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COMPUTER INTEGRATED PRINT PRODUCTION AND JDF

by

Deepak-Kumar Mohan-Kumar

A Thesis  
Submitted to the  
Faculty of The Graduate College  
in partial fulfillment of the  
requirements for the  
Degree of Master of Science  
Department of Paper Engineering, Chemical Engineering, and Imaging

Western Michigan University  
Kalamazoo, Michigan  
April 2005

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2005

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Deepak-Kumar Mohan-Kumar

## COMPUTER INTEGRATED PRINT PRODUCTION AND JDF

Deepak-Kumar Mohan-Kumar, M.S.

Western Michigan University, 2005

In the graphic arts industry, the need for the unification of mechanized and automated systems has seen a great increase in the last few years. This very need has led to various specification formats like, Adobe's PJTF and CIP3's PPF and the latest one of them all, CIP4's JDF. Earlier specification formats that had inherent limitations with proprietary architecture have paved the way to JDF. JDF is an open, extensible, XML based job ticket format that has been a proposed standard to achieve end-to-end job ticket specifications along with message interchange protocol and message description standard.

This thesis research has involved a complete investigation of ways and means of how JDF would enable a streamlined, computer integrated process of print production in the graphic arts industry that is dominated by multi-vendor, multi-platform equipment.

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## **Introduction**

The International Cooperation for the Integration of Processes in Prepress, Press and Postpress (CIP4)<sup>[1]</sup>, is an international, world wide operating standards body, striving to overcome computer integration challenges faced by the graphic arts industry. CIP4 is has proposed an industry specification format called Job Definition Format (JDF). CIP4 was formed in September 2000, its predecessor CIP3<sup>[1]</sup>, was formed by Heidelberg in 1995 and was managed by Fraunhofer Institute for Computer Graphics. CIP3 was a proprietary format and found great success in ink key pre-setting and postpress operations.

Job Definition Format (JDF) is a versatile and comprehensive XML<sup>[2]</sup> based format that is open and multi-vendor compliant. JDF is also combined with message description standard and message interchange protocol. JDF is able to carry a print production job from the initial stages of creation to completion and hence one can expect a greater level of integration in media, design, print production, on-demand and e-commerce companies. JDF is aimed at bridging the communication gap between production and Management Information System (MIS) systems. JDF is also expected to perform on any platform or with any equipment from various vendors, thus providing a seamless workflow solution. As a result, JDF can successfully

bridge the gap between the customer's view of the product and the process of manufacturing, by defining a process dependent, as well as, product independent production view of a print job. JDF can also be used to define or track any user defined workflow without any constraints on any supported workflow models whether it is serial, parallel, overlapping or iterative processing in any arbitrary combination over a widely distributed geographical location. JDF is just a data format and it is not any application that one can buy off the shelf and implement like many other software packages.

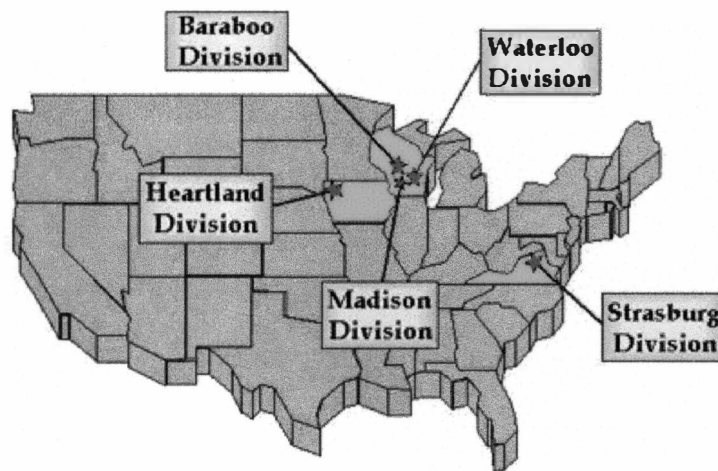
**Perry Judd's:**

Perry Judd's is one of the major printer / publishers in the US. Perry Judd's has production facilities in 4 different locations in the USA, with the corporate office located in Waterloo, Wisconsin. Perry Judd's is located at Waterloo (WI), Madison (WI), Baraboo (WI), Spencer (IA) and Strasburg (VA). Among the 4 production facilities, the Madison Division is a dedicated prepress division. The Strasburg facility is another location that has prepress along with press facilities.<sup>[3]</sup>

Perry Judd's is well equipped with 26 state of the art printing presses along with a huge array of prepress and post press equipment.

**Madison Division, Wisconsin:**

Perry Judd's Madison Division is a digital prepress facility, catering to both the internal needs of the company and also the external clients. The Madison Division produces plate ready digital files that are eventually imaged at different printing facilities owned by the company using Computer to Plate (CTP) technology. The Madison Division works around the clock producing approximately 20,000 "Plate ready" digital files every month. The majority of the jobs are magazine book makeup, with some advertising related jobs. The figure below shows the locations of the Perry Judd's countrywide facilities.



**Figure 1: Perry Judd's Locations<sup>[6]</sup>**

**List of departments:**

Madison division of Perry Judd's has several departments as mentioned below:

1. Customer Service Representative (CSR): CSR department interacts with the customers and other departments of Perry Judd's
2. Color Systems (Scanning and Digital Proofing): Responsible for digitization of the originals supplied by the clients and the proofing requirements of Perry Judd's
3. Image Retouching: Responsible for image enhancement and other picture related demands of the job
4. Page Layout: Responsible for making pages by combining the text and images using QuarkXPress page layout software
5. Imposition: Responsible for imposing ready pages according to the press configuration and the individual job requirement

**Analysis of current operations and systems:**

**Different forms of communication:**

- 1) Production Time Response: Initiated from Estimators @ Corporate Office, Waterloo, WI and meant for Customer Service Representatives (CSRs) at the branches
- 2) Customer Profile: Used only in Color System
- 3) Job Information Sheet: Initiated by CSR
- 4) Job Docket Sheet: A part of Job Information Sheet that is attached to the job docket

- 5) Customer instructions: Received by Fax, Phone, email and written instructions are also received in most of the cases.

