

Automating Page Creation with the use of Contextual Information

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1 Abstract

Multipurposing, the reuse of existing publications, is, if possible at all, is not at all simple. Instead of multipurposing existing publications we introduce and discuss a concept based on relationships between types of publications (genre) in terms of production steps. For that purpose we subdivide production into intermediate states and operations as they lead from one intermediate state to the next. In a following step we address some aspects of job tickets and workflows. We analyze the concept in theoretical terms and present some experiments proving the validity of the model under view highlighting the importance of generic description of rules for design of different genre.

2 Introduction

Workflow and automation, especially when correlated with the possible reuse of information seems to be one of the current buzz words. However looking behind what marketing made of the concepts behind the terms one finds that lot of what is said is not particularly content-rich. Still, the possibility to reuse data and to atomize production seems to be an appealing thought, but very complex, if at all to be realized. We have worked with some ideas as they have been made accessible to us and tried to work under practical conditions in order to repurpose data. Fundamentally it did not work for random productions. However, if we found ourselves in a production environment which was to be characterized by some reproducibility of the products characteristics that went through we found some structures that may well permit reuse of semi-products. The following is to report some of our preliminary findings in an ongoing study.

3 Workflow

3.1 Existing Models of Workflow Description

Traditional workflow concepts implicitly assume that - at the beginning of the production process - all relevant technical parameters of the product finally addressed are known to the operator and, moreover, it is also assumed that production is a linear process without information referring to previous steps being requested later or information relating to upcoming technical or administrative requirements accessed in every step. Pictures for example are scanned assuming a certain screen ruling and print process. All subsequent production steps are also performed according to the print process addressed as the output parameters do

influence the generation of the digital representation of the product generated. In the traditional view the elements of the document are subdivided into text, image and graphics.

The digital production environment production tools and the distribution of both the work on the product and the product itself changed and resulted into new possibilities to potentially use existing data to address a larger variety of output devices and new media within. This had the impact that today individual operators take varying efforts to shift the decision on which medium finally to be addressed as far as possible through the end of the production process. The objective is to reuse data. However, the practical application of these concepts turn out to be very rarely used effectively and meeting comparable standards. On a first glance and for complex publications this is due to the different editorial styles required for the different media to be addressed. E.g. a different emphasis on images on an internet publication then in a printed matter - even when dealing with alike sets of data. An approach to solve that was presented earlier (EUROPTO) that based on a subdivision of production into defined standard production steps and - resulting - standard intermediate products.

The idea occurred since we observed that, depending on how smart the database containing the data to be used in the product (we call those sets of data "generic document elements") is organized, the more standardizable the production is. Thus, after a careful analysis of the products to be generated, proposes a two step approach to device-independent data:

1. to analyze the different genre (e.g. book, catalogue, ...) to be addressed
2. to generate the different generic elements as they are required to produce this document
3. to define databases in a way that they consist of the generic documents
4. to analyze the production steps to be taken and define standard production steps which may be addressed in batch modes and lead to points at which it has to be decided which medium to address.

The subdivision of production steps and intermediate operations is a necessary but not a sufficient condition for multipurposing data. For multipurposing standard intermediate product created by standard production processes must be used in this concept. Furthermore the approach provides a possibility to personalize data and thus results in advantages also in the area of effective RIP design, for example.

