Effect of the Digital Technology to the Print Production Processes

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Abstract: Workflow systems are becoming applied in a wide range to improve productivity and quality control. Digital workflow systems developed by market leading companies meet this novel demand. These systems integrate jobs and forward them to the units addressed. Implementing these systems improve the market status of printing companies. Many routine and calculation tasks can be automated, administrative work can be simplified. In addition information flow becomes faster between units, workflow systems also enhance customer loyalty. All these advantages and opportunities make these systems an actuality to discuss. The objective of the research work is to draw attention to the process design solutions applied in Hungarian print industry, to introduce and analyze digital workflow systems and to provide information on relevant standards and operational background.

Keywords: workflow, CIM, process integration

1 Introduction

Computer aided design and production is integrated to Computer Integrated Manufacturing (CIM). The final objective of CIM is a totally automated unit of a whole factory without human labour force. In theory this objective is conceivable, but maybe in the far future, according to experiments. Nowadays highly automated production development with restricted human interaction seems to be cost effective.

The production of printed products has increasingly changed from a craftsmen's trade into industrial production. As in other industrial sectors, *computer-integrated manufacturing (CIM)* is becoming important. CIM became important during the development of prepress processes, but were soon replaced by the expression: workflow. In the past decades press manufacturer companies developed control software systems that can cooperate with management information systems (MIS) beyond controlling printing presses. The disadvantage of these systems is the lack

of flexibility, for the MIS have to now all individual workflow solutions, which may introduce compatibility errors.

The CIP3 (Cooperation for Integration of Prepress, Press, and Postpress), and from the year 2000 the CIP4 (Cooperation for Integration of Processes in Prepress, Press, and Postpress) nonprofit organisation and the wide spread of the platform independent PDF format created a basis for development trends for all stages of production not only for printing but also for finishing. This way led to optimized, JDF (Job Definition Format) based CIM, which is widely integrated into company control infrastructure [1].

2 Research Methohology

In order to exact data regarding the specification of the printing processes and the using of digital data and workflow systems, an extended survey among print media companies has developed and implemented. The survey took place in Hungary and included interviews and answers to a questions.

The groups of questions are.

- Job preparation.
- How files and originals arrive?
- Digitális workflow system.
- Color management.
- Preflighting.
- Proofs.
- Platemaking/Computer-to-plate.
- After the job is completed.
- Computer integrated production process.
- Digital printing.
- Digital asset management and servers [2, 3].

The survey started in September of 2006 and ended in May of 2007. The questions has been distributed to 72 printing companies data have been obtained by 65 companies. The outcomes and results from the survey are presented in the chapter „Results” of this paper.

3 Integration of Print Production Workflows

3.1 Digital Workflow

There are more solutions to control production processes, one of these is the workflow. The workflow is a sequence of tasks assembled to accomplish a certain objective. Production processes implemented through a workflow need the support of the information system to ensure that the instruction or message is delivered to the addressed party immediately.

Networking can be implemented through external or internet as well. The progress of the process can be traced by control staff. This feedback enables schedule correction on the fly.

Advantages of using workflow systems:

- rapid or automated ignition of repetitive tasks,
- administrative tasks are partly automated and faster,
- verification of the job is fast and accurate through visual and textual report,
- long distances between locations are no problem, connection is easy,
- distant jobs can be integrated into groups,
- costumers and partners may also trace the flow,
- standardized communication channels are used [4].

3.2 Print Production Workflow

Printing houses as production units have a complex structure, control of the workflow is quite a challenge for experts, even though is can be divided to three areas. Prepress, press and postpress tasks are to be fulfilled in harmony. The achievement of this harmony can be supported by an effective workflow system. Process control in print industry includes the complete control of the production process from the idea through printing to the end-product (*Figure 1*).

3.3 Development of the Digital Workflow in the Print Production Process

Digital workflow in the print industry was based exclusively on analog data until the 1970s. The digitalization of the offset workflow has consisted of five stages.

