print option. We proposed to implement a 'print basket' where the visitor can drop documents during his museum tour when he intends to read them later. These documents are compiled on an account and form a personal sample. At the end of his museum tour the visitor can sort his account, widen or narrow his sample and finally trigger a print job. After a minute he can take away his personal museum catalogue for deeper reading.[4]

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[2] The museum stats show that more than 70 % of visitors come in groups, 50 % of the visitors are pupil classes. Consequently, the occupation of the POIs will have peaks whenever two or more groups arrive at the same time. This tendency stresses the importance of a coherent network solution.

[3] Annette Noschka-Roos (1999): Evaluation der Neuen Medien im Museumskontext – Befunde und Konsequenzen. Unveröff. Manskript des Vortrags zum Konferenzthema 'Zauberformel Interaktivität', Heinz Nixdorf Museumsforum, Paderborn, 16.11.1999.

[4] The opportunity to print electronic documents is strongly recommended by user tests which state that electronic displays are the appropriate medium for presenting dynamic information but that readers prefer paper copies for comprehensive reading. See: Andrew Dillon (1994): Designing usable electronic text. Ergonomic aspects of human information usage. London 1994: 30 ff.

1.3. Information should also be offered in the WWW

This demand seems only too reasonable. Today, internet pages play a crucial role for a museum's aiming to reach and maintain a broader public. The only issue discussed with the museum team was whether all inhouse content should be brought to the internet as well. The question was if a complete internet presentation would satisfy the users' interest so much that visiting the museum online is worth enough and makes a real visit seem to be redundant.

We argued that this was quite improbable. Just the contrary, we are convinced that a rich and profound internet site is an indicator of the museum's substance and expertise and will rather awake the desire to see the place behind it.

1.4. Content should be re-used

The wish to supply museum visitor information via different output devices could not be fulfilled without the concept of re-usable content.[5] This concept became more prominent with the rise of XML which is based on the idea of separating form from content. In our project the strategy of a trifold use of the same content (kiosk, internet and personal sample print) was justification enough make a deeper approach by implementing an XML application.

Another pre-condition encouraged this approach. The museum, founded in 1991, is a very young institution and does not have too many legacy systems or records which will have to be inherited in the new system. The new information system will be installed in a new museum building from the very beginning. Thus, the concept and design of an XML document repository could start from scratch and did not have to tackle the difficulties of migration. Indeed, the museum team rather has got a spirit to create 'something new' on the occasion of above mentioned fundamental reconstruction of its residence.
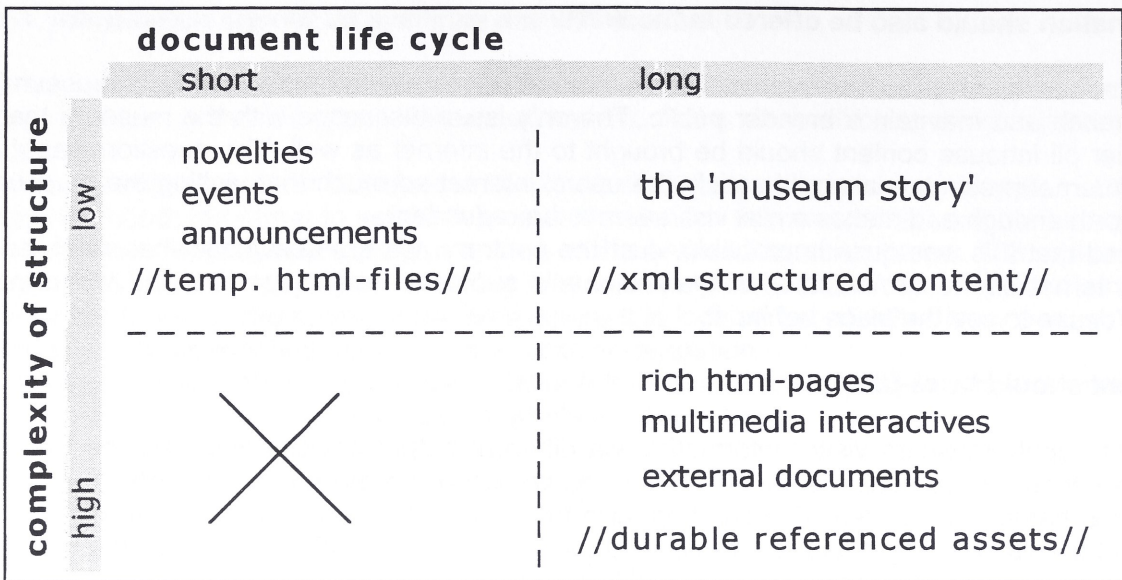
2. Developing a Museum-DTD

