Context Information in the Production of Print Products

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Abstract

Print production is undergoing substantial changes due to the development of new printing techniques and novel prepress methods. These techniques enable even inexperienced users to produce digital parts of a publication, if not whole content, designated for press later on. One of the consequences of this is that more and more interacting and remotely located partners are involved in the prepress production process. However, the digital interaction between partners who may not have met before is not self evident since, especially in new business relationships where intents, timelines, methods and planning, procedures are not self defined. In this paper we present an analysis of the current workflows in print production. In the past there has been the tendency to automate all duties that may be digitized; it is apparent that there should be an infrastructure that permits automation of at least some of the duties that have to be been performed in a context of verbal communication, written job tickets and remarks. In this paper a possible infrastructure for a system like this is described. Suggestions for an architecture involving job tickets, tools, databases and interfaces are presented.

The paper is structured as follows:

Following an introduction to the issue of workflow we present different business cases as they relate to the exchange of files for the remote production of printed material. We highlight the need for the use of so called preflight tools both before and after the file is sent in order to check the workability of the file. In the scope of the business cases presented we introduce an

architecture for workflow analysis and a possible file format for job tickets as they are used in production.

1. Introduction

Small and medium sized businesses form the majority of all printing and publishing operations in the general publishing industry (1). For example, in Germany companies with 10 or fewer employees provide employment to between 270,000 and 850,000 people -- depending upon how a printing operation is defined. Their contribution to the gross national product ranges around 1 % - 4% (2). Worldwide there are some 275,000 shops having about 3,878,000 employees.

The distribution is as follows (1):

	companys	employees
North America	21%	41%
West Europe	22 %	29 %
Japan	15 %	14 %
Rest	37 %	16 %

As with most industries, print production is undergoing significant changes due to the introduction of the new digital production tools (e.g. 3) and the increasing use of telecommunication (e.g. 4). Today we find most of the tools required for production are available, but the intense service competition and the relative youth of the toolset have led to significant technical incompatibilities which a lack in standards has not helped.

As illustrated in Figure 1, the process in which the data production happens in prepress or, in wider terms, data processing, may be structured according to the various technical tasks involved in production, processing, communication, storage and output of the data. Figure 1 shows that the basic workflow as it is used in the production (and consumption) of a particular product, may be complex and, therefore, ahead of the actual production, as discussed with the participants. A situation arises, in which there is a need for default models for different production paths as they are taken in the creation of several different publishing products (5).

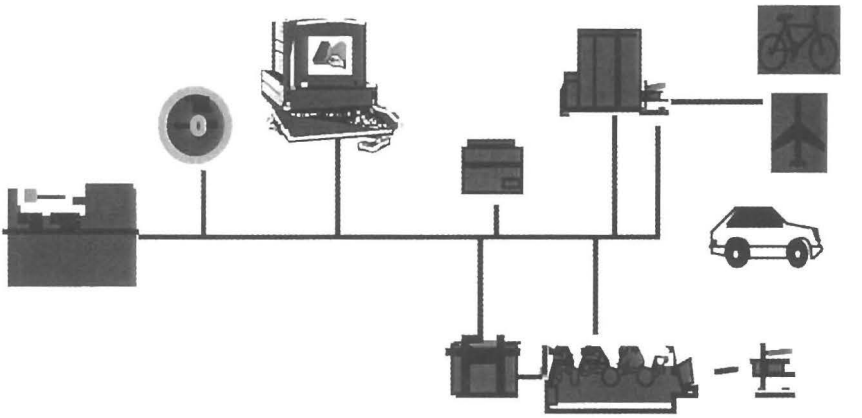

Figure 1: Data production for publishing process involving image and text capture, creation of layout, design and interactivity features, integration of page / publication elements, processing and intermediate/final storage, output (separation, ripping and imaging), finishing, distribution and the need for device control.