At first, color scanners and phototypesetting systems were used to digitize. Drum scanners read the originals electronically, carry out the color corrections and color separations in the processing unit, and record the result on film. The text, image, and graphics were thus available in a digital form.

The second stage in the diditalization of data in the 1980s, with the introduction of Desktop Publishing (DTP). This technology is based on powerful informatics principle. DTP permits the compliling of text, image, and graphics elements digitally into complete pages using layout programs and the outputting of these by laser imaging units on film.

Already shortly after the introdusing DTP is becoming available a new method and softwer: the digital sheet assembly. These softwer utilities permitted the imposition of pages, the assembly of print sheets and their exposition on print format-size films. It was called Computer to Film (CtF).

The digitalisation of prepress ends with Computer to Plate (CtP). The information is directly transferred to the printing plate from the digital sheet assembly without generatiing any film. One of its technology is when by laser imaging unit are made the printing elements directly on the printing plate in a special plate imagesetter. Another use of CtP is that platemaking is directly integrated in the printing press (computer to press/direct imaging).

The last stage is a Computer Integrated Manufacturing (CIM). The transfer of production-relevant data from prepress, and the work preparation for makeready and control of printing and finishing sístems and shipping processing play a vital role in introducing CIM in the printing industry. The purpose of this development is to achive a networked printinghouse [1, 3].

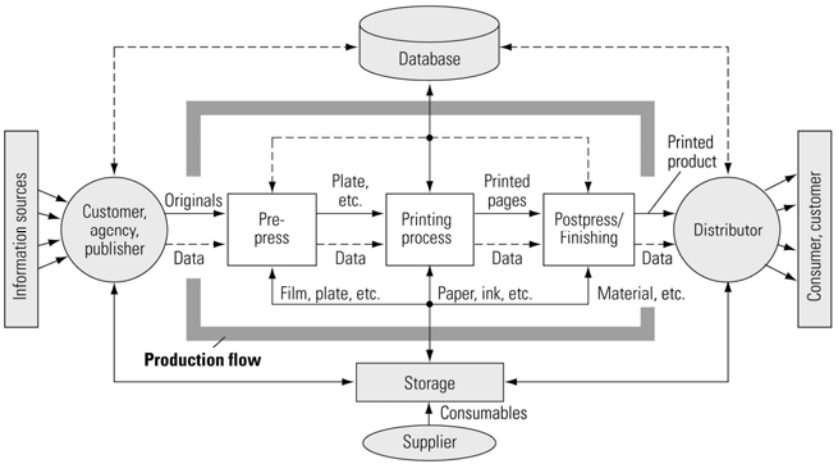

Figure 1
Print production process

4 Results

4.1 General Data

Details by the type of printing organisation are in the *Table 1*. The breakdown by size of company was quite typical of the overall printing industry (*Table 2*).

Table 1
Respondents by Type of Printing Organization (as a persent of all respondens)

Type of Printing Organization	Number of Respondents	%, Respondents
General Commersial Printer	54	75,0
Prepress Service Bureau	3	4,2
Book Printer	3	4,2
Magazine Printer	3	4,2
Package Printer	2	2,7
Miscellaneous/no reply	7	9,7
	72	100

Table 2
Respondents by Employees Size of Printing Organization (as a percent of all respondents)

Size of Printing Organization	Number of Respondents	%, Respondents
1 to 9 emploees	23	31,9
10 to 19 emploees	14	19,4
20 to 49 emploees	10	13,9
50 to 99 emploees	11	15,4
100 to 249 emploees	8	11,1
249 to 499 emploees	5	6,9
> 500 emploees	1	1,4
	72	100

4.2 Results – Answers per Question Groups

4.2.1 Job Preparation

All printers received images in all formats from their cutomers. The greater percent, 33,9%, received of their images embedded into PDF (*Table 3*). Of the respondents 20% received conventional originals (film, photographic printsor slides).

