The Analysis of Workflow Changes Using JDF and Automation

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Abstract

Computer Integrated Manufacturing (CIM) is becoming increasingly important and forms a central pillar within print production workflows. Each process throughout the production workflow is having automated systems introduced that are either software or machine driven. This may be features such as automated imposition or servo motors to help machine setup. These are creating very effective individual systems with high production rates. The underlying feature with new product development is improvement of throughput as a result of the systems, and has been the focus previous TAGA papers [1]. The connectivity between these different systems is critical to ensure effective implementation and ensure that we do not have the so called *"islands of automation."* To achieve this connectivity one of the main methods being implemented is a JDF-enabled workflow. The purpose of this paper is to investigate the effectiveness of an automated system within prepress to transfer data between different devices and impact the productivity.

The paper describes an experimental and analytical investigation to quantify the direct time savings, increased productivity, and management information captured with automated systems and JDF connectivity in the production facility. This project has focused on the savings that can be made between the following areas of production:

- Prepress workflow systems
- Management Information Systems

The time savings from automation and JDF are quantified under the different production scenarios for the complexity of jobs. This shows that the benefits

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gained are a combination of the automation and JDF, the increased complexity of the job provides greater benefit of the JDF-enabled system. This is combined with benchmarking information on job throughput to provide the projected savings for different production environments.

Introduction

There have been great improvements in print production with equipment becoming increasingly automated with the objective of creating a more efficient and streamlined workflow and this has been complemented by an improvement in the software to move and manage the data within production. This automation has the aim of minimizing the cycle times between different production jobs and where possible reducing the level of operators required for each of the production steps. Much of the work has been on the mechanics of automation, with the focus in recent years in automating, in a common and open manner, the transfer of information within a print workflow, through the use of the JDF specification.

JDF-enabled workflows are increasingly common in production environments and there is a significant discussion on the savings that can be achieved by implementing these solutions. The majority of this discussion will analyze the transition to a new workflow and equipment, where there are savings to be made in both the JDF functionality and also from the automation on the equipment. The purpose of this paper is to quantify the impact of these factors in the communication between the estimation (MIS) and pre press.

Experimental Procedure

The experimental procedure was designed to follow different jobs through the workflow that would be present dependent on the amount of automation available. This evaluated the connectivity between the CSR, estimation, and prepress. There will be an evaluation of the workflow that includes just prepress, just MIS, and one fully connected workflow. Real jobs were produced for the project and these varied in complexity to simulate different working environments. The procedure for traditional workflows will be discussed initially; an automated workflow procedure will follow. All PDF content was preflighted and corrected prior to timing because preflighting is independent to a device's automation benefits.

In the analysis of the traditional workflow, the evaluation included times from a typical production job. The significant steps in the process were evaluated using the functionality of the MIS workflow. This is used for the estimation process specifically. The jobs were submitted into the production and the estimate was completed with all job information. In this evaluation the jobs were estimated and job detail was created in the MIS system. This procedure is outlined in

Figure 1. An imposition was created using a separate imposition solution. The job is then sent to prepress with a paper job ticket.

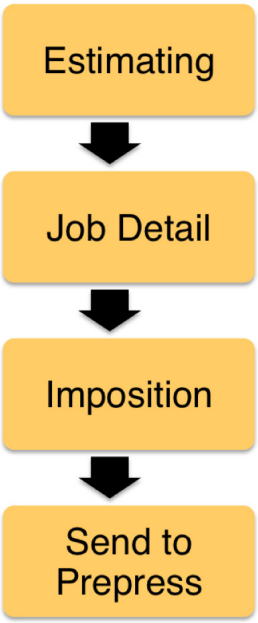

Figure 1. Traditional Workflow: MIS System.

In the workflow outlined above, prepress had no job detail as this information was not passed from the MIS system or layout solution. The initial job detail in a prepress system is limited to the job number or job ID. An imposition was then created using the prepress workflow system. No templates were used during job creation. After the content was then placed in the signature, the job was sent for output. Output could be a soft proof, hard proof, plate, etc.

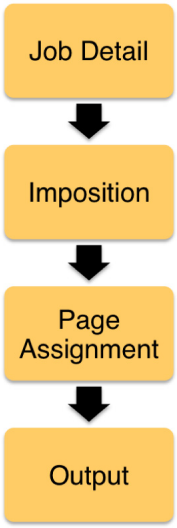

Figure 2. *Traditional Workflow: Prepress System.*

The automation (connected) workflow combined the two workflows for full automation by integration of the software and transfer of the data, ***Figure 3***. Information is passed utilizing JDF between the workflows. Starting with the created estimate, the MIS then uses this information to create a job ticket and information for the prepress system to use. After the imposition is made in standalone solution, the job is sent to the prepress workflow system. In the automated workflow there is a single entry of job detail. Once the job is in prepress, it has all information it needs to produce the job for output. The requirement to check and place is the content is still required.