The complexity of the workflows in the individual companies and customers involved in production hinders the creation of default workflows. This occurs to the degree that it is almost impossible to find like classes of workflows even if the same customer and service shops cooperate. Thus, along with the production processes we find a significant need for communication, interaction, administration and, additionally a likely need for the electronic transfer of payments. Prepress workflows may be structured according to the technical tasks and interactions involved in production, storage and output of the data. This workflow is complex and inter company working agreements are required as there are no default models for workflows. Especially when the use of new media is involved, an important requirement is to evaluate the computer infrastructure the consumer of the publication is working in.
Several very different basic workflow models of the production process can be defined from the circumstance of production. These are presented below.

2. Analysis of digital workflow types

Different results and subsequently different models have been used for the analysis of the workflow in production (e. g. 5, 6). One possible approach to differentiating these workflows is the analysis of intermediate data handling (6) - e.g. a classification of different flows according to whether

no prepress is involved,
prepress is involved or
job broker are involved

in the preparation and submission of the data to be printed or used for publication in other media.

Other structuring concepts may be gathered around the products involved or the degree to which content of already used products may be assembled in a publication to be produced. In any case all of the workflows share problems arising from the fact that with the increasing number of interfaces there should be - but are not - default models for:

1. how data are safely transmitted.
2. how context information should be passed forward.
3. how feedback information (job tracking, clarification by customer) should be ensured and organized.
4. how payment from a remotely located customer will be organized.

Thus we see a necessity for dealing with the interfaces between costumers and printer/prepress- for different business models.

3. Different business models for the interraction and interface between costumers and the printer/prepress

3.1 Workflow when no prepress involved:

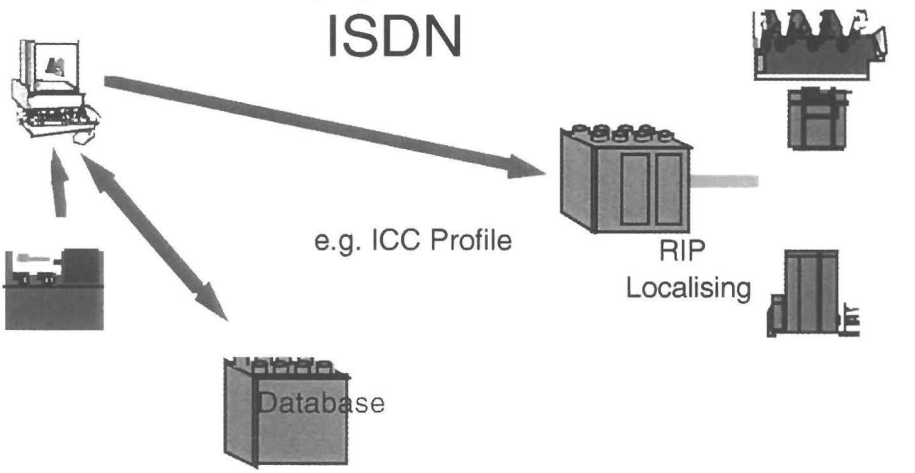

Figure 2: Workflow when no prepress involved. The customer controls his local prepress equipment and, for the most part, a database. He sends data to be printed directly and requires no outside prepress services. The printer RIPs and prints.

As a normal course of business prior to data transmission a conversation will be held between the customer and the printer. In this conversation substantial questions concerning billing, time of printing, color, distribution, finishing, storage, file description etc. are addressed and agreed upon.

3.2 Workflow if prepress is involved:

This business case may be described by a slight modification to the workflow as presented 2.1.
The prepress company produces a data set and sends it to the printer. Again, the same intense interaction between printer and prepress is needed in order to ensure the appropriate handling of the data. Internally, prepress is uses either manual or digital job

tickets. Most of those job tickets are individual, depending on the local requirements of the shop in question. Standard ticketing methods have been developed by both standards groups and commercial suppliers. These include the CIP-consortium (7), MAN-Roland (8) or Covalent (9).