**Different tools of communication:**

- 1) Microsoft Excel: Used for Job Information Sheet
- 2) FileMaker Pro: Used by CSRs to create Job Docket Sheet
- 3) Litho Traxx: To track the production time of a job
- 4) Job Docket Sheet: Printed sheet that moves around the departments

**List of equipment in different departments:**

1. Customer Service Representative
  - a. Personal Computers, 8 units, either P3 or P4s with a minimum of 512 MB RAM and 20 GB hard disk.
2. Color Systems (Scanning)
  - a. Hell Chromagraph S3900 Drum Scanner
  - b. Microtek Scanmaker X12 Flatbed Scanner
  - c. Apple Macintosh Workstations, 3 units, either G3 or G4 with 2 GB RAM and at least 40 GB hard disks.
  - d. Personal Computers, 5 units, either P3 or P4s with a minimum of 512 MB RAM and 20 GB hard disk, these PCs are used to drive different output devices.
  - e. Color Guidance Wide Format Proofer

- f. Kodak Approval XP Proofer
  - g. Kodak Approval PS Classic Proofer
  - h. GretagMacbeth SpectroScan
- 3. Image Retouching
  - a. Apple Macintosh Workstations
- 4. Page Layout
  - a. Apple Macintosh Workstations
- 5. Imposition
  - a. Apple Macintosh

**List of software in different departments:**

- 1) Customer Service Representative
  - a) Microsoft Excel
  - b) FileMaker Pro
  - c) Litho Traxx
- 2) Color Systems (Scanning)
  - a) Adobe Photoshop
- 3) Image Retouching
  - a) Adobe Photoshop
  - b) VISU CoCo - Adobe Photoshop Plug-in
- 4) Page Layout
  - a) QuarkXPress



## 5) Imposition

- a) Artwork System's NexusRIP for imposition. NexusRIP is the standard house RIP and it can drive all the large format printers on the network. NexusRIP also produces plate-ready imposed pages for platesetters (Computer to Plate -CTP) at the printing branches of Perry Judd's. Once the imposed page is ready, the file is transferred over the Internet to the printing branches and stored on to the file servers of the respective branches. At the printing branches, as per the requirement of the job, the plates are made on the CTP using these imposed, plate-ready files.

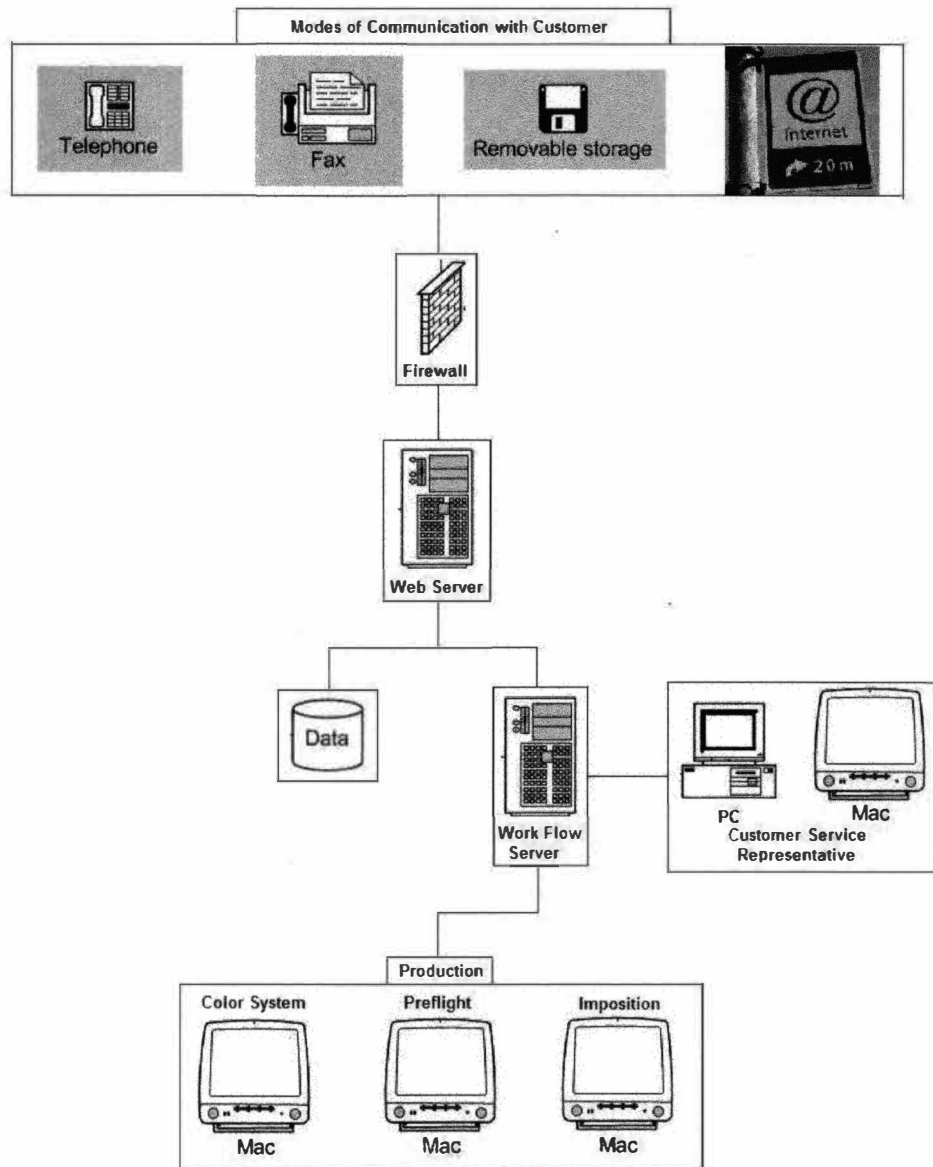
### **Servers:**

Perry Judd's Madison, Wisconsin branch has three different kinds of file servers, Web server, Work-in-progress (WIP) and an Imposition server.

The Web server having 2 terabytes capacity stores the raw data from the clients that is received through FTP, email and removable media. The Web server can be accessed by all workstations within the company and files are archived in their native application formats. The WIP server, with a total capacity of 2.5 terabytes (multiple servers) stores all the jobs running. The Imposition server has a capacity of 2 terabytes and stores the final imposed layouts of the job.

**Observations:**

The Madison division has many job dependant workflow paths. There is no single, complete, paperless mode of communication that exists among the departments and divisions. Hence, there is much of fragmented information which pose a great challenge to the implementation of JDF.



**Figure 2: Schematic Diagram of Current Workflow Process at  
Perry Judd's, Madison Division, Wisconsin**

## **Literature Review**

With the advent of newer technologies and better systems, professionals in the graphic arts industry are coming under pressure to shorten turnaround time, reduce wastage and accommodate complex and shorter run length jobs<sup>[4]</sup>. It has become evident that, only more productive, integrated, flexible and transparent processes can meet these challenges.

There are various challenges to be met in order to achieve better processes like, the inherent problem in the industry which has limited multi-vendor cooperation. The two distinct areas<sup>[5]</sup> of the process are Management Information Systems (MIS) and areas of production that have very limited computer integration. Equipment from multi-vendor and multi-platform pose a great challenge for integration so that they can work together. This challenge requires open-platform<sup>[6]</sup> specification formats.

### **CIP4:**

The International Cooperation for the Integration of Processes in Prepress, Press and Postpress (CIP4)<sup>[1]</sup>, has around 290 members and growing. Founder members of CIP4 were Heidelberg<sup>[7]</sup>, Agfa<sup>[8]</sup> and MAN Roland<sup>[9]</sup>. CIP4 is a not-for-profit organization, registered with the U.S.

