

2 Process integration in the print media industry

The print media industry is going through a period of upheaval. Innovations and industrialization concepts that have already been implemented in other industries have recently started to find their way into this sector too, while IT terms such as Enterprise Resource Planning (ERP), Management Information System (MIS), Computer Integrated Manufacturing (CIM), Customer Relationship Management (CRM), Supply Chain Management (SCM) etc. are also beginning to make their presence felt.

The arrival of the Job Definition Format (JDF) in the year 2000 marked a major step forward. This new standard paves the way for the development of fully integrated process systems that promise a high degree of transparency, flexibility, quality and efficiency. The networking of print service providers via common standards will provide the next major development push for the industry following the establishment of an end-to-end digital workflow in prepress.

The Job Definition Format (JDF) describes and collects all the relevant data and process steps for a printing job. JDF is based on XML and is maintained and developed by the CIP4 consortium.
www.cip4.org.

JDF

Multiple media changes occur between the different departments of a print service provider such as order management, accounting, production and logistics, and also vis-à-vis customers and suppliers. Even activities within individual departments are often performed using different software applications that cannot communicate with each other. These inefficient processes make their mark on process costs. The goal of process integration is to cut these costs. This is done by transferring data generated in the individual departments seamlessly across various networking routes.

2.1

The essential problem with non-networked production – process costs

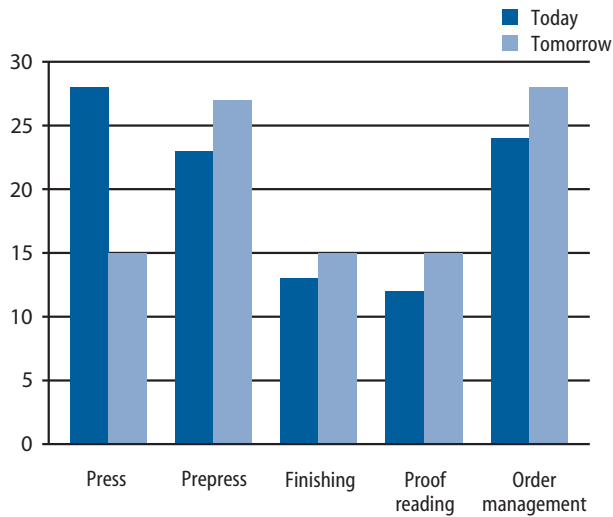
Non-networked print job production generally consists of a series of isolated software solutions and changes of media that lead to lack of transparency and inputs being duplicated. This in turn results in unnecessarily high processing and communication input when managing orders. The more complex the jobs and the shorter the runs, the greater the impact these inefficiencies have, resulting in higher process costs.

Process costs are costs incurred in the process of manufacturing a print product and include indirect costs deriving from order processing, job preparation, production, logistics, etc. In simplified terms, the costs incurred in order management, job preparation, prepress and logistics are proportionate to the number of jobs and their complexity, while in press and postpress, factors relating to the size of the print run have most influence. Investing in suitable platesetter (Computer-to-Plate) technology and state-of-the-art printing presses can reduce process costs in production. Process costs in order management, job preparation, logistics and prepress can be reduced by using “lean” workflows which ensure inputs only have to be made once and that different departments do not have to get involved in complex coordination procedures.

A study conducted in 2000 by the Rochester Institute of Technology found that inefficient processes become a problem when average print run sizes fall. According to this study, in the years 1998 to 2000 alone, the number of print jobs with runs smaller than 2,000 increased from 28% to 44%.¹ This leads to increased order costs, above all in prepress, proofing and order management, i.e. sectors that are not governed by print run levels.

This is confirmed by research by Heidelberger Druckmaschinen AG. A study from 2000 found that, on average, 24% of job costs are incurred in the order management sector. Prepress accounts for a further 23% of costs. Print service providers anticipate that costs in these two sectors will rise to 28% and 26% respectively in future. Indirect administrative costs and prepress costs that are not governed by print run levels are further eating into margins. Production will become unprofitable if countermeasures are not taken.