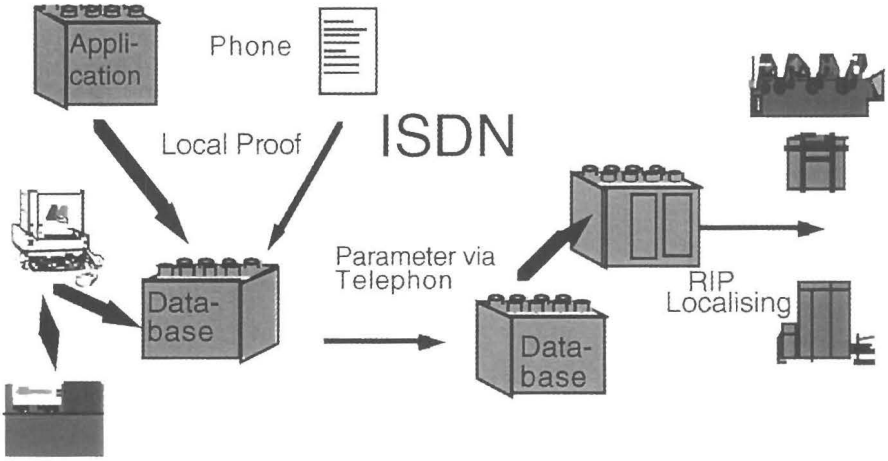

Figure 3: Workflow when prepress is involved: There may be a situation in which the printer and the prepress companies do cooperate closely. In this case databases that contain the same information may be located in both respective internal networks. The data transfer may be simplified by transferring only scripting information by telephone lines.

3.3 Workflow if broker is involved:

This situation arises when the customer calls a broker, requesting a given set of data be printed. Subsequently the broker checks whether there is already an established business relationship, and then whether the file is already in the brokers database. If not, the file is digitally transferred, otherwise the file(s) are checked as to whether they are about to be printed in a new combination (layout, text and images, fonts, colors, etc.). In order to remain some kind of „analog security" the file may, as a layout proof, be sent to the customer.

For the purpose of appropriate use the data, the database software should be able to handle attributed data. The attributes should both be of administrative and technical character. To some degree these attributes should also be accessible interactively by the owner of the data.

Additional services of a broker may be

- Billing
- Distribution
- Translation
- Storage
- Search for local printer
- Ensuring that „all goes well"

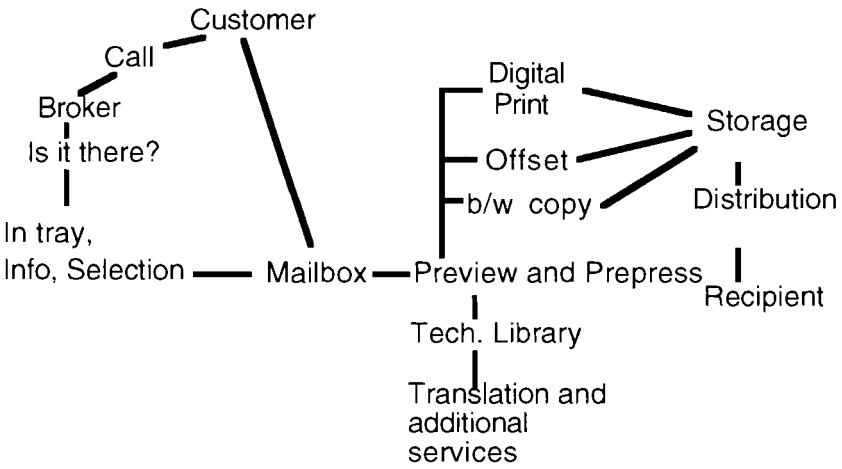

Figure 4: Workflow if a broker is involved.

One needs to highlight, however, that the added value in media production originates from what is (and can be) done to (and with) the data available in pre-publishing. This is due to the fact that this is where the largest potential for saving energy and money can be localized. On the other hand there is the paradox that, money comes from - and to the largest extent will come from - printed output.

4. Needs to be specified in the different interfaces

Summarizing the caracteristics of the models given above we find that

1. The interaction of the whole process requires either significant amounts of communication or structured job tickets in either written or digital form. Last minute changes may occur thus flexible digital job tickets are to be preferred since the rest of the process is digital.
2. If the job tickets are digital, than the interactive part of the communication may well take place on a private place on the internet.
3. In cases where customer communication is required a feedback channel is required in order to allow for information sharing such as ICC profiles for an output device.
4. The interface between customer and printer is crucial in order to ensure that all is printed as intended.
5. The databases involved need to
   a. have the ability to hold and adminsiter the appropriate context information and,
   b. be equipped with an interface to the internet that permits the owner of the data to interact with his or her data.