Department of Justice and the Federal Trade Commission, as a Standard Development Organization. CIP4 has its head office in Zurich, Switzerland. CIP4 has no regular offices and is a global organization with its representatives all over the world. CIP4 is responsible for networking graphic arts industry vendors who offer many software, equipment, processes and peripheral solutions. There are around 20 technical and administrative workgroups that are responsible for development of future technologies in Job Definition Format (JDF) and designing JDF Software Development Kit (SDK). Workgroups “meet” regularly over the Internet. There are also six face-to-face annual meetings are held to facilitate the better interaction among its members.<sup>[1]</sup>

#### **JDF:**

JDF is compatible with Print Production Format (PPF)<sup>[10]</sup> and Adobe's Portable Job Ticket Format (PJTF)<sup>[11]</sup>. JDF can completely support Job tracking functionality of IfraTrack<sup>[12]</sup>.

JDF can provide a very flexible adjustment to suit any workflow because JDF is XML based and it also has a powerful internal tree-like structure of information. JDF is being developed keeping in mind the future requirements, extensions would easily be accomplished to support newer devices and processes<sup>[1]</sup>.

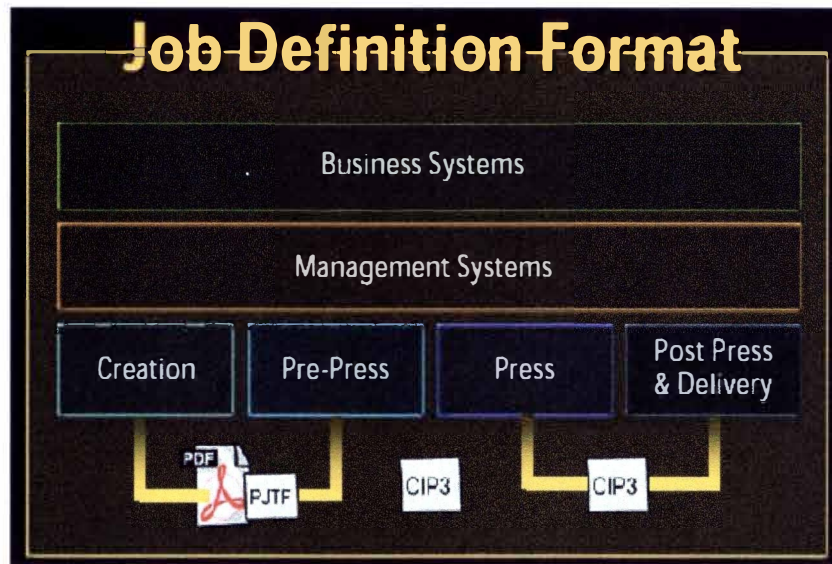


Figure 3: Job Definition Format (JDF) <sup>[1]</sup>



**Sample of important PPF information's:**

Customer	Position of folding marks
Product volume	Gathering
Order number	Cutting
Date	Private Data
Producer	Collecting
Paper type	Stitching
Film/plate material	Inserting
Inks	Sewing
Preview images	Adhesive binding
Position of register marks	End side gluing

Figure 4: Print Production Format (PPF) <sup>[10]</sup>

As JDF is PPF, PJTF and beyond, the abilities of JDF can be illustrated with the following charts.

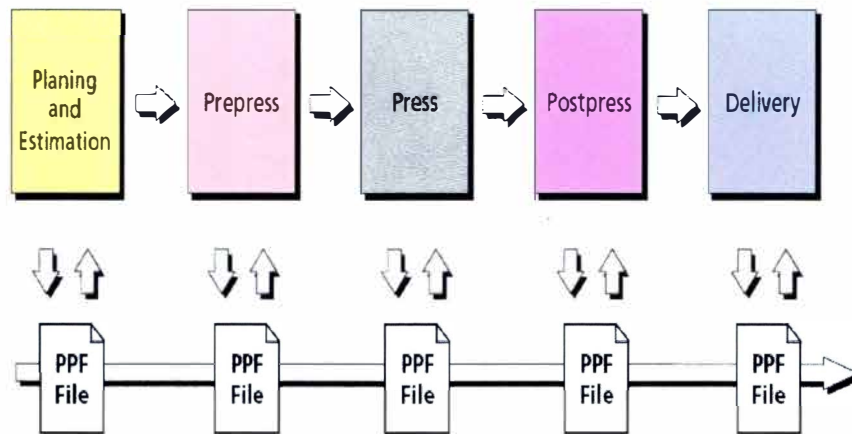


Figure 5: Print Production Format (PPF) Workflow<sup>[1]</sup>

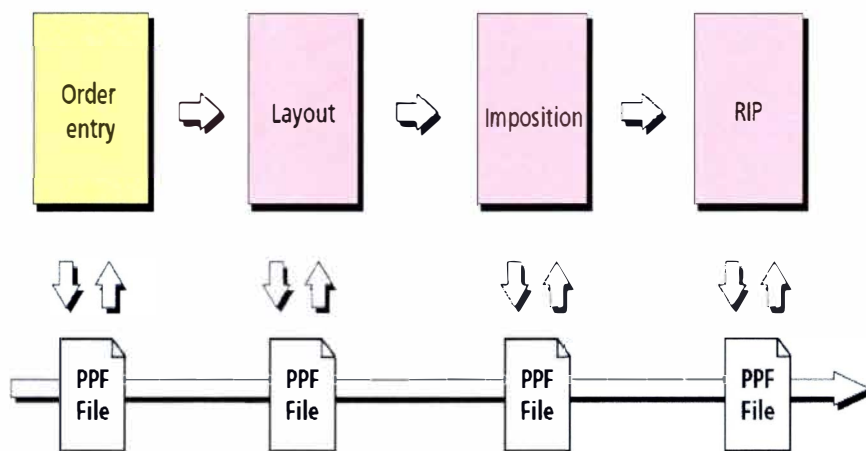
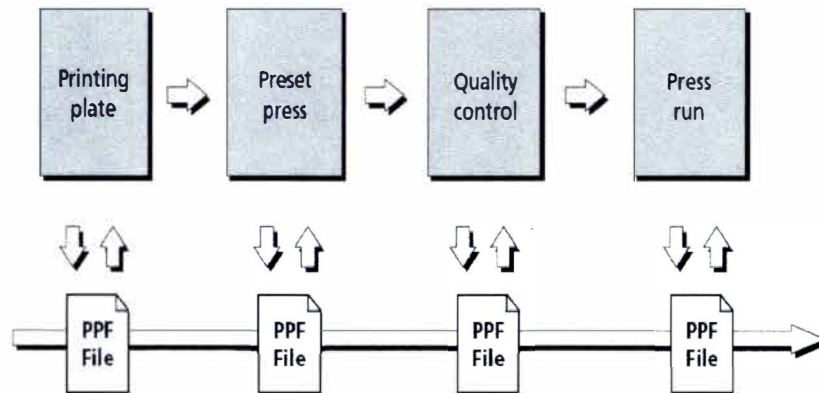
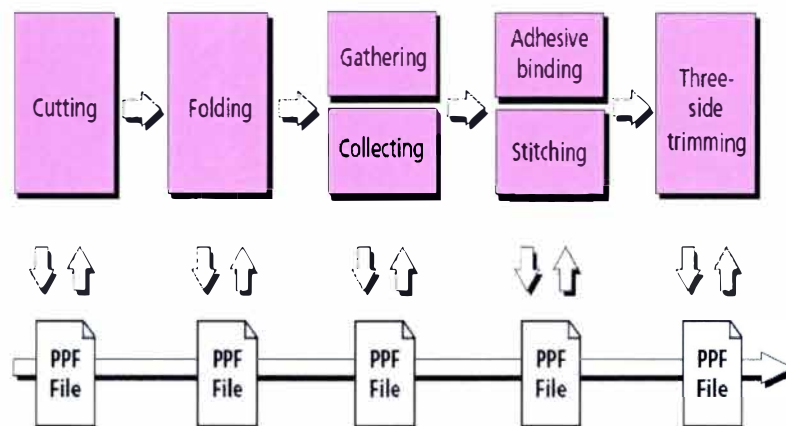