¹Romano, Rochester Institute for Technology, 2000



*Figure 1
Manufacturing costs
as % of order costs.
Source: Heidelberger
Druckmaschinen AG*

2.2 Data types in the print media industry

Data types store technical and commercial information in digital form. The structure of the different data types varies depending on what they are used for. Some have already been standardized, others have not. In addition, interpersonal communication is still required at those interfaces where communication is not supported by technology.

The data encountered in the print media industry is discussed below. It can be subdivided into:

- Content data,
- Master data,
- Job data,
- Production data,
- Control data,
- Operating and machine data,
- Quality data.

It can be difficult to separate these data types in individual cases, since the data can be used in different contexts.

2.2.1

Content data

Print media production is based on content that is processed into a document. The content is compiled by, for example, a publisher and an author from various sources of information (agencies, archives etc.). Content data can be entered into a database where it can then be accessed for producing both print media and electronic media. This data must be adapted to the output medium, e.g. paper or Internet. This is particularly true as regards color, resolution, image format and data format. PDF has become the standard exchange format for content data in the print media industry in recent years.

PDF

The Portable Document Format (PDF) was created by Adobe as a platform-independent data output format. It is a recognized standard in the print media sector, and has also been widely adopted in the IT sector.

2.2.2

Master data

Master data is data that is needed again and again in all areas of order management, planning and production. It includes product structures, equipment, human resources, production structures, and customer and supplier addresses. Master data does not change a great deal and can be used over and over if it is stored in a database. It is best to maintain master data at a central location and make it available to staff at their workstations through access rights.

2.2.3

Job data

Job data describes a job. Traditionally, job data is transferred to the individual workstations in the form of a job ticket. The job ticket serves to ensure that the job proceeds smoothly through production. The job name and number, customer name and number, etc. are fixed and do not change.

Job data is created by entering it into the order management system no later than when the order is awarded, but usually as early as the quotation phase.

JOB TICKET		No.: 04-0013	
Delivery date:			
Customer:			
Heidelberg Druckmaschinen AG		Cust. No. 1	Reference: prinance_dba
Kurfürstenanlage 52-60		Phone. 1:	Last order no.:
		Fax:	Date: 28.03.2004
69115 Heidelberg		Mod.:	
Notes: House Colors: Blau HKS 42 = Cyan 100, Magenta etc. Always 5 print samples in the job ticket!!!			
20,000 brochures, summer festival 2004			
Extent: 4 pages		Form number:	
Finished size: 21 cm x 29.7 cm		Order number:	
Open size: 42 cm x 29.7 cm			
<input checked="" type="checkbox"/> New print		<input type="checkbox"/> Reprint	
		<input type="checkbox"/> Reprint w. changes	
Sheet(s):		Front colors:	Back colors:
1 sheet of 4 ups 4/4-colored		Euroscale	Euroscale
Composition/Repro:		Correction: <input type="checkbox"/> YES <input type="checkbox"/> NO	
Correction until:		1 st correction: _____	
Correction to:		2 nd correction: _____	
Composition ready until:		3 rd correction: _____	
		O.k. to print at: _____	
2 DTP Composition work		60 lcm screen	
2 COLOR SCAN 4 Scans 4c A4			
Form Production:		Archive of assembly:	
1 CTP Output computer to plate		/ Plate 103 cm x 77 cm 4	
Print:		Archive plates: <input type="checkbox"/> YES <input type="checkbox"/> NO	
1 CD102-5L Set up		4	
1 CD102-5L Printing: Work and turn		11,000	

Figure 2
Typical job ticket

Order management systems are software applications that enable orders to be costed and processed. In the print media industry, such systems are known as costing software or industry-specific software.

Order management
system

Customers are now increasingly able to submit job data to the order management system online via Internet portals.