Most of all the files a printer receives come directly from the customers. All printers receive files from multiple source, and close to half of all jobs, 45,3%, require revisions.

Table 3
Format of Images Recived from Clients (as a percent of all images received)

Format Images Received from Client	% Received
Embedded in PDF	33,9
Digital file	32,3
Film	15,8
Part of composite file	7,0
Photographic prints or slides	6,1
Other	4,9

4.2.2 How Files or Originals Arrive

Jobs are sent to printers in a wide range of formats, the most popular being PDF (*Figure* 2).

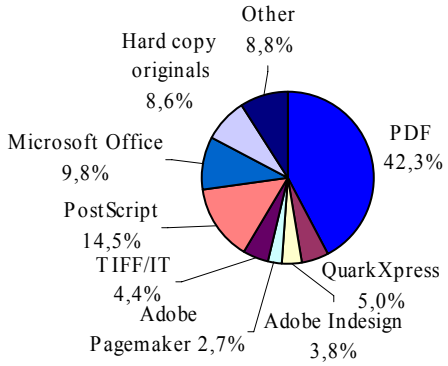

Figure 2
Types of Files Formats Receives by Printers

With the files arriving at the printer's location digitally, the question arises – did the costumer send a hard copy proof with digital file?

Close to three-querters of the respondents did receive a hard copy proof of some type with digital file.

Interesting is the wide range of hard copy outputs they received as demonstrated in *Figure 3*.

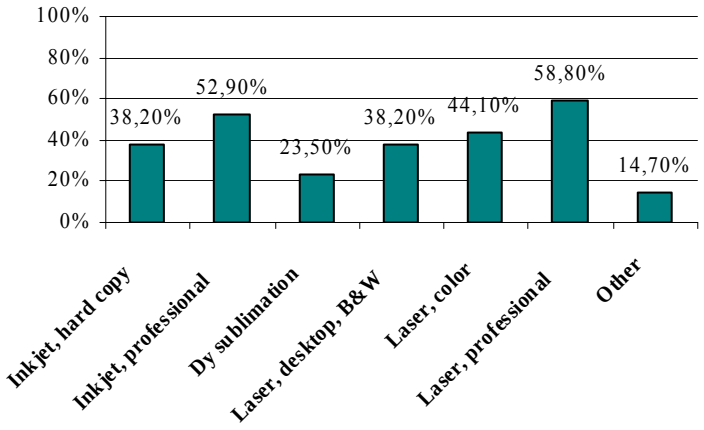

Figure 3
Types of Hard Copy Proofs Received by Printers (multiple respondes)

4.2.3 Prepress Workfow System

About half of the respondents used prepress workflows, PDF and PostScript are the most popular and Apogee (Agfa) is very much used (*Table 4*). We asked the respondents what system they were using in 2006 vs. what they were using in 2012. Primary PostScript was used by 15,6% of the respondents in 2006 vs. 7,4% of the respondents in 2012.

Table 4
Prepress workflows

Primary Prepress Workflow	% of All Respondents	
	2007	2012
Apogee (Agfa)	12,3	16,7
Barco	0	0
Brisque (Scitex)	2,8	1,9
Delta (Heidelberg)	2,2	1
Harlequin	1,3	0
PDF	19	18,5
PostScript	15,6	7,4
Prinergy (Heidelberg)	1,2	1,8
Prinergy (Creoscitex)	4,6	4,6
Other	10,7	5

4.2.4 Platemaking

Of the respondents 35% used computer-to-plate in their operations. The type of the used plates are: Agfa (35%), Fujifilm (25%), Kodak (15%), hagyományos nyomóforma (25%).

The better quality of the printing forms and prints and less platemaking time are the most important advantages of CTP for the printers as presented in *Figure 4*.