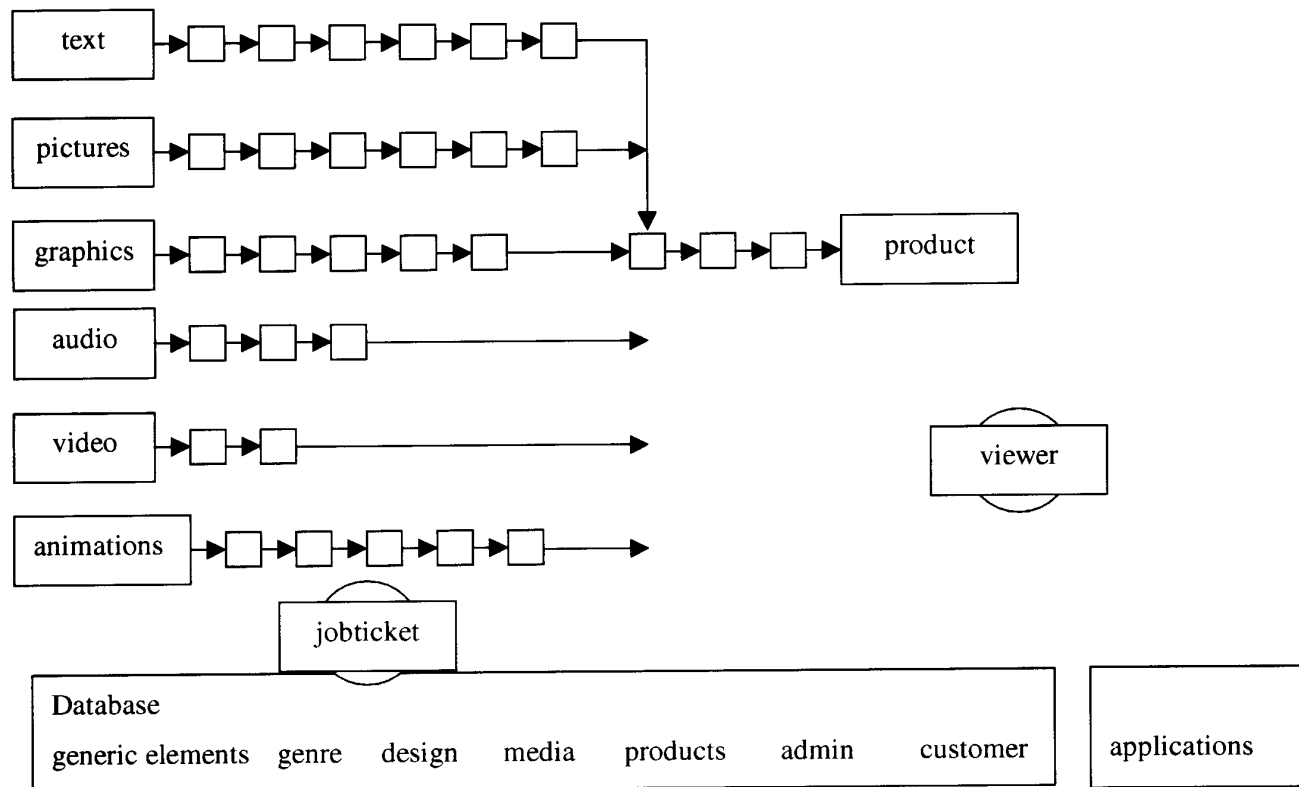


Figure 1. Workflow with intermediate products

Here the job tickets serve as means to control production together with a repository of (partly local and partly standardizable) repository of rules which describe how to use the information encrypted in the job tickets. E.g. the information on the genre to be addressed is part of the job ticket. When given the 'go' for the process batch tools pick and process the generic page elements depending on which genre to produce and call for the appropriate tools to process the elements or the resulting intermediate products. The generation of a layout cannot really be addressed as batch process having a clearly predefined result. However, as we have shown previously (Layout bericht) when knowing which genre to address rather well described page designs may be generated by rule driven expert systems. Furthermore the rules stored in the repository may deal with customer (e.g. their preferences or their payment behavior) or administrative requirements. Apparently a job ticket is an intelligent agent being able to:

As indicated the generation of intermediate products is driven by the information stored in the job tickets and the rules making use of those information and calling the appropriate tools.

In order to display that approach in an example we use the generation text for a web publication as it is required to encounter the following duties:

- size (number of signs), if necessary the document has to be splitted in smaller units

- the file format has to be converted into HTML or XML
- (if converted into a PDF-file the following decisions had to be made in advance)
- the page layout has to be oriented to landscape format
- typography font, font color and -size have to be chosen
- a layout with columns used in the printed form may be simulated with frames or sets of tables in the browser window.
- pictures are to be converted to low resolution in web enabled formats, color palettes, and sizes that could be handled
- the setting of hyperlinks might generate a completely new content published
- animated elements, video, audio can be integrated in the web presentation
- the content of the document published online might be dynamic - with this the term document does not really fit - whereas a printed document has a static content

Layout and typographical rules for a webdocument may be included and stored central in an external stylesheet. Using a stylesheet for design and typographic advices fastens the workflow as a bundle of information may be linked to the documents in one step. One single change in this stylesheet causes changes in all of the linked HTML/XML documents. Furthermore stylesheets for other mediatypes as they are described in the CSS2 specification might be

linked. So in present it won't be a one way decision whether to aim at an output on screen or print, the documents react dynamic depending on the media published. This works even better with XML data that also understand the CSS advisory.