2.2.4 Production data

Production data defines the production process between different software applications and machines. It is mainly generated in the job preparation and prepress stages and passed on to downstream production resources. Production data is not associated with specific machines and is therefore still relatively flexible. This data is encoded in industry standards such as ICC profiles and the Print Production Format (PPF), in quasi-standards such as the Portable Job Ticket Format (PJTF) or in proprietary formats.

Numerous parameters for a print product can be described in prepress in Print Production Format (PPF) and used later to preset presses and finishing machines. PPF was stewarded by the CIP3 Consortium, which was also responsible for its ongoing development. <http://www.cip4.org>

Portable Job Ticket Format (PJTF) is a format from Adobe for automating the prepress workflow. The PJTF set of functions is included in JDF. www.adobe.com

Thanks to the intensive cooperation between agencies and prepress, production data has already been widely standardized since the introduction of Postscript in the mid-1980s. The possibilities opened up by remote proofing and PDF certification will also close the last remaining gaps in the automatic workflow between agencies and print service providers.

2.2.5
Control data

Production data can be transformed into control data using machine and device control software. Calibration curves, ICC profiles and folding type catalogs are among the means available for doing so. Production staff can use production data directly or in slightly

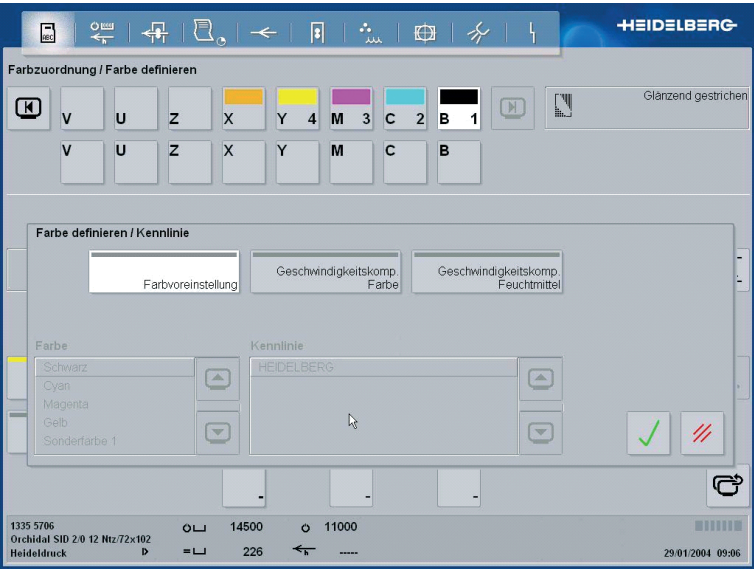


Figure 3
Input of control data at
the CP2000 Center

adapted form to steer processes at the control consoles. In addition, presses, for example, require various items of data that do not come from prepress, but must be input directly at the control console. These include printing unit assignment, application of dampening solution, powder length, etc.

2.2.6

Operating and machine data

Operating and machine data is needed to evaluate the processes actually carried out for production control purposes and actual costing. Evaluating this data provides information about the status, utilization and availability of production resources. Machine data is technical data that is loaded directly from the machine or workflow and must be interpreted in business management terms.

Operating data is traditionally recorded by staff on daily dockets and provides information about resources used and materials consumed. In addition to job-related data, non-job-related data such as servicing times, training times, etc., is also recorded.

2.2.7

Quality data

Quality data is data that serves to maintain a defined quality standard or ensure continuous production. It includes densitometric and photospectral measured values and information on the chemicals necessary for plate development. Quality data is important to print service providers as it helps them ensure high production reliability within predefined tolerances.