Figure 6: PPF Administration and Prepress Workflow<sup>[1,10]</sup>



**Figure 7: Print Production Format (PPF) Press Workflow<sup>[1,10]</sup>**

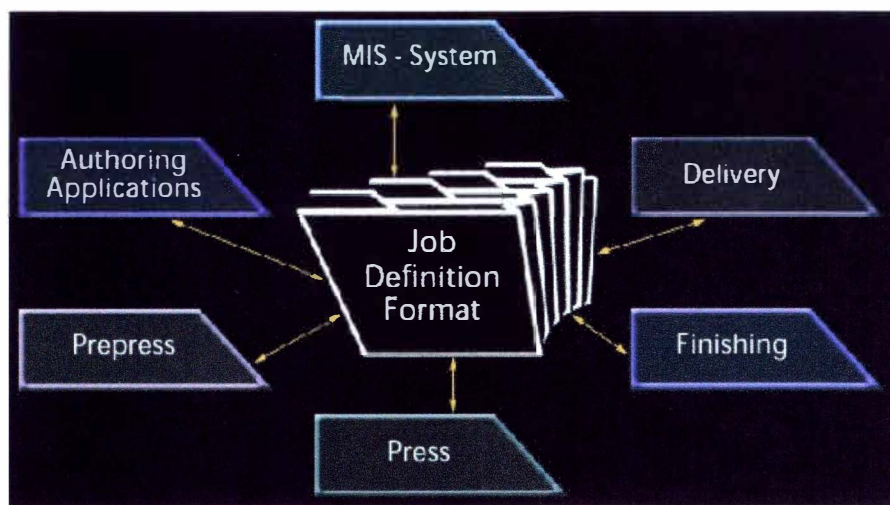


**Figure 8: Print Production Format (PPF) Postpress Workflow<sup>[1,10]</sup>**

JDF can also accommodate branching and merging of partial orders to facilitate an automated workflow based on multiple sites among many processes like printing and prepress services. Preset information pertaining to the job can be entered by the Management Information Systems and it can



easily be flown down the process to subsequent processes like prepress, press, postpress and delivery. JDF can greatly reduce the costly setup time in press and postpress because it can contain the necessary information that can facilitate quick setup time. JDF supports color management for color critical printing jobs.



**Figure 9: JDF- Complete, Transparent Job Costing & Job Monitoring<sup>[1]</sup>**

JDF can successfully bridge the gap between the planned and actual production times through the easily available operating data that get back to the Management Information System (MIS), and hence Job Costing and Billing can be more accurate. JDF can be vital to maintaining inventory, because it contains details about what material is needed in what quantity

and what has been actually consumed at various production steps. Job Tracking is possible in real-time because Job Messaging Format (JMF)<sup>[1]</sup> supports the exchange of data like information on devices, job status, progress messaging and queue management. This way, job monitoring would be possible with the click of a mouse.

### **JMF:**

JMF has five support levels. It is very important to understand what level of JMF support the particular equipment can provide. A clear understanding of the JMF support level would enable the decision making process of whether or not an upgrade is required to meet the requirement of automation.

JMF Level 0 /No messaging is the level in which devices have the option of supporting no message at all. For this level of JMF, JDF includes audit records for every process that allow the results of the process to be recorded.

JMF Level 1/Notification is the level in which devices that support notification would provide unidirectional messages that inform the controller when they begin and end execution of a particular process within a job, and it may also notify some error conditions.

JMF Level 2/Query support is the level in which devices that support queries respond to requests from any other device by communicating status information like information about the job in progress.

JMF Level 3/Command support is the level in which devices have the ability to process commands directly.

JMF Level 4/Submission support is the level in which devices with controllers that accept JDF jobs via HTTP (internet) and support MIME<sup>[13]</sup> (Multipurpose Internet Mail Extensions ) multipart documents.

In the actual production environment, we can witness much equipment in the level 0 / No messaging level of JMF messaging requiring to be upgraded in order to be able to meet the basic requirements of JMF support and improve company's Return On Investment (ROI).

Print buyers can place Request For Quotes (RFQ) along with the details about the job over the internet and the Management Information System (MIS) makes use of these data to process a suitable quotation for the request placed. This very first step in the process can be so comprehensive that, apart from containing the production details of the print job, it can also have information about the destination of the product delivery.

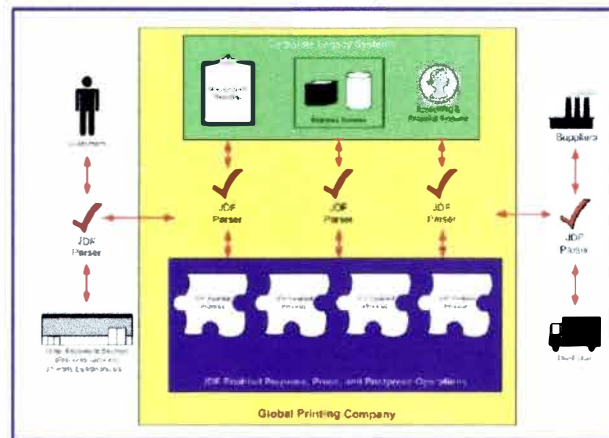


Figure 10: JDF- Complete Overview<sup>[1]</sup>

### XML:

XML stands for EXtensible Markup Language. XML is a cross-platform, software and hardware independent tool for sharing information. XML data are stored in plain text format and hence it is a software- and hardware-independent way of sharing data.<sup>[2]</sup>

XML makes it much easier to create data that different applications can work with. XML also makes it easier to expand or upgrade a system to new operating systems, servers, applications, and new browsers. In the graphic arts industry, computer systems and databases contain data in incompatible formats, this poses a great challenge for exchange of data between such systems. Converting the data to XML can greatly reduce this complexity by enabling data to be read by many different types of applications running on different platforms.