An intermediate product in the sketched process might be f.e. a web aural presentation without pictures or graphics that gets later distributed via the web together with software that reads aloud the text shown on the screen.

The jobticket has to decide depending on

- which media and audience gets addressed
- whether the text files size fits to a screen presentation
- which stylesheets are to be used
- provide tools for converting pictures
- decide whether animated elements will be integrated, within the production workflow
- and before reaching the end of it and the launch of the website the jobticket has also to initiate several quality checks and tests.
- decide if, where and how long the final product has to be stored, arrange the billing, do some kind of documentation for the libraries (customer, genre, design,...)

Analyzing the approach we find that if having some experience in working in such a way the decision on which genre is finally to be addressed occurs at alike production steps. Thus the point in which to separate production steps which address different media becomes somewhat reproducible and automation becomes easier. We furthermore found that the most important factor determining this reproducibility is the page design/layout of the product finally to be addressed.

Based on these standard production processes production environments seem to be attractive to be designed in order to produce automatically as far as possible. We will discuss some of our experiences with the approach later in this paper.

3.2 How to Determine the Intermediate Products?

In order to determine the requirements to the input data (the "generic page elements" in this notation) it is required to define the final sets of products and to understand the structure of the genre finally to be addressed. Starting at the end of the production chain one can - step by step - determine the requirements for each intermediate operation and the intermediate product generated in it. At the end of this procedure it is possible to define the requirements of the generic page elements required for the production process.

3.3 Definition of Genre

When backward chaining for different products it becomes apparent that it is possible to build groups of products that have almost the same production steps and intermediate products. One moreover realizes that it is mostly the layout and the intended look and feel of the publication determining their differences. We call these families of products "genre".

With this concept one may define a genre depending on two properties

1. the outer shape of the publication as it usually defines the term genre (like a catalogue or a multimedia presentation)
2. the degree of similarity as it occurs in the sequence of intermediate products and standard production steps to be taken to produce the publication.

In this approach and assuming systems treating the operations as objects (in the sense of object oriented systems) may be the objects is an apparent advantage. The definition of the generic page elements as far as possible using the SGML standard is helpful. As indicated while using it we found that it is the layout that generated most problems in applying this approach. However, in principle the concept may enable experienced users having larger databases to repurpose the same data for different products or, at least, to repurpose intermediate products as they are required for production.

One also finds that the way intermediate products of a given genre are determined does affect the possible number of reusable generic page elements. As a side aspect one should indicate that more modern RIP-concepts use an approach like this to reduce RIPing time for localized publications due to subdividing the page element into those which will be reused and others as they will be changed from page to page (like addresses).

4 Contextual Information

A further means to structure production and to enhance its effectivity may be provided by the effective use of contextual information as it is usually processed in analogue and in very proprietary and production site-dependent ways (traditionally in style sheets). A concept presented earlier by one of us (Quelle: Has TAGA, 1997) fits into what has been said above with respect to the structuring of content. In that approach an architecture has been defined which includes the different tools being required for the processing of and interaction/co-operation on contextual information.

For practical reasons we subdivide the context information into several, correlated aspects as they are:

- Device and technology related information
- Process control
- Administration and
- Billing

These aspects of product related information are dealt with while on an interactive basis with the flow of the content data in production, but not necessary alike it, at the same speed, frequency or operators involved. Thus, to be exact, there are different workflows as they may be characterized by the character of the data exchanged - whether they deal with context or content.

Having a look at the technology related context information as it is required for the production of media in prepress, one finds that the most crucial information is related to the intended output device [4]. We deal with some of the information required to do that in Appendix 1. Other

device related aspects involving the work on a product are technology related (like format etc) or may also be of administrative character (for example describing the availability of the device).

4.1 Job Ticket

The context information as it is described above needs a container for its transmission and use. We propose two possible realizations:

- Objects containing information
- Separate job tickets stored in a database or e.g. as a tagged file

Objects Containing Information

An object based approach may be helpful in order to avoid the static character of traditional job tickets still they may serve well to forward contextual information on the processed data since the concept for objects ensures that

- only objects are positioned that are processed appropriately and adaptable
- objects may adapt themselves

The objects do consist of:

- Content and
- Context as described above

In order to make the appropriate use of objects the following items need to be taken into consideration:

- Rules for adaptation
- Hints from customers as they are part of the job description.