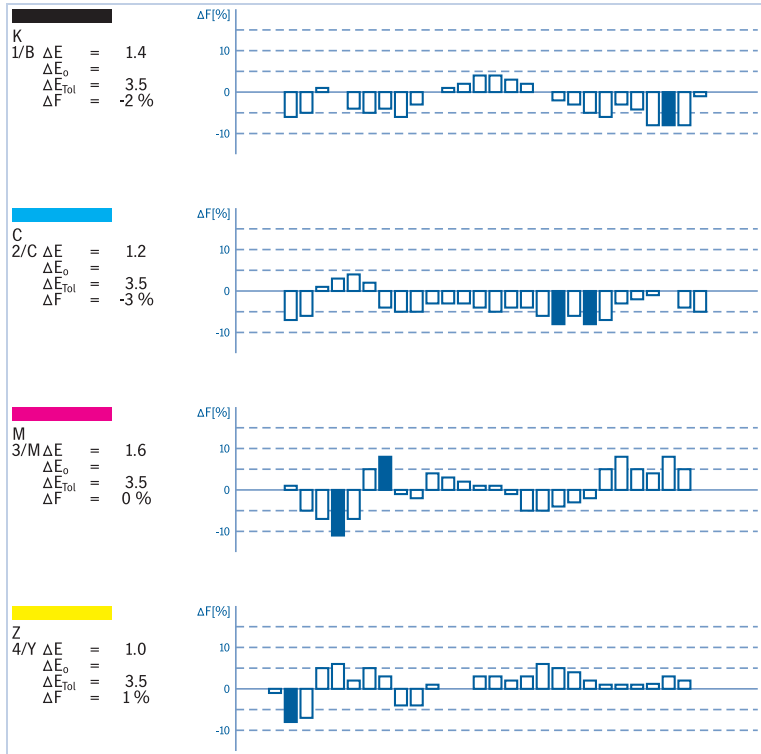
Quality data can be used directly to regulate the production process. If a measured value exceeds the required tolerance zone, the press has to be adjusted or a warning is issued. Quality data is also required for documentation. Print service providers aiming for ISO certification in particular must document – and be able to provide retroactive proof of – the levels of quality they have attained.

2.3

Networking routes of process integration

Data is exchanged within an application or between different applications at print service providers in digital, written or oral form.

Figure 4
Report from a color
measurement and
control system



A stream of data interconnects various applications to form net-
working routes.

Due to the high division of labor in the print media industry, data
streams are not limited to one site or one company. For example,
customers make inquiries, approve the print result, and ask when
production will be ready for delivery. Suppliers offer their prod-
ucts with price lists and product information. Agencies exchange
content data with print service providers.

Integrating the processes used by print service providers is
a major task. Networking requires an investment in up-to-date,
network-enabled software applications and services. To be able to
communicate in the network, older machine controls have to be
brought up to the current level of hardware and software. Last
but not least is the not inconsiderable work required internally to
introduce networking and train staff.

However, print service providers do not have to be networked in
every aspect, nor does networking have to be completed in one fell
swoop. It is therefore a good idea to split up the complete package

of networking possibilities into individual networking routes, then focus on particular areas of investment. Specifically, we can identify the following networking routes:

- E-business,
- Job preparation,
- Machine presetting,
- Job planning and control,
- Operating data logging and actual costing,
- Color workflow.

Depending on the order structure and the machine park, analyses are needed to identify which networking routes actually offer feasible benefits for the particular print service provider.

2.3.1

E-business

The purpose of the e-business networking route is to minimize process costs between customer and print service provider, increase customer loyalty through solutions specifically tailored to customers, and offer new services. Since they enable 24/7 availability without regional limitations, e-business solutions offer print service providers the opportunity to expand their market.

24/7 availability (24 hours, 7 days) refers to the availability of the service to remove faults and provide help with user problems.

24/7 availability

E-business solutions have begun to penetrate the market, especially in the prepress and digital printing sectors. In prepress in particular, this has led to a widening in the range of services offered, with providers supplying services such as image databases, standard print products and coordination of content data. By its very nature, digital printing is ideal for very short runs, and must therefore grapple with relatively high process costs in order processing, which can be reduced using Internet portals.

Key aspects of the e-business networking route include:

- E-business solutions must be marketed. Potential customers have to be actively approached. Given the relatively large training and advertising effort required by e-business solutions, target customers should generate comparatively high sales to justify the effort on both sides.