XML is a markup language much like HTML, but it is not a replacement for HTML. XML was designed to describe data and to focus on what data are. HTML is to display data and focuses on how data look. XML tags are not predefined, where as HTML tags are all predefined. HTML documents can only use predefined tags like <EM>, <CODE>, <p>, <h1>, etc. The following example is a “note” to “pci” from “wmu”, stored as XML:

```
<?xml version="1.0" encoding="ISO-8859-1"?>  
  
<note>  
  
<to>pci</to>  
  
<from>wmu</from>  
  
<heading>Reminder</heading>  
  
<body>Submit the documents</body>  
  
</note>
```

The first line is an XML declaration that defines the XML version and the character encoding used in this document. The version of XML this document conforms to is XML 1.0 specification and it uses the ISO-8859-1 (Latin-1/West European) character set.

The note has a header and a message body. The note also has sender and receiver information. Here, the XML document does not DO anything. It is just pure information wrapped in XML tags. The tags shown in the

example above like <to> and <from> are not predefined in any XML standard.

### **Differences between HTML and XML:**

The differences between HTML and XML are that, in HTML some elements need not have to have a closing tag. The following example of code is legal in HTML:

```
<p>This is a paragraph  
<p>This is the second paragraph
```

Whereas in XML all elements must have a closing tag, like this:

```
<p>This is a paragraph</p>  
<p>This is the second paragraph</p>
```

Another difference is that, XML tags are case sensitive whereas, HTML is not and hence in HTML the following example is legal:

```
<Letter> </letter>
```

Whereas in XML, opening and closing tags must be in the same case, for example:

```
<letter> </letter>
```

or

```
<Letter> </Letter>
```

In HTML few elements can be improperly nested within each other, for example:

```
<b><i>This text is bold and also italic</b></i>
```

Whereas in XML, all elements must be properly nested within each other, for example:

```
<b><i>This text is bold and also italic</i></b>
```

Another example shows the proper nesting of root and sub elements:

```
<root>
  <child>
    <subchild>.....</subchild>
  </child>
</root>
```

In HTML, white space is not preserved because HTML reduces multiple white space into a single white space, for example:

```
<b><i>This text is      bold      and also italic</b></i>
```

would be displayed as,

This text is bold and also italic

Where as in XML,

```
<b><i>This text is      bold      and also italic</b></i>
```

would be displayed as,

This text is **bold** and also *italic*

More details about XML can be obtained online.<sup>[2]</sup>

### **Example of JDF:**

The following is an example of a JDF file that contains details of a customer, internal customer id, job name, order number and also the internal processes like ink zone calculation, printing type, finishing operations like cutting, gathering, folding.

```
<?xml version="1.0" encoding="UTF-8" ?>
+ <JDF DescriptiveName="Test Double 01.26" ID="JDF" JobID="TD126"
JobPartID="CurrentlyUnused" ProjectID="Test Double 01.26"
Status="Waiting" Type="Product" Version="1.1"
xmlns="http://www.CIP4.org/JDFSchemas_1_1">
<!-- Generated by the CIP4 C++ open source JDF Library version JDFLib-J
JDFWriter 27.2.2002 -->
+ <AuditPool>
  <Comment Name="IssueDate">2004-01-26</Comment>
  <Comment Name="TaskNumber">HelloKirsten</Comment>
+ <CustomerInfo BillingCode="Our Billing Code" CustomerID="Internal ID
for Test Company" CustomerJobName="Test Double 1.26"
CustomerOrderID="TD126" DescriptiveName="The Test Company">
```



```
+ <ResourcePool>

+ <JDF ID="n00" Status="Waiting" Type="InkZoneCalculation">
+ <JDF ID="n01" Status="Ready" Type="ConventionalPrinting">
+ <JDF ID="n02" Status="Waiting" Type="Cutting">
+ <JDF ID="n03" Status="Waiting" Type="Cutting">
+ <JDF ID="n04" Status="Waiting" Type="Gathering">
+ <JDF DescriptiveName="Folder1" ID="n05" Status="Waiting"
Type="Folding">
+ <JDF ID="n06" Status="Waiting" Type="Cutting">

</JDF>
```

### **Statement of the Problem**

As JDF is still in the evolving stage, there are many areas that have to be addressed. It demands enormous time, resource and effort to consider many vital issues like whether or not the entire range of equipment in the industry can support JDF in the near future.

The issues of what would be the kind of investment required to implement JDF and what would be the associated Return On Investment (ROI) would be the most important issues to be addressed by any company seeking to implement JDF.

In the case of the production arena, the kinds of workflow changes that JDF can influence also need to be studied. The issue of what new equipment would be necessary would also have to be considered. The issue of training or deployment of a new workforce that can meet the requirements of JDF, along with the associated real costs, has to be addressed. Color management issues are also areas of concern<sup>[7]</sup>

### **Objectives:**

The objective of the thesis research was to investigate the existing workflow and ways and means of implementing Computer integrated manufacturing at Perry Judd's Madison, Wisconsin division. In order to do

achieve this objective, customer priorities for process improvement and operational and budgetary goals were taken as the baseline for the research.

**Customer Priorities for process improvement:**

1. Quicker response time
2. Faster turnaround time
3. Value added services
4. Error-free products
5. Advantage of cost reduction

**Operational and budgetary goals:**

1. Reduce overall cost of production
  - a. Improved communication through Job Ticketing will lower production cost
2. Reduce production cycle time
  - a. As the complete job information is readily available throughout the job cycle, shorter make-ready times, a reduced production cycle time can be expected
3. Higher throughput with fewer staff
  - a. With the reduced production cycle time, the number of manual hours required will be less, hence more throughput can be expected with the same or fewer number of personnel
4. Development of integrated processes

- a. Print production processes can be seamlessly integrated with job information made available from the stage of inception to completion of the job, including MIS.
5. Optimization of equipment utilization
- a. Elaborative Job scheduling that takes into account the machine on which a job would be produced would enable optimum planning of the machine hour usage.
6. Quicker Return on Investment

### **Experimental Procedure**

This thesis research was expected to have duration of one academic year. This thesis research was conducted at a printing and publishing company. The printing and publishing company has Business and Management Systems involving Customer Support, Job Scheduling, Job Tracking and Production Planning systems. The company has departments like Creative, Prepress, Press, Postpress and Delivery Department.

The action plan for the thesis research was as follow:

#### **Initial stage of the research:**

1. JDF expectations of the management in terms of
  - a. Job turnaround
  - b. Value addition
  - C. Cost savings / ROI expectations
1. List of Departments
2. Current, intradepartmental workflow path
3. Equipment replacement turnover period

4. Details from department heads
  - a. Expectation for process improvement and automation
  - b. List of equipment
  - c. Aging of equipment
  - d. Current, departmental workflow path
5. Who is responsible for process automation programs (if any)?