The following figure sketches the dataflow in the different cases where a mirrored interface installed. A professional prepress shop or a printer needs to equipped with all the possible interfaces involved in order to be able to communicate:

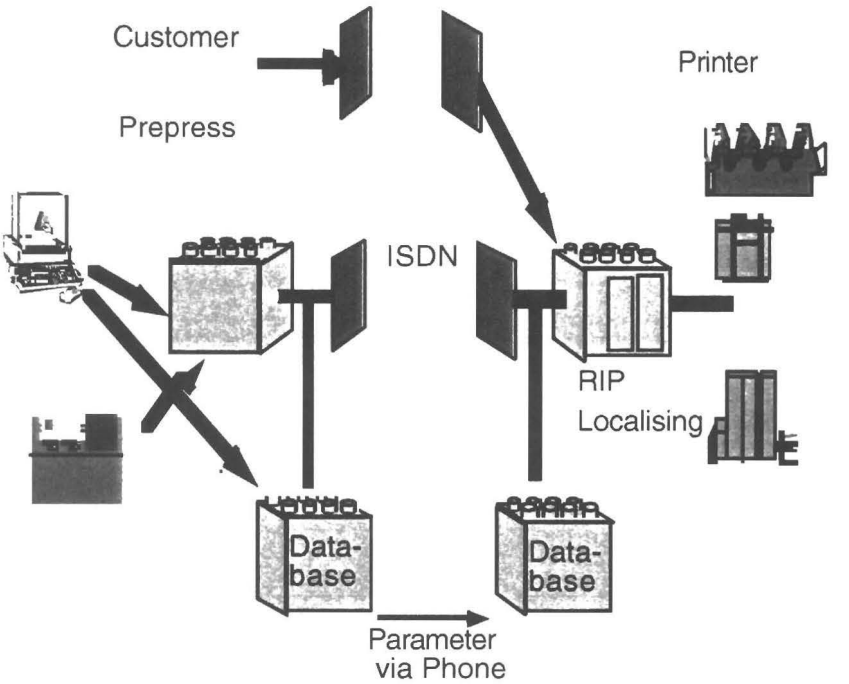

Figure 5: Possible flows of data in different business cases, as they are displayed in Figures 3 and 4. It is important to point out that the only defined interface in the whole workflow is the one before data leave the one shop to enter the workflow in the other shop. Since the functionalities provided in at the interface are undefined one should check a wide variety of properties of the files to be transferred. Preflight tools may serve here - but the set of functions they supply is not standardized.

As the Figure 6 indicates, there is a need for commonly specified interfaces to serve as gateways between data production/databases and output. One of the needs is that the files to be sent are still editable in order to permit last minute changes and reuse of publication parts.

Even processes in use in the same location undergo some sort of a distributed production. The problem of uncoordinated workflows, unclear interfaces (6) and the quality of unambiguous color communication (10) is significant. Currently the problem can

only be overcome with the use of hard copy forms which include the local requirements for production (11). In order to develop a means for solving parts this problem, some companies have developed workflow management systems and so called preflight tools. In the following we introduce the basic functions of such systems that attempt to provide mechanisms to ensure some aspects of the communication of the data.

Preflight tools

Before transferring or storing the intermediate product „scanned image" a preflight might be useful to check such properties as:

- are files corrupted?
- are all referenced files in the folder?
- are color definitions and geometry-hints unambigous and useful?
- are trapping parameters as required?
- can one open the files in the folder with the application referenced?
- is resolution adequate?
- is decompression neccesary? - if so, by which tool?