- The degree of integration with the order management system is key for ensuring low process costs. The fewer interventions required to process orders, the higher the probability that the e-business model will be profitable.
- E-business solutions should be particularly adaptable to customers' needs. An unwieldy user interface, violation of security guidelines, or the need to involve companies' IT departments can quickly jeopardize e-business projects.
- The Internet portal provider becomes a 1st level service for its customers. The round-the-clock availability of the portal must be ensured. Companies should consider whether to operate the Web server themselves or look for a provider whose services they can use.

1st level service

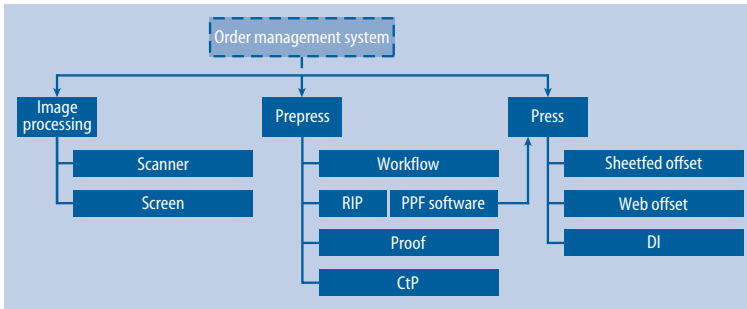
1st level service is a service offered to customers giving them an initial point of contact for user questions and problems. For more complex questions, 1st level service can seek assistance from 2nd level service.

The task of defining the job in hand is transferred to the customer's sphere of responsibility. This significantly reduces the administrative effort required for order processing, and clearly increases customer loyalty, particularly where the solution is integrated in the customer's ERP system.²

2.3.2 Job preparation

Order management involves creating job tickets, which are then augmented with production data, print samples etc., and transferred to prepress, the printroom and finishing operations. Job-related information from all the cost centers in the production process is described in the job ticket. Changes during the production process are input in the job ticket and reported back to order management. Networking the job preparation stage is intended to eliminate the change of media between order management and production. Further aims include the avoidance of duplicate inputs, more up-to-date job tickets and increased reliability in production.

²An overview of e-business can be found in König: E-Business@Print, Springer-Verlag, 2004.



*Figure 5
Job preparation
networking route*

Key aspects of the job preparation networking route include:

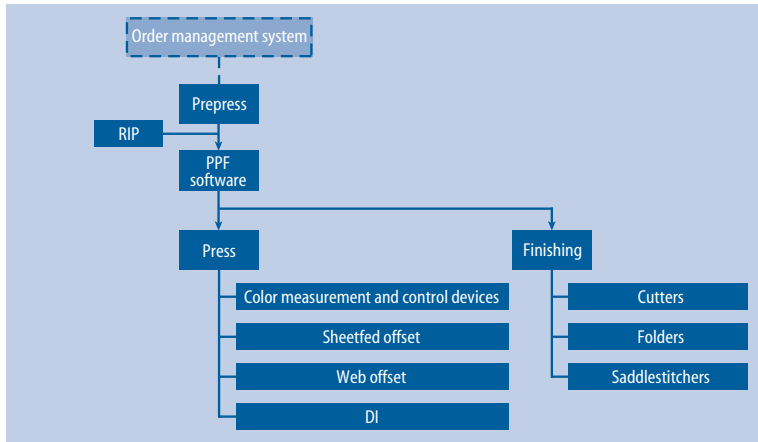
- Standardized job designations at the print service provider or within a production network simplify communication and help to avoid errors, especially in cases where job preparation data is sourced from different places.
- Complete, transparent and up-to-date job tickets are important for ensuring error-free production at every workstation round the clock. Information should be reduced to what is actually needed and must be easy to identify clearly, for example with the help of previews.
- Job preparation stations have become established in prepress, press and finishing stages. They increase the degree to which production resources are utilized and enable consistently high quality even when staff have different levels of training.