After scetching the different functions of the visitor information system we had to work on the document structure which is the backbone of the application. An XML application allows applying different formats to one single content entity and the merging of different entities within a new document or publication 'on the fly' in case the elements which have to be gathered and formatted are known. The application of abstract formatting rules requires an abstract content model, the DTD.

At first glance, narrative content appears to be very diverse and manifold, and it seems a bit discouraging to align it with an abstract schema. It is either possible to tailor the schema to the various types of content which renders a DTD painfully complex. Or one can submit the content to a more concise DTD at the risk of creating a schematic application with little appeal. We tried to avoid both extremes.

An analysis of the range of the museum content formed a matrix with to axes: Once, the document lifecycle could be short or durable. Second, the degree of complexity of the content structure could range from very much individual presentations to rather schematic content types. [see fig. 1]

We estimated that about 80% of the content within the VIS would be longlived and schematic. This is where we marked the claim of the content DTD. And we allowed two exceptions to occur: the permanent flow of short-lived information which occurs in the form of genuine html-pages, and the case of non-structured or non mark-up content which will be incorporated into a structured document container as a plug-in. Besides these two exceptions, the majority of documents represents more or less a discursive or narrational text and illustration type of content.

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[5] This is true given the limitations of most museum institutions who have to fulfill very diverse requirements with very little ressources. Writing and editing content is only one aspect of the museum business.

document life cycle	
short	long
novelties events announcements `//temp. html-files//`	the 'museum story' `//xml-structured content//`
	rich html-pages multimedia interactives external documents `//durable referenced assets//`

(complexity of structure: low / high)

[fig. 1: matrix of museum content types]

2.1. General content structure

In structuring this text and illustration type of content we did not go into very deep. On the top level we subdivide our document page into the sections of head, index, and content. Within the content, we separated the illustrations ('visuals') from the text ('chapter').

```
<!ELEMENT content
        (title, visuals, chapter*)>
```

The integration of text and illustrations is a task that can spoil any abstract formatting very easily – just think of the occurrence of pictures with a vertical or horizontal orientation. We rid ourselves of this problem by defining an area of preview images which occurs on top of each chapter. These preview images all have the same height and vary only in width; if necessary we allow ourselves to crop the original picture. The preview images are linked to fullscreen views of the same graphics which can be switched into the page by the user. In some cases we will use the fullscreen area to display a multimedia type of content, which we handle as a subset of 'visuals'.

2.2. Text structure

Within the structure of the text area ('chapter') we identified three entities with specific conditions: the firstPara, the anyPara and the lastPara element.

```
<!ELEMENT chapter
        (firstpara, anypara*, lastpara?)>
```

We chose a flat structure for the text content because we wanted to allow the authors to write in a 'natural' manner without a mark-up headache. All other distinction of document and content types is accomplished by different subclasses of the firstPara element and by document meta-data. Furthermore, firstPara and anyPara provide some format options like quotations, lists or tables, as well as stressed, highlighted or colored sections.