As of today, these „functionality-tests" still have to go along with verbal clarification between sender and receiver. The most crucial topics for those interactions are (5) helpful in the correction process - e.g.:

1. image intentions and corrections,
2. do both participants use compliant software to read the data sent, and
3. to ensure that the data are used in the way the owner of the data wants them to be used,
4. intended finishing,
5. intended distribution.

In the long run further problems will arise as there is no standardized means for transmitting information concerning the analog „gap" in production press in a digital production chain. Let alone that post press devices would accept any standardized data format.

As the business cases displayed above indicate, there is further need for information transfer in the production process. This

channel is supposed to serve as the means to enable the customer to interact with his service companies and to transfer information, digital money, approval or disapproval, ICC Profiles and similar information.

5. A proposed architecture for processing of feedback information in prepress

Several approaches had been published for the transfer of context or attributed information aside of the file to be printed. The most remarkable may be the IFRA track, the CIP3 initiative, and the workflow organisation approaches in PostScript 3 or Quark. However, as to the knowledge of the author all of the approaches lack a couple of properties:

- differentiation of information and tools the information is handled with
- no interactive web environment involved
- no differtiation of not-to-be changed information and changable information
- no „non proprietary" encryption of side information
- no plug in like architecture for the tools to be used in workflow

Subsequently we introduce a concept to serve for the creation, analysis and forwarding of side informations in production. First figure 6 sketches an interface to serve both for the use of the data flow and preflight and the need for a defined structure for passing reverse informations:

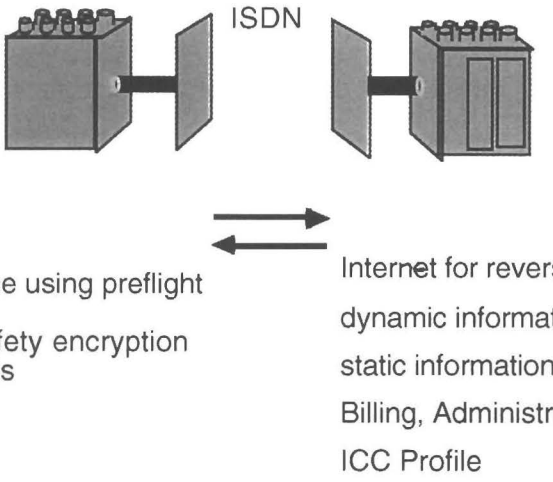

Figure 6: Structure of context information flow around content information flow.

Architecture

For the transmission and use of the context information we propose the following architecture:

The architecure, as it is displayed in figure 7 essentially consists of the following parts:

- ticket creation and analysis tool(s) (compliant tool(s) on the side of the customer or other service bureaus that deal with the job under review)
- job ticket
- web environment
- database.

The architecture has, to some degree, also to involve the operating system that support the applications used. Some of the functionality required (i.e. time consumed, labor, and use of such infrastructure as backup or net bandwidth and the like) may be easily accessed by using the information that is available on the OS level, as the Apple OS does today:

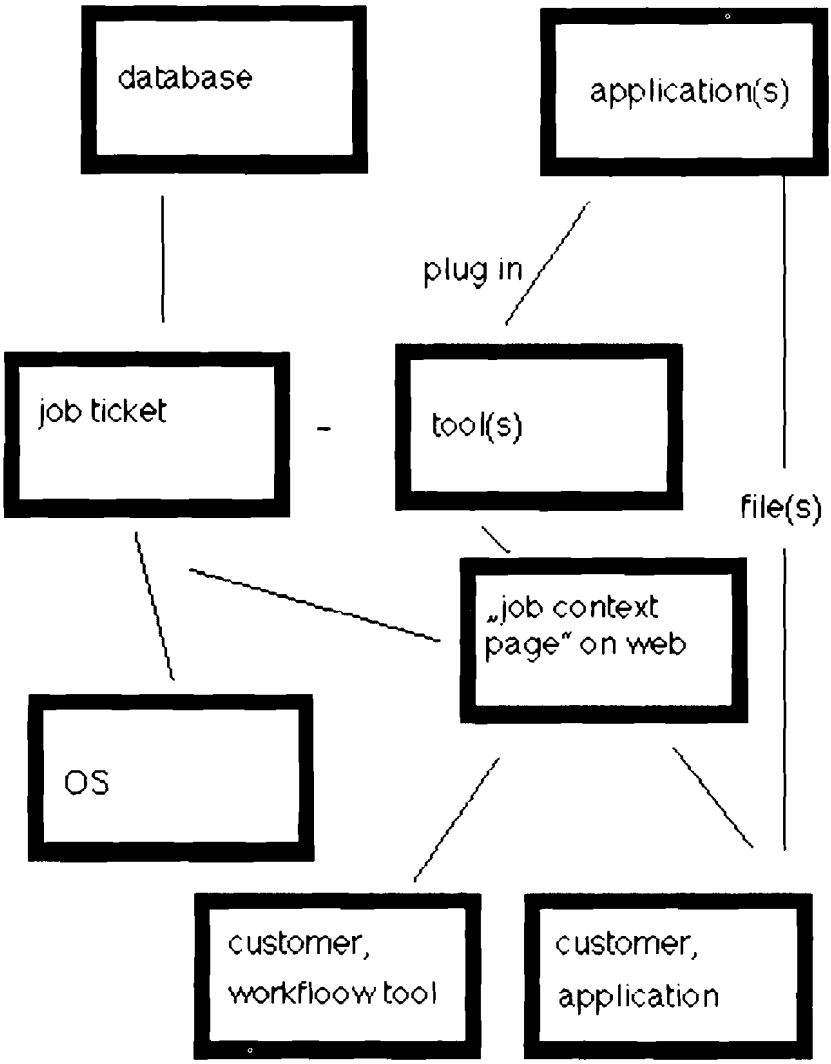

Figure 7: Architecture and scalable information paths in the suggested open workflow environment. The dataflow between applications (located at the service shops) and customers (or other service shops involved in production) usually involves images creation, builting of preview and graphics, composition of texts, graphics and images, preflight, output (e.g. as PostScript, pdf, ...), transmit for approval, perform image replacement, and RIP.

5.1 ticket creation and analysis tool

The „ticket creation and analysis tool" - rather a set of tools serving different purposes - should be of the structure of a „plug in" or an „Xtension" so that;

1. it may be called out of the application without interfering the work therein, and,
2. the file, as it is produced or processed in the application, information as it is available on the OS level, the database, and the net the may be analyzed automatically by the tool with further information manually added.

The tool must, of course, be standardized to the degree that it accepts the standardized tickets as they are produced by other tools and be able to merge tools containing the context for different page elements and / or of a page to be created. On the other hand different vendors may add value by using the information in the ticket in varying ways.

The data input into the profile may be performed via those tools, preflight tools and automatic analysis which accesses data out from the system (i.e. date, person registered to work at the workstation and in which application, use of net, applications and infrastructure, etc.), the application, the net, assigned databases, manual input or to read job tickets.
When integrating different page elements in the page assembly process, this tool may also integrate the job tickets as they are available for different elements and must make the user aware of possible conflicts.

Upon decision to send off the file to the customer the tool should also automatically create an individual job related website that serves as the intermediate between the customer and the alligned service shops in order to exchange job related information and serve as the medium for financeial exchange.
In order to provide the most extensive functionality, the tools need to be accessible from most of the applications and not assume any workflow structure. The use of the so called „plug in" or „XTension" structure for a tool such as this will prove useful. An architecture like the one anticipated here calls for value add tools based on a standardized and open infrastructure. It is apparent that the following tools and the combination of those

tools may be used for the analysis of the information as they are gathered in the job tickets:

- *post-production analysis* (Most prepress shops and designers calculate what they charge based upon rule of thumb - the post production analysis may add more information used in further production planing and calculation processes.)
- *job tracking* (For internal and external uses it is useful to know the state of the job and the steps to be taken before it is finished.)
- *production intents* (Here we find planned production steps such as finishing, distribution, personalization etc..)
- *copyright* (Going along with the different elements of the publication there is often input on copyright constraints e.g. for the restricted use in a limited set of information.