Thanks to networking, operators are immediately notified of any changes in the job or processing caused by e.g. a press becoming unavailable at short notice. The modified electronic job ticket is immediately adapted to this end at the corresponding control consoles.

2.3.3 Machine presetting

Machine presetting aims to reduce setup times and waste in production. As the name suggests, presettings must normally be carried out on the machines. The area coverages determined in prepress are converted into ink zone values that are used to control the individual ink zone valves on the press. In addition, the autoregister, cutting, folding and saddlestitcher marks created in the impositioning software can be employed for presetting presses and finishing machines using the PPF file described above.

Figure 6
Machine presetting
networking route



Key aspects of the machine presetting networking route include:

- The necessary knowledge about the production process must be available in order management and prepress. To maximize reliability in production, the parameters that can be selected in the order management system and in the print workflow should be restricted to those that are actually available. Incorrect presettings, far from saving working time, just lead to problems.
- In order to avoid presettings being wrongly allocated in production, it is important to make sure what job is being processed. Either the job number must be entered manually in prepress, or a rudimentary networking with order management must be established.
- In order for the investments in machine presetting to pay off, the presetting options for the machine in question must be comprehensive enough to cut working time significantly.

CIP3

The CIP3 (International Cooperation for the Integration of Prepress, Press, and Postpress) Consortium was responsible for maintaining and disseminating the Print Production Format (PPF). www.cip4.org

Machine presetting was made possible in 1997 thanks to the manufacturer-independent PPF format of the CIP3 Consortium, and became established at the latest in 1999 with the increasing popularity of CtP. Other machine presettings are based on proprietary formats, such as paper and sheet information from the order

management system and is used to preset suction air and printing pressure at the feeder and delivery.

2.3.4

Production planning and control

Production planning and control aims to ensure optimum use of production resources while keeping to specified delivery dates. This requires that activities captured in order management are structured, and carried over into production plans for prepress, press and finishing. Defining the production sequence accurately is important for keeping to delivery dates, especially where it is not possible to process jobs sequentially. An important task for planners is to optimize the utilization of the press. The printing units must be allocated so as to minimize downtimes due to ink changes. In addition, the printer must be relieved of unscheduled activities such as looking for plates, paper and ink.

Key aspects for the production planning and control networking route include:

- Planning changes must be quickly forwarded to all affected workstations. Many orders come with only short notice, making it necessary to change the production plan many times each day. The various operations must be dovetailed such that, when changes occur, the schedule is updated automatically and conflicts are avoided.
- There should be a system in place for planning in maintenance operations and periodicals. Not all jobs are pre-costed, and it must be possible to add such jobs into the production planning system and to factor in times that are not job-related.

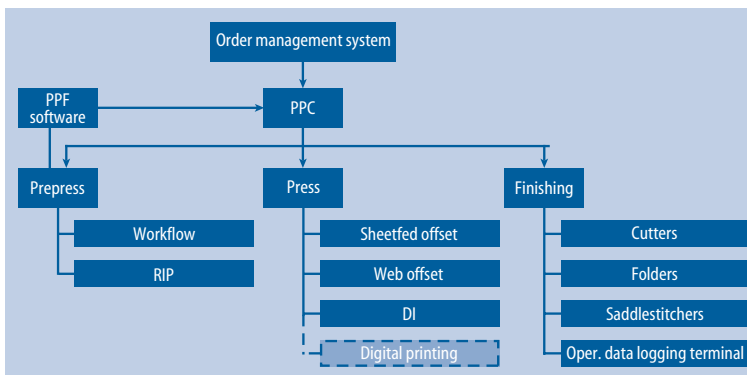


Figure 7
Production planning
and control networking
route

- An electronic planning system must map the entire production process from prepress to delivery. It should also be possible with database support to perform both rough and detailed planning separately, and to plan printing and finishing separately. The planner must have information on the availability of consumables such as plates, paper and ink. Ideally, it should also be possible to implement a networked planning system across multiple sites so that partner companies and suppliers can also be integrated.