   In the default chapter the firstPara is only of presentational use: it is the section which will be highlighted in the layout and which delivers an introduction or opener for the rest of the chapter. In addition to the default chapter, we identified five special content types, which seemed to occur on a

regular basis: the description of an exhibit, of a person or institution ('agent'), a 'location', a 'date' or an event, the definition and explanation of a 'keyword', and the presentation of a document, an asset or illustration as 'source'. In these cases, the firstPara contains different sets of obgligatory elements such as 'name', 'place' and 'date' of 'birth' and 'death', and 'occupation' for 'agents'.

The anyPara element is meant for any further description and discourse.

The lastPara element is specified to contain document information and relational links. Elements of the lastPara are creator and contributor, the date of creation and the copyright info, the list of quoted sources, and references towards related or recommended documents for further reading.

```
<!ELEMENT lastpara
        (chaptersources?, copyrights?, references?)>
<!ELEMENT chaptersources
        (chaptersource*)>
<!ELEMENT chaptersource
        (% content;)>
<!ELEMENT copyrights
        (copyright*)>
<!ELEMENT copyright
        (copyrightitem, copyrightowner, copyrightyear)>
<!ELEMENT copyrightitem
        (% content;)>
<!ELEMENT copyrightowner
        (% vcard;)>
<!ELEMENT copyrightyear
        (#PCDATA)>
<!ELEMENT references
        (reference*)>
<!ELEMENT reference
        (% uri;)>
```

2.3. Referencing external documents

A last issue which required some reflection was the handling of keywords. When we surveyed existing museum information systems we decided rather quickly not to apply a typical hypertext structure. We felt that hyperlinks embedded in the text interrupt the flow of reading and confront the readers with a distracting decisions to either maintain reading or to track the link. In the early conceptual stages we even wanted to ban all hyperlinks from our content and postpone them to the end of each article (see the 'reference' element in 'lastPara').

This seemed to work perfectly with all references to related our deeper reading. We only felt uncomfortable with keyword definitions at the end of the article because readers do ask for a definition at the moment when a keyword occurs. Therefore we decided to list keywords appearing throughout the text in the index area of the page and allow the readers to switch in definitions if they want. For switching we use the firstPara element of a keyword definition article and display a short description of the issued term, for deeper reading the reader will then find a link to the full article at the end of the document.

To conclude with, our DTD for the content of visitor information aims to balance flexibility and structure. We allow exceptions from the xml-structured content at the expense of loosing the print-option for those documents. Our content DTD is flat enough to support a natural manner of writing,[6] and it works with documents of any length which can even consist of nothing else than the

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[6] The flat structure also makes it easy to apply the DTD to documents from external authors because most text can be dropped into the DTD structure with little copy and paste effort.

firstPara element (i.e. for keyword definitions). A deeper structure would only make sense if we wanted to handle and process documents in a more modular way. This was not necessary because our documents are coherent units.

3. Document Meta-Data

In the VIS application meta-data have three basic functions: they supply the description of a document, they support retrieval and they serve for the ordering and grouping of documents.

The first question was where the meta-data should be derived from: the existing *museum catalogue* or the new visitor information system. The museum catalogue already contains data-records on about 7.000 exhibits, 3.600 bibliographic items, and about 1.500 photographs, graphics and illustrations. In the future it will be used for digital asset management as well. Could these meta-data from the catalogue be re-used ?