Unlike traditional job tickets in case of an object orientated storage the information is split up and stored near the place where it is needed and used. In this case content and context stay consistent, while using a separate job ticket this has to be controlled by a database. For the automatic processing of the context information as they are encrypted in the objects the tools must be adapted to the object formats. It has to be pointed out, that the full power of such a solution would be given only if it is supported by new data formats and an appropriate operating system.

Separate Job Ticket

Context information can also be encrypted into a separate job ticket. Despite it seems to be wishful thinking it would be nice to have standardized tickets that would then be used by workflow tools to generate value add out of the information stored in the tickets. In order to provide some further chance for value add it might be helpful to subdivide the information in the job ticket into a set of mandatory and optional information. In some tests we learned that it is not really necessary to include all information into the job ticket, since some data formats permit to store context information together with the data. In this case a hint on where this information may be found is included in the ticket. Existing literature offers a variety of information on that topic [5,6].

5. Architecture

Of course for the use of the concept of genre, structuring of production and the use of job tickets a variety of separate tools is required as they would interact to make use of the information existing and process data. Subsequently we describe the architecture of a possible production system which based on the use of job tickets in production of intermediate products for different genre as described before should lead to an automatic production as far as possible.

5.1 System Model

An approach like the one proposed here requires a software architecture consisting of several interacting elements. Concerning the job tickets, their environment and their interaction job ticket and its integrating role in production some ideas have been presented earlier [9]. The architecture required for the approach described above contains essentially a set of databases in which the tool analyzing the job ticket may access and use. The information on the genres finally to be addressed is stored in the job ticket and serves as means to initiate the standard production steps in order to generate the intermediate products to a stage in which the user has to interact with the process in order to decide which genre he is interested in seeing first. In working with an abstract implementation we saw that a layout tool providing the user with a proposal for the page design of the product under view is to be most of the time after the decision on which media to be addressed.

Of course in the whole process a database is involved from which workflow tools do access information on the intermediate operations and relate those to a further database which again contains a list of genre specified and intermediate operations necessary to produce the genre out of a given set of generic elements and intermediate products. A mechanism calling for intermediate operations in terms of batch processes is another element of the architecture proposed.

The production system contains a set of tools as they are required to generate the intermediate products. Beside the production system itself a series of libraries store the relevant information on the

- the genre
- generic elements
- layout and fonts
- output media accessible.

In a practical production the operator would access these data and the generic elements and define the genre to be addressed. These information then become a part of the job ticket. The job ticket and the tool to process the information stored in the job ticket play an active role in the production: They

- analyze the information stored
- access the tools required to process the intermediate products
- initiate the processing that merges the individual job tickets of the generic elements involved in the production under view.

In a highly automated workflow this information could be used to call for required batch processes (for automatic intermediate operations) till the intermediate product is generated which would require the interaction with the operator.

If different genre are to be produced out of a given set of generic elements then the automated process should stop if the decision which genre is to be addressed is required. Documents stored in the libraries can, for rule driven operations e.g. be imagined as objects which fundamentally consist of

- a static part containing of a description
- a dynamic part with rules on how to manipulate the generic element or the intermediate product.

Of course one needs a set of libraries and databases to make the concept work - we d introduce some of them in Appendix 3.

5.2 Process Control

For each job an individual workflow may be assumed (which, however, as described above, that workflow may be alike to other workflows in different degrees). In order to ensure constant quality of what is produced measures are required to both in a structured and in random ways serve as control mechanisms to find errors or misdevelopments not intended by the producer.

Those means are required to be used and the result of their use needs to be reported back into the contextual information in order to initiate appropriate means if e.g. corrections or changes are required.

Means for controlling the intermediate states of the product and the different other aspects of the flow of contextual information (like administrative aspects such as: is that customer one that tends not to pay in time ..) are not always at hands, at least they are not integrated in digital workflows even in modern environments. In separating the production process in different sub-processes, of which not all are required and which may be regarded as single and independent work items we do find it required to develop new means for the controlling of the different aspects of production.

The idea is to make the best possible use of the available resources. Control steps are an essential part of the workflow. The production planing for a certain job should include some intermediate quality checks. This control processes information again have to be steered again by workflow tools and the information regarding the result of the control should be part of the job ticket - which then may serve as documentation for ISO 9000ff purposes (The aspect of administration, organization, and billing is briefly addressed in Appendix 2).