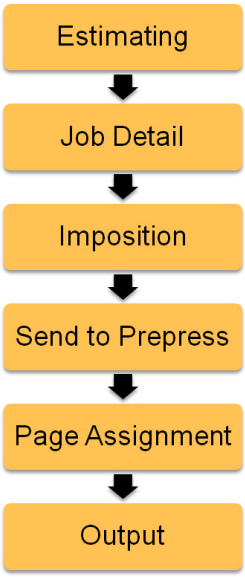

Figure 3. *JDF Workflow.*

Three different jobs were created for the evaluation of the workflows, these varied in complexity to represent different jobs that would typically be produced in production environment. These are summarized below:

- Postcard: This was a 5×7 postcard on a 20×26 sheet, front and back.
- 64 page magazine (self cover) with creep: This is a 8.5×11 magazine
- 4-page cover with 5 colors (Process and PMS color).

Note: in this investigation EFI's Monarch MIS, Kodak Prinergy and Metrix Layout systems were used.

Results and Discussion

The results will discuss initially the evaluation of the postcard job with the MIS traditional workflow, followed by a discussion of those obtained from the prepress traditional workflow, and finally the automated workflow.

The times taken for each of the production steps for the postcard job described earlier were recorded. An experienced estimator was used for the investigation, each of the production steps were repeated a minimum of three times, and the average data obtained is use for the analysis of the times.

The MIS workflow for both solutions had the benefit of a customer database for quick job information retrieval. Job information retrieval took approximately 5 minutes to complete (***Figure 4***), while the layout took a similar amount of time. The estimator does not need to enter the correct address or paper information including size. The system has this information stored using the MIS database. Having a database of customers and job information (paper, ink, customer, etc.) allows the estimator to reduce touch points when creating the job detail and concentrate on the job itself in more detail.

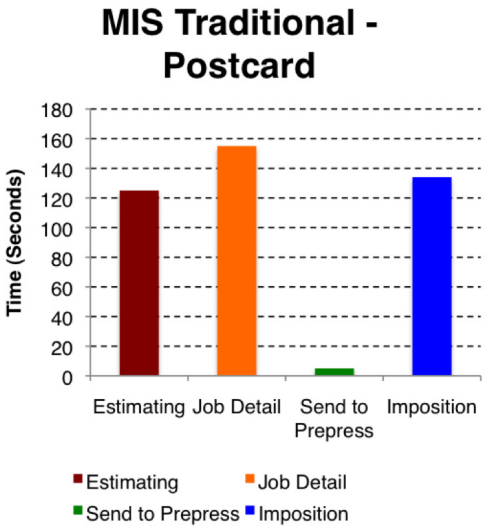

Figure 4. *Time required producing Postcard job in MIS workflow.*

While the traditional (without a connection into the prepress or pressroom) MIS workflow allows for accurate estimating and job detail, it does not allow for accurate job cost tracking. A paper job ticket is created and passed along to prepress for plate and imposition enhancements. This "fire and forget" system will not get information back in real time, but rather by staff who works on the job. There is no automated/accurate manner to calculate the time a job is waiting in prepress, on the press, or job reproduction until after the job is completed. Improvements in the workflow are calculated by staff calculations and estimations.

The results obtained from traditional prepress workflow are shown in ***Figure 5***, separated by job detail, imposition, page assignment and output. The prepress information provided was the job number, and information from the MIS paper job ticket had to be re-entered, such as paper size, plate size, and quantity. This double entry of data increased the probability of incorrect data being used. The

operator had to enter the information to have an ability to create an imposition. This took a significant portion of the prepress time for the job.

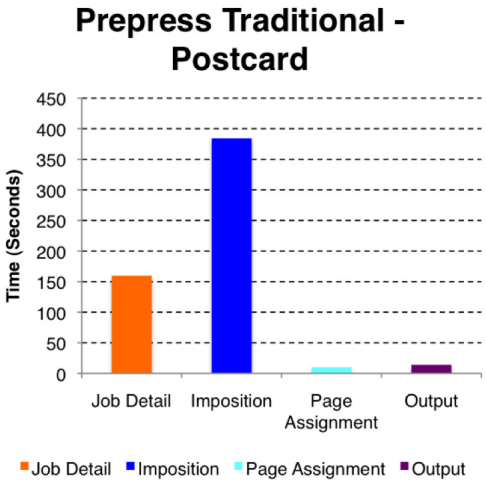

Figure 5. *Time required to produce Postcard job in Prepress workflow.*

Workflows that do not connect the MIS and prepress workflows do not capture job information and subsequent cost tracking, while having to enter job information repeatedly. In doing so, the job takes longer to produce with a greater chance of errors.