3.1. Interrelating internal and public repositories

When we examined the existing catalogue records for their applicability within the VIS we had to face the different nature of these two systems: The VIS is designed as a repository for the public, the catalogue was not. This does not only mean that some of the fields of catalogue records have to stay hidden from the public, it also means that records were not gathered intending public usage.
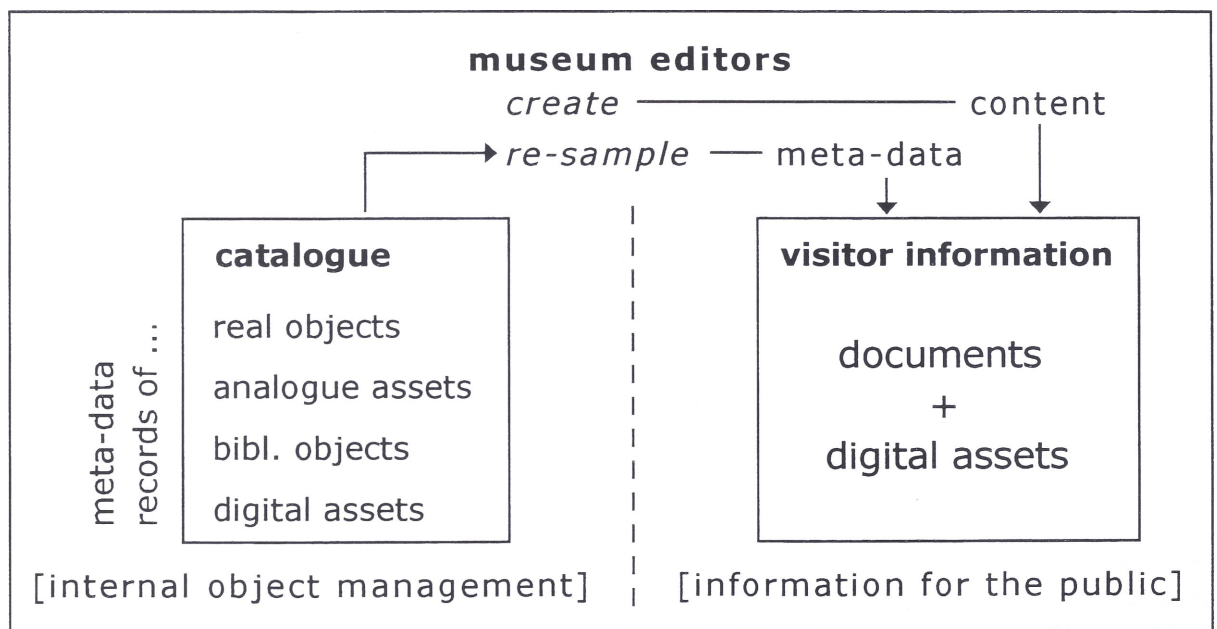
[fig. 2: the interrelation of internal and public repositories]

For many of the object descriptions the quality of records is too poor and cryptic to be displayed in the visitor information system. Exhibits are documented with pocket camera pictures, descriptions use staff specific abbreviations and expressions. All in all, the quality and style of the catalogue records is based on '*good enough*' and '*you know what I mean*' criteria.

Second, we were decided to align our publication meta-data neatly with the Dublin Core set of elements as the most widely shared standard. Obviously, the designers of the catalogue had not thought of D.C.: some of their fields were kind of identical to D.C. elements, but had a different name, some others were completely missing. For publication it would have been necessary to transform some of the existing records and to supplement others.

Instead of thinking about filtering and transcription mechanisms, we decided not to connect the two systems and to establish the VIS as an independent repository separated from the catalogue.

[see fig. 2] The only bridge between the catalogue and the VIS will be the continuity of unique identifiers which have to be consistent throughout the museum.

With this separation we make the editors responsible for the style and quality of any information which is displayed for the public.

3.2. The set of meta-data

In the VIS we apply a set of Dublin Core meta-data extended by some own, museum specific ('*imc*') elements. We present the designed set of meta-data grouped according to their functions.

3.2.1 Naming and description of documents

DC.Identifier, DC.Title; DC.Description, IMC.Mode, DC.Ressourcetype, DC.Language, DC.Format; DC.Creator, DC.Contributor, DC.Date, DC.Rights, DC.Source, IMC.Print-charge
The elements for the naming and description of documents will be displayed to a different degree in different situations. For tables of content rendering the title element will be sufficient. A description is helpful together with the presentation of surch results. 'DC.Description' offers a very short abstract of the content, while 'IMC_Mode' and 'DC.Ressourcetype' specify the manner how the content is presented. 'IMC_Mode' refers to the way how a document can be experienced by the user, its distinguishing features are text, audio, video, image, model and multimedia. 'DC.Ressourcetype' characterizes the way in which a matter is treated or approached, it presents a genre-like term, such as 'essay, portrait, interview, table etc ...', according to a list of expressions. Together with the 'DC.Language' element these description items help the users to refine their choice within a list of search results.