6. Example

In order to display the ideas we use the example of page design for a print- and online publication. The printed product consists of several text files which are strictly formatted including some pictures in different sizes and placements. The text and background elements of it (f.e.

table background) were single colored, the pictures in CMYK. In backward chaining it became clear that the text elements of the files could be seen and used as intermediate products which were then converted automatically into HTML-files. As the preformatting of the text files targeting an output as prints was very strictly done the further on layout for the online publication was easily solved with external stylesheets (CSS). The stylesheets were especially built to meet the expectations as one would have them for screen. Documents aimed for a web presentation differ in the following from those addressing print:

- size (number of signs),
- layout
- and typography have to be adapted to be easily read on a screen.
- font, font color and –size have to be chosen
- a layout with columns used in the printed form may be simulated with frames or tablesets in the browser window.
- pictures are to be converted to low resolution in webenabled formats
- the setting of hyperlinks might generate a completely new content published
- animated elements, video, audio can be integrated in the web presentation
- the content of the document published online might be dynamic – as opposed to a document for printing.

Using CSS stylesheets part of the job could be done highly automated and flexible – changing only one stylesheet causes changes in the design of all linked HTML-files. On the short run also information for print of an HTML-file can be contained in an external stylesheet (there is even more options when using XML which will become standard and also will understand CSS). The HTML document will then adapt itself depending on the addressed output media.

In order to display the ideas we use the example of page design:

When storing information about a font, a table with font sizes for different output media can be contained in the static part. In the dynamic part a rule like "don't use font size less than 12 point for screen output" or, in case of a fuzzy rule system, the rule could be " don't use small fonts for screen output". On the other hand the same information can be stored in the media library instead of the design library. It is be a matter of experience how to separate the information between the static and dynamic part of the object under view, or alike which document belongs in which library. Those questions cannot be answered in general but may be decisive with respect to performance. Of course the approach gets simpler and more effective when working with structured documents like SGML (Standard General Markup Language).

Summary

The approach presented discusses a method to create publications and repurpose part of their content dependent on

the information which genre is to be addressed. The approach involves the use of job tickets and prior knowledge on the structure of publications. In order to make the optimal use of the capacities available we subdivide production into a chain built out of intermediate products and standardized operations.

The concept is based on the reuse of intermediate products which exist in production rather than the concept of repurposing publications existing. For the implementation of the concept we introduce the fundamental workflows involved and an architecture containing some of the important elements required.

Appendix 1

Photography:

The material used and the settings of the camera do specify resolution and color gamut available.

Digital image creation (scanners, digital cameras):

The scanning device and the scanning software do specify resolution, amount of data accessible in a reproduction process and color gamut available. Since the scan software may already expose the data scanned to changes like transformations between color spaces or intensifying of signals (like some software apply them in cyan) those data and related reproduction or transformation curves should be transferred. Some of the devices automatically apply image data compression modes, which for apparent reasons, need to be specified according to the degree of compression and their type. Different scanning devices do create the raw or changed data in different data formats. Those formats and related restrictions need to be hinted.

Retouch:

In order to correct or adapt errors in scans retouch software is used. Some of the functionality used may be characterized by filters – more mathematically speaking: matrices - and they are used to adapt colors, simulate sharpness, change resolution. We find that those functionality, as they are applied to the image, should be indicated in the ticket, since multiple appliance of transformations influence each other (However, context information should include change of image segments, merge of images, intended use and hints for retrieval just as creator and name of file).

Definition of Colors:

Currently, some of the retouch systems perform poor when it comes to define color in an device independent way. If no standard space like CIE Lab is used a well defined transformation between the color definitions used (RGB, CMYK or catalog) must be given. In principle color management systems provide this automatically.

Color and Resolution Conversions Applied:

For the print out colors and resolution have to be adapted to the specified device. In traditional workflow either these transformations often already happened before creating the layout and integrating text, graphics and images. On the

long run the use of pre-separated parts of pages may turn out to be disadvantageous since it limits the possibilities for the change of single parts of full pages. Parameters adapted include tone reproduction curves, primary colors specified, screening, colors of the paper.