The data for the combined automated workflow is shown in ***Figure 6***. Although MIS workflow dependant, the automated solution significantly reduced the total production time by 50% from 16 minutes to 8 minutes. The greatest benefit is the information entered during the estimation process is retained throughout the job process. The prepress operator does not have to re-enter information already known by the MIS system. Information is transferred to the prepress system. Additionally, costing information will be recorded through JMF (Job Messaging Format), the real-time communication agent within JDF. Having this real-time communication will update the digital job ticket dynamically without human intervention. The information captured is accurate and real.

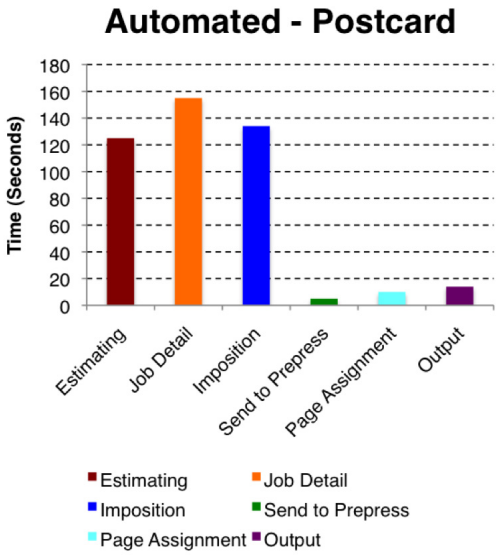

Figure 6. *Time required to produce Postcard job in Automated workflow.*

Analysis of the time differences using the different workflow scenarios for the three different jobs is shown in ***Figure 7***. The use of automation saved on average 46% for all jobs, with the greatest amount of time saved for the 64-page magazine job at 56%. Not only did automation save time, it reduced steps to create the jobs by an average of 32% with the greatest step savings for the postcard (46%). Automation using JDF and JMF communications, reducing human touch points, repetitive functions, and accurate data transfer between workflows allow automation to increase speed while reducing the amount of steps it took to complete the jobs.

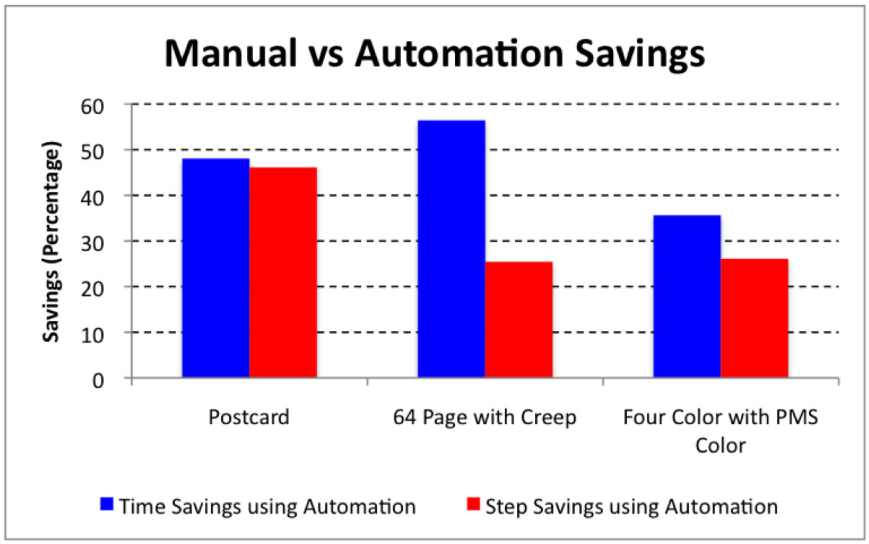

Figure 7. *Comparison of manual versus automation time/step savings for all jobs.*

Conclusions

A series of print production jobs have been successfully used to quantify the impact of automation and JDF workflows in prepress. This was completed with three typical job types that would be preset in most modern commercial print operations.

The results from the analysis have shown there has been a time savings of nearly 50% on the jobs, with the majority of these savings coming from the reduction in data re-entry. The use of the bi-directional communication has also minimized the number of errors as data is entered only once and provide accurate information on the job performance to be able to accurately bill and then improve the estimating process.

References

1. MacPhee, J. "Presses—Past, Present and Future," 50th TAGA Conference, 1998.