The 'DC.Format' element will mainly occur in the internet. It is relevant when the content has a multimedia format such as movie, audio or director files. Internet visitors need to know which plugins are required, and they like to know how long it will take to load the file. These issues don't count in the controlled environment of the museum. Here, we will only tell the users the running time of an audio or video file.
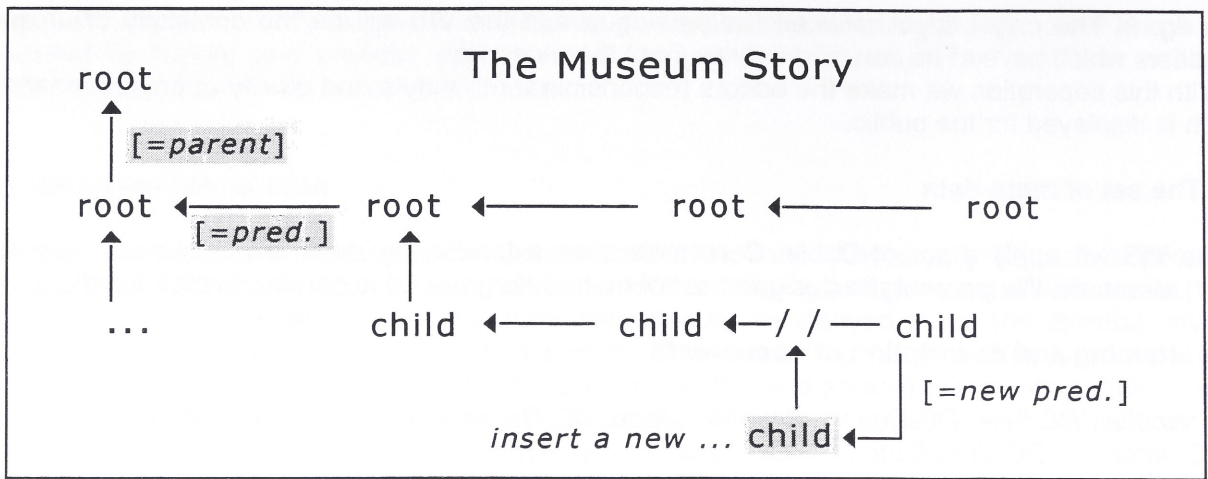
3.2.2 Grouping and listing of documents

Meta-data elements are *IMC.Parent* and *IMC.Predecessor.*
For *grouping and indexing* documents we have to handle two major classes of content, the '*museum story*' and the '*apparatus*'. Within the 'museum story' every document has a unique and specific occurrence in the hierarchy and sequence of the whole narrative. The '*apparatus*' is our term for those documents which cover a single aspect or item and can occur in different relations, such as the description of a person or institution, the definition of a keyword etc. These documents will mostly be listed in alphabetical or numerical order.

Documents which are assembled within the museum story all derive from one root - the museum homepage - and they are knitted through horizontal or vertical paths. Besides that, every document which leads to subordinate child documents can be regarded as a 'root' too. We decided to define all vertical relations 'bottom up', so that child documents refer to their specific root by referencing it as 'parent'. Horizontally, documents with the same 'parent' reference occur on one level. We define their sequence through a backward reference, so that every document refers to its 'predecessor'.