Trapping, Imposition, UCR, GCR:

Context information should include hints indicating whether trapping, imposition, UCR, GCR had been applied to the file, since different methods for those mechanisms are available, information on which of those had been or has to be used. This is true not only for the whole document but for each part. Additionally the rendering method best suited to an image should be specified.

Layout :

Immanent structures of text-image-graphic-documents are reflected in the layout of the document as it is reproduced. Layout should highlight inner structures of the document under view in order to make the content easier accessible by the recipient [7] in this process output-method related parameters are taken into account. (paper based publications are linear in most of the cases, digital documents may well be hypertexts containing links). Layout related data should be encrypted as context information as far as format, fonts, line spacing and properties of the substrate printed on are concerned [2]. It should be emphasized that the use of SGML or related methods may introduce a high abinitio quality.

In addition to these information for device independent technology related context some information for the print process, control process and finishing should be gathered [8]:

Screening Information

This information depends on whether AM or FM screening is to be used. In case of AM screen resolution, in case of FM dot size has to be specified. The dot gain is dependent on either the dot size and the paper used (smaller dot size leads to bigger dot gain). Dot gain has to be considered when doing reproduction or via transfer curves, which describe the dependency of the dot area and dot gain.

Register Marks

These marks are printed outside the document size and are used to control whether the different colors (cyan, magenta, yellow, black) printed register-true.

Format and placement must be specified in order to control the printing process.

Color and Ink Control

For presetting the printing machine information for the zonal ink metering is required. In addition it has to be specified what kind of color control strip should be used and where it is placed on the page. Cutting and folding data After printing sometimes the sheets have to be cut and folded. Therefore special marks are printed which have to be specified in form an position.

The resulting blocks have to be arranged. This process is familiar to the imposition process, so these methods may

be adapted to some degree. When specifying folding a certain sequence has to be defined.

Appendix 2

Administration, Organization, and Billing

Beside the technical information it is important to pass along information necessary for administration, billing and purchasing new material. Administrative information may relate to the production process the target product under view, such as:

- the customer
- the desired genre
- the number of copies
- the generic elements - and whether they are in the system
- special wishes which must be registered
- If possible the system can help at this step with information out of the customer library (4).

Customer

The most important administrative information are about the customer. Most of these information may be stored in a separate database used for billing and invoicing which is already exists in the print store. This are information like company name, contact persons, address, phone number and bank account. Maybe some a notice about her/his solvency is added. While working with the job it might be necessary to contact her/him. Therefore is seems useful to store further technical information, like possible communication channels like fax, ISDN-direct, URL, etc. These channels may be used even for data transmission, if not too many.

Some customers use special equipment themselves which requires special treatment within the job or workflow. Others prefer a certain kind of paper for example and order only certain formats. In order to accelerate the workflow it is best to get this information when the job is ordered. But not all of this information is necessary for all customers.

Job Order

The job order is a description of what the customer wants. In this part of the job ticket the desired product is defined, e. g. information like

- Number of pieces
- Desired output device
- Desired paper
- Desired finishing
- Personalization
- How to be distributed
- Special wishes (special devices or software to be used or special employees to do the work)

The job order information will be used to define the workflow and is there for obligatory. As mentioned before it seems useful for a print shop to offer predefined products, i. e workflows. The one desired has to be specified in the job order. If the job is urgent a certain timeframe might be defined (and maybe charged extra).

Job Inventory

The job order should be completed by a inventory list. To make sure that all goes well with the job and no data (hardcopy or files) get lost a list of all items required for the work with it should be maintained. The creation of this inventory list can be done by some kind of postflight-tools or the employee receiving the hardcopies. In addition the inventory is required for optimizing the workflow queues, to calculate the time needed to do the job and to trace the job status.

Job Tracking

While the work is done the tools involved automatically stored information about the individual activities done on the job. These might be - The time needed for the different processes

- Devices used therefor
- Employees involved
- Specials remarks made by the employees when doing their job, e. g. special problems occurring.

On one hand the job tracking information is required for calculating, invoicing and ordering new materials. On the other hand it is part of a quality management system which demands to know if and how the different process steps have been done.

Beside the use of human and technical resources the consumption of materials has to be tracked as it is for example - Paper for Printing

- Ink type and consumption
- Storage Capacity in DB

After the production process the further way and state of the distribution has to be watched.

Appendix 3

4.3 Libraries

In the following an rough overview on the information stored in the different libraries is given.