It should be pointed out that some of the functions a structure like that may be naturally used for finishing, distribution etc. ad, accordingly do enable intelligent interfaces on the side of the device-softwares or drivers to gain a further value add.

5.2 Job ticket

For the purpose of encrypting context information, we propose a mixed structure containing of two correlated files (6):
One file contains the „static information". Such information being a profile structured like a tagged file. Static Information in this sense may be (12):

- file formats
- file elements
- type(s) of compression
- employed type fonts
- UCR/GCR setup
- Image resolution
- total file size in MB
- Type of screen
- Screen with or dot size for FM Screening
- definition of colors
- if CMYK - standard specified
- references to duotone images

A tagged file is preferred as other structures (pdf, dcs, PostScript, etc.) discussed in the literature (12) have proven to

satisfy the some of information requirements, but some of them are propritary.

The file would consist of different elements:

a. A file header
b. A tag table
c. Tag data elements

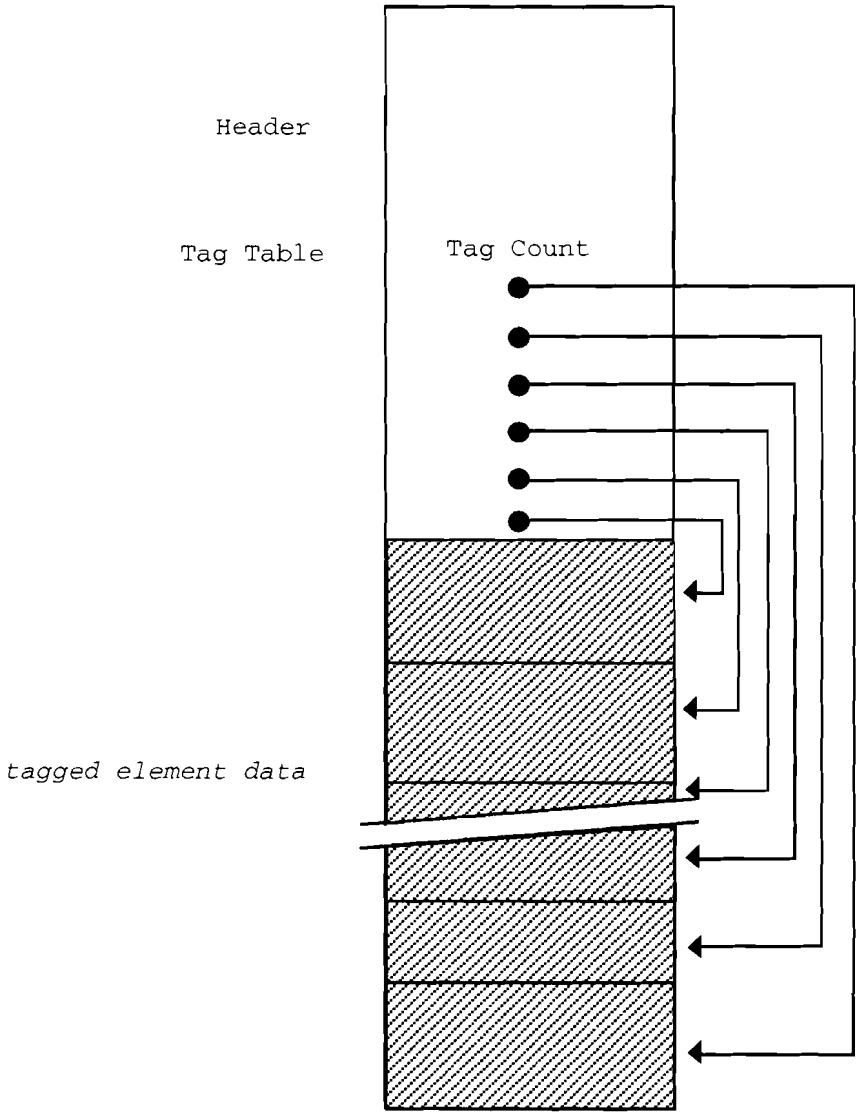

Figure 8: A possible structure of job tickets - encrypted in a tagged file.