These two elements, 'parent' and 'predecessor', allow the complete description of a tree structure. [see fig. 3] This structure is easy to maintain, even if documents have to be inserted into an existing sequence. In this case you would only have to redefine the 'predecessor' reference in the following document. Through its abstract order it even allows to create coherent numbered indexes for personal print samples. By referring to the original index of the complete museum story the gaps of 'missing' documents can be closed easily.

```
                    The Museum Story
  root
        [=parent]

  root ◄──────── root ◄──────── root ◄──────── root
  ▲      [=pred.]            ▲
  │                         │
  ...            child ◄──── child ◄─//── child
                                    ▲         │
                                    │         [=new pred.]
                  insert a new ... child ◄────┘
```

[fig. 3: an abstract tree structure referenced back- and upwards]

3.2.3. Retrieval of documents

DC.Subject_exhibit, _agent, _date, _place, _keyword; DC.Coverage_exhibit, _agent, _date, _place, _keyword; IMC.Context

When designing the retrieval options for the VIS it was important to remember the target audience. Museum visitors are most likely to ask for comprehensive information, they like overviews and get involved into short guided tours. Others focus primarily on the museum highlights and scan the site for the most spectacular exhibits or the 'coolest' multimedia presentations. Some visitors will further like to explore the range and character of the collection and the information system. But most museum visitors are neither experts nor researchers.

Therefore, retrieval had to be easy and understandable rather than refined and sophisticated. We provide three modes of access to the museum content: Overviews and TOCs, different lists for browsing and a free search mode.

Most users will certainly navigate the information system along with the thematic and narrational structure of the content. They will find 'tableaus' for each of the seven topic areas: nice graphic menus for overview and quick access to the mainstream highlights.

Next, users will find different types of lists. The most prominent list leads to the description of exhibits and will be close at hand throughout the information system. Besides that, we expect many visitors to look for certain types of media, mainly movies or interactive multimedia to play with. Some others will probably look for documents related to people or institutions, places or dates, often because they are related with their personal history. A third type of users will certainly like to browse the list of keywords in order to see what the story is about. The applied set of metadata elements is designed of support the listings of documents according to these issues. Choosing the name of a person from the list of historical agents triggers a retrieval process which will deliver a list of all documents that relate to the requested person.

The applied set of metadata makes it possible to identify three levels of relevance within search results: they can be rendered as

    document 'a' *treats* search-term 'b'   [based on 'DC.Subject']
    document 'a' *covers* search-term 'b'   [based on 'DC.Coverage']
    search-term 'b' *occurs in* document 'a'   [based on full text search]

Finally, the design of the retrieval option allows a free search request. But we estimate this mode not to be used very frequently. Indeed, we did not support the retrieval of a wide range of qualified hits. Most results for a free search will probably derive from the full text search procedure. In order to make our system coherent we narrowed the variety of items occurring as 'subject' or 'description'. With the element subsets _agent, _date, _place and _keyword we rather try to enforce multiple hits for one list item instead of a wide spread of single results.

4. StyleSheets

The generating of various output from one single XML source is based on XSL Style Sheets. Printable output format from the VIS will be PDF. For screen displays we transform XML files to HTML. In the controlled environment[7] of the museum we apply StyleSheets in a rather sophisticated manner. We will also make use of high-quality images and multimedia. For the WWW we will have to check our StyleSheets for browser compatibility and replace our highres-assets with some more compressed versions.

The most tricky issue was the transformation of screen-design into print layout. Here, we held on to the principle of separating the pictures from the text. In the printed version we will present the pictures of a chapter above the text, too. Instead of switching keyword definitions into the page, we will make use of footnotes in the print-version.

A deeper look at StylesSheets and different layouts would go beyond the scope of this article.[8]

5. Discussion and future opportunities

The conception and design of the visitor information system (VIS) for the Industrial Museum of Saxony tries to balance the expections and requirements of both parties who will live with it. On the input and maintenance side, the basic concept of re-usable content makes the work of the museum editors very effective. A flat DTD allows them a natural manner of writing, and the amount of meta-data to be maintained seems reasonable and bearable.