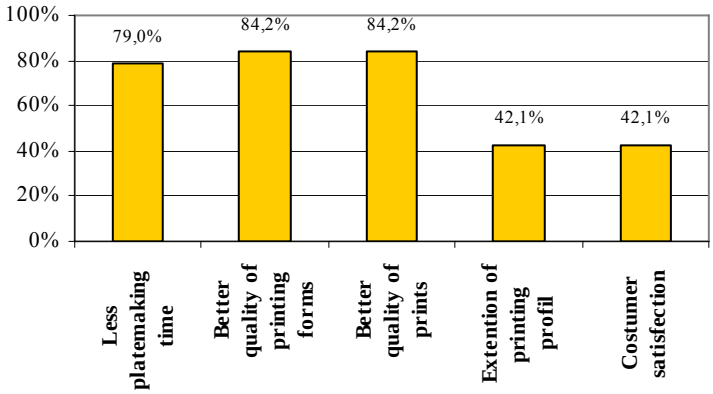

Figure 4
Advantages of CTPlate

4.2.5 Computer Integrated Production Process

Nearly half of the respondents had management information systems. We can stress the importante of the storage and the production scheduling from these system included.

We asked the respondents what setting and controlling operations were performing automatically. Of the printers 76,6%, chose the less waste for advantage of automatization, 66,7% the better product quality and 61,9%, the less human error. The presses of the printers make first ink fed setting possible automatically, as is apparent in the Figure 5.

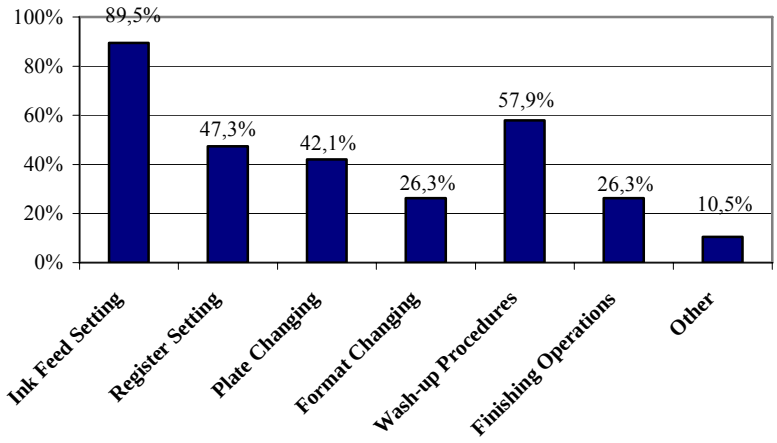

Figure 5
Automatic setting and controll operations (multiple respondes)

Majority of the presses, 67%, can not receive digital data from prepress and can not transfer them to the setting and controlling of the printing and finishing processes.

4.2.6 Digital Asset Management

Digital Asset Management (DAM) is essential component in the working of the printing companies. Close to two-thirds of the respondents, 72%, were using digital asset management internally. Of those respondents not using a DAM they were using a wide variety of methodes, mostly a manual sytem, CDs or DVDs, file server or hard drives.

The digital storage average is 56 MB/page and the storage capacity average is 240 MB/job.

Conclusions

From our results we can concluded that in Hungarin Printing Industry one part of the workflow is based on digital data (for instance in prepress). But the electronics – with above mentiond – first are used for measurement and process controll.

In recent years, computers and automated processing have had a considerable influence on prepress. The integration of prepress and press, as well as automation in printing and the integration of related processes, have also reached a certain maturity. In the other areas of production such as finishing, the integration of computers is by no means standard and is still in its infancy.

Complete digitization and integration of prepress, press, and postpress is unavoidable if computer-integrated manufacture of printed products is to be achieved. Close to one-thirts of the Hungarian printing companies have JDF is needed for the integration of the complet process. But there are two main obstacles to its implementation. At the moment, in Hungarian printing companies partially incompatible systems and interfaces still exist and there is only a limited supply of machines and computers that can be electronically controlled.

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