**Intermediate stage of the research:**

1. Met the management
  - a. Discussed candidate JDF paths
  - b. Discussed ROI considerations and the critical path to implementation
  - c. Considered who are the key decision makers and what is the final approval path
2. Met the department heads and key decision makers
  - a. Discussed proposed candidate JDF paths (for the department)
  - b. Assessed the JMF levels and options for the department

- c. Assessed the JDF process and resources that must be supported by equipment
- d. Met the other key decision makers and discuss input
- e. Made the changes to JDF plan and selected the most probable implementation path in consultation with the management

**Final stage of the research:**

1. Contacted fellow CIP4 members in the industry regarding upgrades available
2. Considered the cost effective way of – inducting new equipment / changes in existing equipment / upgrading / acquiring third party solutions for “Handshake”
3. Determined methods of evaluating product acceptability
4. Determined how impact of JDF will be measured and evaluated
5. Prepared an estimated schedule for implementation
6. Finalized the JDF path
7. Discuss with the management and initiate the implementation of JDF

## Results and Discussion

### Equipment choices for each option:

An in-depth study of software available for each department was conducted and the findings about each of the software are as shown below.

#### **Prism-Win:**<sup>[14]</sup>

##### Strength:

1. Faster and accurate quotes from templates, standard models or existing quotes with similar specification.
2. Quote letters are automatically generated
3. Purchase orders, invoices and dispatch instructions are generated automatically
4. Easy comparison of actual cost with quoted cost and material usage
5. Comprehensive job costing report provides a very detailed analysis of single job or on the basis of ranges of jobs, by customer, product type and processes
6. A detailed trend analysis, production loading and budgeting
7. Strong inventory control with automatic reordering, stock details and prices
8. Can record bin and stock locations for comprehensive inventory management that can make even individual tracking easy



9. Easy shop floor management with the help of electronic timesheets and automatic transfer of information
10. Tailor made reports to suit the individual requirement, Ad hoc report creation using a report writing application and can also provide management analysis reports.

Weakness:

1. Lacks control over the sections of process such as production planning, human resource management, online file submission, JDF Preflighting, soft Proofing, imposition, press, postpress and delivery.

**Graphisoft-Integrale:<sup>[15]</sup>**

Strength:

1. Effective customer management with extensive information about the customer and handling of activity reports by sales representatives.
2. Detailed Estimation Tool incorporates the most economical production process depending on the equipment available for the job.
3. Production Management and Control Tool can forecast time and material consumption to great accuracy
4. Inventory Control Tool can consider historical data to keep track of material consumption and accurate management of raw materials. The

record of actual consumption by any given job helps in better billing of the job.

5. Information and Resources Management allows real-time sharing of information with all the employees in the company

Weakness:

1. Concentrates mainly on the estimating and management control and lacks control over the sections of process like JDF Preflighting, Soft Proofing, Imposition, Press, Postpress and Delivery.

**Creo-Synapse Prepare:**<sup>[16]</sup>

Strength:

1. Links creative and production processes with easy creation of PDF files
2. Production ready and Error-free PDF creation due to predefined PDF parameters that represent the creation preference of a particular production environment
3. Extension to applications like, QuarkXPress, Adobe InDesign and a drag and drop Synapse Prepare applet or hot folder for Postscript or PDF makes it easy to use

Weakness:

1. Available only on Macintosh platform

**DALiM – PRiNTEMPO:<sup>[17]</sup>****Strength:**

1. DALiM PRiNTEMPO is much more than a preflight tool, it is a web-based automated JDF imposition and deadline management tool.
2. Supports Job Ticket definition
3. Can provide real time job status
4. Can send automatic emails on job status change (job creation, pages status, imposition status, etc.)
5. Supports Job and job sections deadline management
6. Efficient production planning tool
7. Centralized web-based application
8. JDF-based Automatic imposition tool that supports Signature creation and web-based validation
9. Supports separation re-mapping
10. Web-based "soft-interpretation" file preflight and JDF preflight is an option
11. Automatic page normalization to "Print Predictable" state
12. Web-based soft proofing and validation for pages and signatures
13. Has an intelligent page version management
14. Supports automated page-numbering settings with manual override option

15. Pagination can be re-ordered at any time
16. Can accommodate last minute imposition changes like, translation, rotation or scaling at page-level
17. Can also accommodate last minute press changes with database-accessed imposition templates

Weakness:

1. DALiM PRiNTEMPO requires DALiM TWiST automated workflow system

**EFI-PrinterSite Internal:**<sup>[18]</sup>

Strength:

1. It can run on laptop, desktop or latest PDA
2. Clear specification of jobs
3. Can receive estimates
4. Can generate Letter of quote
5. Easily track job status
6. Easy viewing of invoices
7. Reviewing account history is possible
8. Job reordering
9. Estimators, CSRs and back office can share information

10. Integration with EFI Hagen OA, Logic SQL and PSI Print management system makes it a complete online process and paperless to a great extent

**Weakness:**

1. Viewing and checking of page contents of job is not possible

**Heidelberg-Prinect Prinance:<sup>[7]</sup>**

**Strength:**

1. Estimation of jobs is done considering all the relevant production steps by pre-structuring of work steps prepress through finishing
2. Electronic job ticket carries the job data to other Heidelberg software products along the workflow and hence multiple entries of job data is avoided
3. Continuous monitoring of costing and statistical evaluation through other Heidelberg software solutions
4. Automatic generation of quotation and transfer to the sales designated person's Microsoft Outlook Date Management software
5. Other documents like delivery notes and invoices are automatically generated without any additional manual intervention
6. Customer calls are monitored through special Computer Telephony Integration (CTI) software that identifies the customer through the

customer's ISDN number and opens a window containing all relevant job information about the customer

7. Material management is easy and comprises of storage site management of both raw material and finished products
8. Supports re-ordering process of raw materials

**Weakness:**

1. Complete advantage of all the features can only be availed with other hardware and software solutions from Heidelberg such as, Prinect Data Control, Prinect Signa Station, Prinect Printready System, Prinect CP2000 Center, and Prinect FCS 100. This demands extensive investment on these solutions.

**Creo-Synapse Insite:<sup>[16]</sup>**

**Strength:**

1. Secure login (SSL-Secure Sockets Layer) to print buyers that is restricted to only their jobs
2. Job uploading and downloading
3. Job submission functionality can create new jobs and submit job data with CSR notification
4. Integrated remote proofing
5. Change requesting can be done by remote and email notification
6. Customized HTML interface

7. Option to use down-sampled images with option to view high-resolution, production-file data on demand with great control over zoom, pan, annotate and collaboration with multiple users and multiple sites simultaneously
8. Detailed transaction log that is included in jobs
9. Internal management of jobs and customer information by a browser interface requiring no special plug-in

**Weakness:**

1. Requires Creo Brisque / Prinerger to support many features

**EFI-Hagen OA:[18]**

**Strength:**

1. Versatile database integration even with external databases such as Oracle and DB2/400.
2. Robust SQL based enterprise applications are robust, scalable and secure on almost any client/server environment.
3. Intelligent estimating system with better control over estimating, quoting, order entry, job management, purchasing, scheduling, inventory and fulfillment
4. Browser-based data collection
5. Remote production monitoring
6. Budgeted hourly rates

## 7. Standard and custom reporting

### Weakness:

1. Lacks capabilities like Online File Submission, JDF Preflighting, Soft Proofing, Job Approval, Integrate CSR, Imposition and Delivery