Thus the structure could be like the one in the so called „ICC Profiles" (13), which appear to work well in the encryption of device characterizing information concerning color.

The information necessary to understand and create the Tag Data Elements is arranged within this approach as follows. Each „context information" requires the use of specific tags and allows other, additional, optional tags. These relationships should be described in a specific document („job ticket specification"). No proprietary information is contained in this file.

Context information can be encrypted into a job ticket which - as tagged files - consist of a set and of mandatory and optional informations. We also include a hint on where the variable information may be found. We find it inappropriate to include all necessary information to be enclosed into the job ticket. Existing literature offers a variety of information here (e.g. 11, 5).

As indicated, this information will require subdivision into static context information - meaning those that shall by joint definition of customer and services not be changed and remains in the profile, and the job related web site that consists of dynamic information (e.g. ICC Profiles, job status, etc.) .

In this file, aside of the static information, the ticket creation tool automatically creates a job dependent URL for a „homepage for any job" pointing to dynamic context information for required interaction between the customer and the printer involved in the process (5).

5.3 Web environment

The web environment may, depending on design, be based on or accessed by one of the commonly used web browsers. It is important, however, that the application not necessarily call for a specific browser. The idea is that a user can access job related information via the job related web site. For that purpose one of the workflow tools creates a website for every job. The idea is to enable the customer and the service bureaus he/she cooperates with to interact on job related issues in a formalized and interactive way, to use the web for financial transactions, and to apply technologies for web based job tracking. We think that the web environment - both for inter- and intranet - is not used widely enough today.

5.4 Database

It is appearent that a database is required to make an architecture like the one proposed here work. But, except for a high degree of openness there are no special requirements for their architecture.

6. Summary

The structure of the industry and business cases presented prove the complexity of situations that may occur in the production of publications and the need for flexible solutions. An architecture for an open workflow solution is presented which does not assume any workflow structure. It suggested that it's application consists of ticket creation and analysis tool(s), a job ticket, a web environment, and a database. The features and functionalities as they are required for the standardized job ticket and the other pieces of the architecture have been highlighted.

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Literature quoted:

1. Scampelaire, L. de:
Computer to Press as Business Model, 11th IS&T Conference on Non Impact Printing, Hilton Head, S. C., US, 1994

2. Treichel, W. :
Gesamthochschule Wuppertal, private communication, 1996

3.Seybold, J.W.:
The fourth wave - Publishing joins the mainstream,
The Seybold Report on Publishing Systems, Vol.17, Nr.9,
Seybold Publications, Media, USA, 1988

4. Kuron, R.:
DIDOS-Projekt: Märkte und Konzepte für das elektronische Publizieren.
In: Deutscher Drucker Nr. 36, S. w34w42, 1994

5. Dauer, L., Hecht, T., Kuron, R., Schmitt, U., Schnitzler, T., Has, M.:
Verteiltes Publizieren, Abschlußbericht zum Forschungsvorhaben FOGRA No. 64.014, FOGRA Institut, München, 1995

6. Has, M.:
Infrastruktur und Software um den Digitaldruck, RAPO, Chemnitz, 1996

7. CIP 3 Consortium
CIP3 Specification, Heidelberg, Darmstadt, 1994

8. Kalla, J.:
Peacom, FOGRA-Symposium 1996, Conference Proceedings, Munich, 1996

9. Job Monitor Protocoll, Covalent Inc. , Freemont, Cal. , 1995

10. Traber, K., Dolezalek, F.:
Anpassung von Digitalprüfdrucksystemen an den Offsetdruck, FOGRA Forschungsbericht Nr. 10.034, München und Wiesbaden, 1996

11. Fiebrandt, O., Huegli, S., Jaeggi, S., Meinecke, K. M., Vollenweider, M. :
Übernahme digitaler Daten, Bundesverband Druck E. V.,

Wiesbaden 1997

12. UGRA Recommendations for the exchange of digital data in final page form,
UGRA Report 122, St. Gallen 1997

13. International Color Consortium:
International Color Consortium Profile Format, e.g. Version 3.01, Boston, 1995