While manual planning and simple spreadsheets are widespread, less use is made of the capacity planning features of the order management system. The networked production planning and control system that enables data to be passed on in real time is a true rarity.

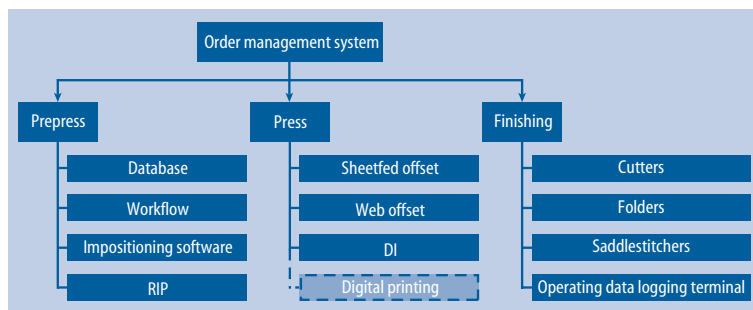
2.3.5

Operating data logging and actual costing

Operating data logging and actual costing deliver the figures used for producing the statistics required for in-house controlling. While working times and material consumption levels are paramount in prepress, interest in the printroom and finishing operations is mainly focussed on which cost unit has been utilized and for how long. The print service provider is guided by these key figures. Basically, the more data is logged, the better the processes can be monitored.

Key aspects of the networking route for operating data logging and actual costing include:

- Exporting machine data is a quick way to log reliable up-to-date data for actual costing. However, practice has shown that robust mechanisms must be implemented that prevent open transactions appearing in the actual costing due to operator error. In some cases, recording machine data requires staff agreement and must be coordinated with the works council.
- Logging operating data is necessary wherever machine data cannot be logged or wherever the specific job cannot be determined (this being an absolute prerequisite for actual costing). Therefore, operating data logging complements machine data logging. This is the case, for example, during machine downtime, at manual workstations in the finishing and mailroom departments.



*Figure 8
Operating data logging
and actual costing
networking route*

- It also makes sense to network the order management system with the financial accounting system so that payment transactions with banks, payroll operations and annual accounts can all be processed automatically. Payroll is usually part of the financial accounting software, which receives the necessary data from the order management system via interfaces.

In recent years, special operating data logging terminals have become increasingly popular. In the printroom, machine and operating data logging has now matured sufficiently to allow informative actual costing with inputs at the control consoles. In prepress exporting machine data has only been made possible by the most recent generation of workflow systems.

2.3.6 Color workflow

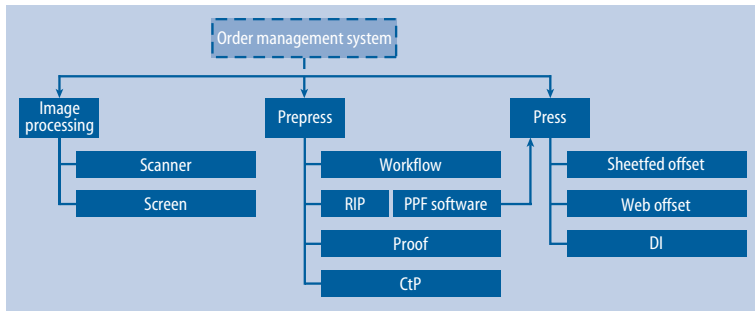
It's not only global companies with multiple sites who face the challenge of ensuring color stability from the digital copy right through to the final print. Securing predictable, constant color quality is also absolutely essential for small companies if they are to remain competitive.

This challenge requires color management, which produces a standardized visual impression on the various output devices (scanner, screen, proofer, press). It makes (virtually) no difference what materials, devices and machines are used, as long as they have been calibrated and profiled.