Genre Library

This library stores specific information about the different parameters used to describe a genre such as:

- structure elements used (heading, body text,...)
- prototypes of these structure elements
- rules on how to use these structure elements (mandatory, optional, following element of type,...)
- typographic information specific to these structure elements
- Media usually addressed
- Materials to be used.

Design Library

This library can be subdivided in parts describing fonts and layouts. It stored information such as:

- font types, -sizes, -shapes
- preferred usage of font for special genre
- layout schemes

- preferred usage of certain layout schemes for special genre
- situation when not to use a special layout schemes

Media Library

This library stores information required to characterize the different output devices that are addressed:

- maximum resolution
- primaries
- timing information (print products don't allow audio and video)
- ICC profiles
- screening information
- paper

Customer Library

This library stores information about the preferences a special customer has like:

- usage of a special paper
- usage of special colors (corporate design)
- restriction on layout because of the finishing addressed
- restriction on colors because of the printing machine addressed

Product Library

At the end of the production process when the customer has given his ok the parameters finally used by the system will be stored in this library. It is the combination of the various parameters and the context they are used which is in the center of interest here

- font parameters used
- layout parameters used
- media parameters used
- customer
- warnings on special combinations

Instead of a library which stores parameters a neuron net can be trained or some new rules can be added to the different libraries.

Admin Library

Contains information about billing, job tracking, controlling of the production system.

7 Literature

1. Has, M.; Luidl, Ch., Schäffner, J.; Klotzbücher, U.: Some Aspects Of The Use Of Contextual Information In Production Processes; Europto Zürich 1997
2. Luidl, Ch.: Konzeption Und Prototypische Implementierung Eines Integrierten Systems Zur Unterstützung Und Automatisierung Des Gestaltungsprozesses München: Fogra, 1997 (64.012) - Forschungsbericht

3. Has, M.: Context Information In The Production Of Print Products, Proceedings Of Taga Conference 1997 , P. 317ff
4. Hecht, T.; Has, M.: Verfahrens unabhängige Vorstufe München: Fogra, 1995 (10.031) – Forschungsbericht
5. Fiebrandt, O.; Huegli, S.; Jaeggi, S.; Meinecke, K. M.; Vollenweider, M.: Übernahme Digitaler Daten Bundesverband Druck E. V., Wiesbaden 1997
6. Dauer, L.; Hecht, T.; Kuron, R.; Schmitt, U.; Schnitzler, T.; Has M.: Verteiltes Publizieren München: Fogra, 1995 (64.014) - Forschungsbericht
7. Seidt, M.: Remis - Zwei Wege Zum Normierten Datenaustausch In: Ix, Magazin Für Professionelle Informationstechnik April, 1994
8. Schlapfer, K.: Recommendations For The Exchange Of Digital Data In Final Page Form St. Gallen: Ugra Report 122, 1997
9. Has, M.; Hecht, T.; Luidl, Ch.: Workflow And Dataflow Around Computer To Press Production Proceedings Of The 13th Is&T Conference On Advances In Non Impact Printing Technologies, Seattle, 1997

Biographies

After finishing his degree in Biophysics **Dr. Michael** has become researcher in the offset department at the FOGRA Institut in Munich, Germany in 1991. Since 1993 he is this institutes Head of New Technologies and Prepress Department. He serves in several industry gremia such as the Board of Directors of the TAGA (Technical Association of the Graphic Arts in Rochester, N.Y.). As one of the founding members of the International Color Consortium he is this organizations Technical Secretary. In 1998 Michael received the degree of a Maitre de Recherches of the University Ecole Francaise des Papeterie et Graphique in Grenoble, France. Michaels key research topics are, aside of the use of color in digital workflow and output devices, automation of prepress processes and digital printing.

After finishing her degree in Biology **Ute Klotzbuecher** first became an artist creating jewellery. Then her attention was drawn to the design of publications and she decided to join a design school for graphic arts and multimedia. After finishing that school she is working in the New Technologies department at FOGRA Institut in Munich, Germany. Utes key research topics deal with publishing in the www and automation of prepress processes.

Christian Luidl holds a diploma in physics and, after being researcher in the Newspaper printing Technology department at the FOGRA Institut in Munich, Germany, he became senior researcher in this New Technologies department. His research activities cover a wide range from newspaper printing to database publishing and workflow related questions. In the recent years he was involved in automation of layout processes.