On the output side the application had to be structured without appearing schematic and dull. This could be fulfilled by establishing a body of xml-structured content which allows the occurrence of non-structured up to date information as well as sophisticated multimedia. Rich, various and compelling multimedia content will be crucial for the public acceptance of the information system.

The outlined print option is a prototype application in a museum context. Thus, it is difficult to estimate its acceptance. But within an xml-based information system, this feature can be established at very low entrance costs. It requires little extra effort but an additional stylesheet and a digital printing device.

At the beginning, the opportunity to print a personal sample of the museum content may be regarded as a nice but unfamiliar gadget by most of the museum visitors. What is more, the PoD sample does not intend to replace the official museum catalogue or other high gloss publications: it will be printed in grayscale and the finishing will be more or less simple.

We rather do conceive the print option of the VIS as a node of plant which has the potential for growing. The idea is to establish a platform for different kinds of niche publications. These are some scenarios and pathways for future development:

5.1. Special interest groups

The origins of the Chemnitz Industrial Museum go back to the initiative of a group of ardent engineers who are very much interested in the technical aspects of production lines and machinery. Organized as a board of museum companions, they have formed several working groups for the inquiry and documentation of technological development in different branches of the local industries.

Whereas the mainstream of museum visitor information orients towards a level of common understanding, the print platform will be able to host all the deep and specialist documentation produced by the engineering working groups. The museum encouraged these working groups to develop and maintain their own edition of essays on technological issues.

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[7] As the kiosk browser, at the moment we prefer the Internet Explorer because it supports CSS very satisfyingly.
[8] Some examples will be shown during the conference presentation.

5.2. Cooperation with schools

School classes represent about 50 per cent of the total visiting party of the museum. Many of them see their museum trip as a day off and it is a challenge for the museum guide to keep pupils involved during a tour.

The general idea for the educational role of a museum is to support and complement the work that is done in school. Therefore, it will be useful to offer schools material for preparing and resuming their museum visit. This material can range from background information on certain aspects of the exhibition, over guides and games which help to explore the exhibition, to documents about regional aspects of industrial development which are underestimated in the exhibition but can help to transfer and apply pupils knowledge from one sphere to another. This kind of material is due to be gathered and developed in close cooperation with school teachers to make sure they can find what they need. The vision for this branch of the print repository is a toolbox where every teacher can find the right stuff to make a sample for her purpose.

Beyond this, it might be nice for pupils to bring their fruits of learning back to the museum. The print repository could also have a branch of essays written by pupils. These essays could certainly encourage other pupils to explore aspects of industrial society 'their way'.

5.3. Reprints of editions from third parties

The museum is in contact with the informal network of researchers in the field of industrial history. These researchers edit or contribute to publications on different occasions. One phenomenon with scientific publications is that they circulate within very narrow paths. First editions often count less than a thousand copies, and many journals can only be found in special libraries.

The print repository can become an archive for scientific articles and essays. Researchers and institutions will be invited to deposit their publications in here in order to keep them available. Print on demand makes this service attractive in two ways: reprint is cost effective with only one copy, and articles from a volume can be supplied as modular issues and merged from different original sources. Such a 'digital library of industrial history' will not only attract scientific users. Hosted in a museum it can also serve as a gateway towards common visitors.

5.4. Internet access

Any of the different editions and branches of the print repository should be accessible via internet. It should also be possible to mingle any documents from the VIS with documents from the print repository. Users can choose if they want to have their samples printed in the museum and delivered via mail or if the want a PDF file for their home desktop printer.

Internet access will certainly broaden the number of users of the print service. It will also raise the question of a business model. At least, the museum will have to establish an accounting system. It will be a strategic decision whether to run print on demand as a commercial activity or to keep it on the level of a useful museum service.

6. Appendix: Project information

The application presented in this article will run in the Chemnitz Industrial Museum from the date of its new opening in 2003.

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