Key aspects of the color workflow networking route include:

- The print service provider must be fully prepared to standardize his workflows, as this is the only way to ensure stable processes with a reasonable outlay. A few standard workflows should

Figure 9
Color workflow
networking route



be chosen rather than multiple production resources and processes.

- In order to implement a networked color workflow, it is also essential that these workflows are consistently adhered to. Consistent color quality can only be achieved if the conditions are kept within the tolerance range. Company guidelines regarding calibration, ink, paper, and exchanging blankets are to be strictly adhered to. Any process deviations that occur must be rectified at their source and must not be compensated for by the printer.
- The success of the networked color workflow can be measured in terms of a reduction in waste paper and complaints, rather than “better” printing. The likelihood of success is strongly dependent on the circumstances at the outset and the company’s range of products.

Connecting spectrophotometric measuring devices, which measure the entire sheet or the color control bar, with the reference values from prepress opens up interesting possibilities. The digital reference values are compared with the measured values and the press’s ink zone valves are adjusted accordingly.

2.4

Why has process integration failed so often in the past?

The networking routes presented above exhibit significant potential for optimizing the production process and cutting process costs. Attempts have long been made to network print service providers. The providers Creo with Networked Graphic Production, Heidelberger Druckmaschinen AG with Prinect, MAN Roland with PeCom and

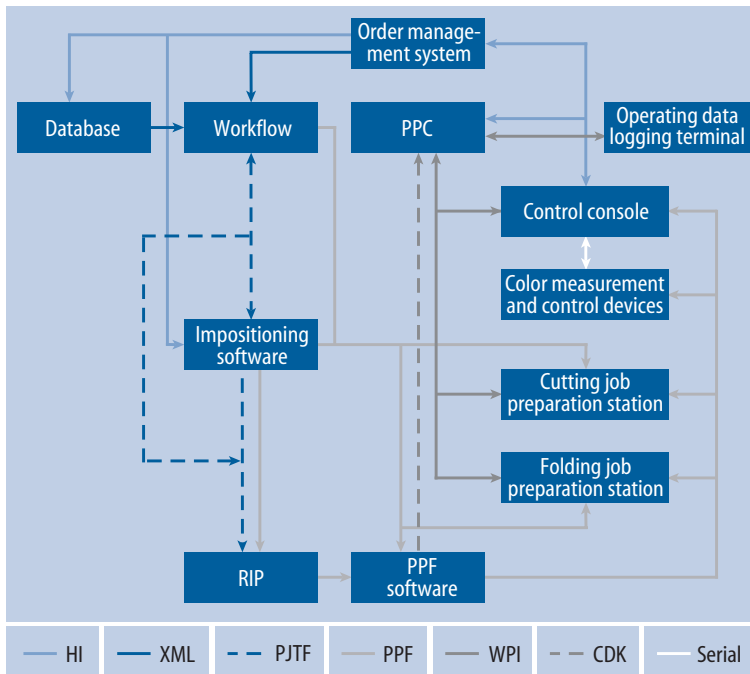


Figure 10
Multiple interfaces of
a networking solution

the PrintCity consortium have for some time been offering solutions that enable order management to be networked with production.

However, apart from ink zone presetting of presses, these attempts have not yet met with any great success. This is mainly due to

- the insufficient market-readiness of various integration scenarios,
- too many proprietary, incompatible interfaces,
- the significant integration, testing and installation outlay required by the numerous proprietary interfaces,
- a poor cost/benefit ratio when networking different makes of product,
- the interfaces' limited functionality that does not enable any meaningful evaluation and presetting,
- the lack of a central networking architecture with consistency checking.

On the technical level, these weak points are set to be eliminated with the establishment of the Job Definition Format. Manufacturers

in the print media industry are endeavoring to find a practical solution which takes the extremely heterogeneous production structures of the print media industry into account. However, it will take a while for manufacturers to correct the networking solutions' final "teething troubles" and for them to be able to offer print service providers expert, comprehensive advice.

JDF

Process Integration, Technology, Product Description

Kühn, W.; Grell, M.

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