### **Heidelberg-Prinect:<sup>[7]</sup>**

### Strength:

1. Precise pre and post-costing of job
2. Seamless job data exchange within the entire production processes of prepress, press and postpress
3. Clear job preparation by determination of all the production steps required for the entire job with specification of deadlines
4. Robust archiving and asset management system allows access to all production-related data
5. Data generated in prepress can be successfully used in press and postpress to preset the equipment to be job specific
6. Press operator can initiate the process of plate making even in the absence of prepress personnel

### Weakness:

1. Areas such as sales management, human resource management, online file submission by client, JDF preflighting and delivery logistics are not given attention



2. In order to avail all the advantages mentioned above, it is required to have the complete range of hardware and software solutions from Heidelberg such as: Prinect Prinance, Prinect Data Control, Prinect Signa Station, Prinect Printready System, Prinect CP2000 Center, Prinect Online Kit, P-Net / Compucut and Prinect FCS 100

**Creo- Prinergy:**<sup>[16]</sup>

**Strength:**

1. End-to-End native PDF processing
2. Scalable and configurable infrastructure
3. Supports JDF
4. Efficient Job and Production management
5. Automation as easy as click-and-go
6. Robust Oracle database
7. Macintosh and Windows interface
8. Automated PDF trapping
9. Color matching and management tool
10. Supports Hexachrome colors
11. Database based archiving

**Weakness:**

1. Need to purchase the entire package of solution in Prinergy that consists of - Prinergy Connect, Direct, Powerpack and Synapse Prepare, InSite and Link

#### **AGFA-Delano:<sup>[8]</sup>**

##### **Strength:**

1. Excellent solutions for better customer relations that encompass a common workspace that simplifies and accelerates project planning and production with a strong link to customers.
2. Automated, simplified process of planning, staffing and tracking jobs using simple graphic icons
3. Hot folder based file handling and page processing
4. Highly JMF savvy that allows devices to exchange of status information and hence better messaging throughout the entire print process

##### **Weakness:**

1. No tools to support Invoicing, Accounting, Sales Management, Estimation, Material Management and Imposition but it can integrate with applications or tools with these functionalities

#### **DALiM -Mistral:<sup>[17]</sup>**

##### **Strength:**

1. Very strong tool to display, track and administer print projects

2. Apparently covers all the requirements from Online File Submission to Delivery

Weakness:

1. Completely lacks important capabilities such as invoicing, estimating, accounting, sales management, order processing, production planning, human resources and material management.

**Heidelberg-MetaDimension:<sup>[7]</sup>**

Strength:

1. Job ticket driven RIP and workflow solution
2. Supports Open Prepress Interface (OPI)<sup>[19]</sup>
3. Supports trapping
4. Supports automatic page positioning
5. Supports color management and screening
6. Supports different kinds of proofs such as, form proofs, color proofs and concept proofs
7. Special screening pattern - Satin Screening is supported for better image quality

Weakness:

1. Full advantage of all the features can be availed with other hardware and software solutions from Heidelberg like, Prinect Prinance, Prinect

Signa Station, Prinect Printready System, Prinect CP2000 Center, and  
Prinect FCS 100

**Heidelberg-Signa Station:<sup>[7]</sup>**

**Strength:**

1. Easy imposition
2. Imposition is flexible to accommodate last minute modifications, product and production requirements
3. Quick, transparent and reliable job processing using different modes
4. User friendly display
5. Customizable color control marks and line marks

**Weakness:**

1. Complete range of advantages of all the features can be availed with other hardware and software solutions from Heidelberg like, Prinect Prinance, Prinect MetaDimension, Prinect Printready System, Prinect CP2000 Center, and Prinect FCS 100

**Heidelberg-AutoRegister:<sup>[7]</sup>**

**Strength:**

1. World's first and only sheetfed press measuring and register control system
2. Accurate registering even at changing printing speeds and ink settings

3. Corrections made by the press operator is stored as a reference file in  
Prinect CP 2000 Center

Weakness:

1. Must be used as a part of Heidelberg Prinect solution and not as stand-alone software

**Heidelberg-CP2000 Center:<sup>[7]</sup>**

Strength:

1. Preset data from Prinect Prepress Interface can be transferred online
2. Preset data can be transferred between presses
3. Software module connects to MIS, Prinect Data Control and Prinect  
Prinance and hence press and job status is available online all the time
4. Powerful search and filter function for easy navigation
5. Online, remote service facility for Heidelberg Speedmaster presses
6. Reduced waiting time for UV ink wash up, using a software module
7. Can set dryer parameters directly
8. Joint washing of impression and blanket cylinder on Speedmaster SM

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Weakness:

1. A part of solution in the Heidelberg Prinect package of solutions

**Heidelberg-Compucut:<sup>[7]</sup>****Strength:**

1. Cutting programs for machines such as Polar can be created to optimize the workflow
2. Time savings and production cost savings are two big advantages
3. Complete visualization and documentation of the process
4. Flexible production
5. Maximum utilization of machine capacity
6. Improved Quality of production

**Heidelberg-FCS 100:<sup>[7]</sup>****Strength:**

1. Easy creation of programs for folders along with Heidelberg Compufold
2. Using Heidelberg Compustitch, programs for saddlestitchers can be easily created using data from Signa Station
3. Precise production data from folders and saddlestitchers can be obtained
4. Along with Heidelberg Production Data Management (PDM) software, time and production cost reduction is easily achievable
5. High utilization of finishing machine capacity

Weakness:

1. Heidelberg Production Data Management (PDM) software is a must along with FCS 100 to get production data from finishing machinery
2. Heidelberg Compufold is required to generate programs for folders

#### **Heidelberg-Compufold:<sup>[7]</sup>**

Strength:

1. Available in both standalone and online versions
2. In case of standalone version, a detailed printout can be provided to the folding machine operator
3. Selection of a particular folding machine configuration
4. Folding machine configuration can be displayed graphically in detail
5. Easy changes in folding sequence from the fold-type catalog
6. Presettings for folders can be easily defined depending on folding sequence
7. Processing of JDF folding data

Weakness:

1. Can be used only along with FCS 100

#### **Graphic Microsystem-ColorQuick:<sup>[20]</sup>**

Strength:

1. Closed loop color control system for most of web offset presses

2. Reduces make ready time tremendously by using digital ink key presets
3. Extensive Color Manager Statistical Process Control (SPC) Reporting package
4. Manpower reallocation can be done due to less manual attention requirement in production
5. Consistent quality is easy to achieve with closed loop color controlling
6. Spectrophotometer along with the video technology makes the system more efficient
7. Wide range of press integration due to close working with major printing equipment manufacturers
8. Remote diagnosis via modem enables testing, upgrade and analysis of the equipment by GMI support and engineering staff
9. Add-on interface would support the flow of JDF data from either imagesetter or platesetter

Weakness:

1. It is available to web offset presses and not for sheetfed presses

**Graphic Microsystem-MicroColor:<sup>[19]</sup>**

Strength:

1. Full-featured digital computer ink key control system for most sheetfed and web offset presses



2. Can be retrofit onto an existing press or fitted to a new press
3. Can recall color settings for an old job and the match the previous results instantly
4. Very precise ink key settings using patented digital servomotor
5. Customizable design components to match over 400 press models
6. Varying factors such as, speed, fountain sweep, color sequence and ink coverage of the job are taking into consideration
7. Add-on interface would support the flow of JDF data from either imagesetter or platesetter

**Graphic Microsystem-PrintQuick:<sup>[19]</sup>**

**Strength:**

1. Closed-loop register control system for web and newspaper presses
2. Superior optics with tiny targets makes it very effective
3. Highly sophisticated image analysis helps
4. Wide field of view allows high control over the process in locating the target and locking
5. Live camera view allows continuous monitoring of the targets and register status
6. Unique positioning on the unsupported web after the last printing unit negates many obstacles in achieving continuous registering even at high speeds

**EFI-Auto-Count 1000:<sup>[18]</sup>****Strength:**

1. Easy to use windows interface with user-friendly Graphic User Interface (GUI)
2. Can be used on sheetfed, web, digital and postpress equipment
3. Self-sustaining equipment with its own server and networking to support multiple auto-count systems dedicated to equipment in press and postpress
4. Collects real-time press and production statistics that covers the entire plant and also identification of the product on the skids, generation of load ticket and labeling of skids
5. Connected to the corporate network and hence management can get a clear picture
6. Control over the equipment to even shut it down after the required quantity is produced
7. Eliminates overruns, underruns and reruns and hence eliminates wastage also provides a means of monitoring the performance of personnel and machines so that better scheduling of men and machinery can be achieved

**Weakness:**

Can run on Window platform and not on Mac OS

## Conclusions

A wide range of software and hardware products that support JDF were considered and evaluated. Many of the products had similar functionalities and it was difficult to find a single, complete solution. Keeping in mind that JDF is still in the developmental stage, the software and hardware solutions available in the market need to incorporate many more functionalities to be more effective.

Considering the management and customer priorities of Perry Judd's, combination of Graphisoft – Integrale<sup>[15]</sup>, Dalim Printempo<sup>[17]</sup> and Mistral<sup>[17]</sup> would be an ideal software combination. Graphisoft – Integrale is a powerful in the areas of customer management, estimation, production management, inventory control, information and resources management tool. Dalim Printempo is strong in the areas of preflight, JDF imposition, deadline management, web based, page normalization, versatile to accommodate last minute changes in translation, rotation and scaling. Dalim Mistral covers apparently all the requirements from online file submission to delivery hence this makes it a very strong tool in the area of production.

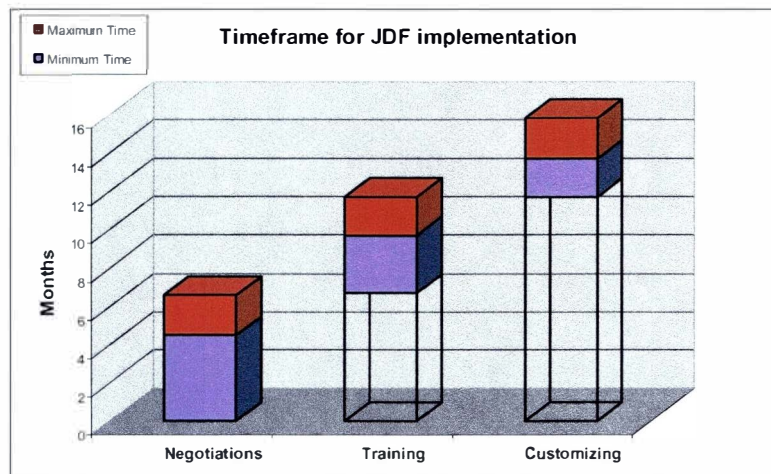
The pricing on Graphisoft – Integrale and Dalim products Printempo, Mistral and Twist are also attractive as shown in Table 1.

The thesis research done has been extended to press, postpress and delivery but at the moment the focus is on the design and the prepress. Total cost of

implementation would range between \$ 170,000 and \$360,000. The expected benefits to be achieved are quicker job turnaround, value addition and cost savings.

### **Time Frame:**

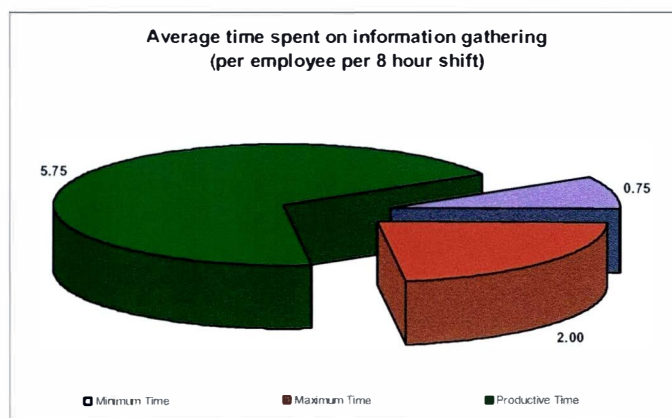
Timeframe for implementation of JDF can be estimated at anywhere between 9 to 15 months due to the fact that, the interaction of management and equipment provider would take anywhere between 4 – 6 months that would cover discussions on technical and pricing fronts. Employee training and orientation on the issues of the need to implement JDF and basic training on the software and hardware under consideration would require 3 – 5 months. Installation of the hardware and software solutions and tailoring them to the needs of the management would take around 2 – 4 months.



**Figure 11: Timeframe for JDF Implementation**

### Return on Investment (ROI):

According to the internal study conducted by the Perry Judd's management, redundant tasks like gathering the job data, tracking changes and its communication both within and between the departments take approximately 0.75 hours to 2 hours per 8 hour shift, depending on the department. It should also be considered that, average salary and benefit paid per employee is \$65,000 hence savings of around \$6,000 to \$16,000 per employee labor dollars can be saved. Considering the workforce of around 40 employees the average total savings in one year would be from \$243,000 to \$650,000.



**Figure 12: Average Time Spent on Information Gathering**

As the project of implementing JDF demands a total budget of approximately \$170,000 to \$360,000, return on investment can be estimated as 1.5 years to 2.0 years. It should also be taken into consideration that more jobs can be turned around and the customer satisfaction is increased considerably so this case makes it a very strong reason to implement JDF.

**Table 1: Estimation of Software Pricing**

<b>Software</b>	<b>Price range (\$)</b>	
	<b>From</b>	<b>To</b>
Prism-Win	100,000	250,000
Graphisoft-Integrale	60,000	140,000
Creo-Synapse Prepare	75,000	150,000
DALiM - PRiNTEMPO with TWiST	50,000	120,000
EFI-PrinterSite Internal	45,000	100,000
Heidelberg-Prinect Prinance	50,000	110,000
Creo-Synapse Insite	15,000	30,000
EFI-Hagen OA	45,000	100,000
Heidelberg-Prinect	75,000	130,000
Creo- Prinergy	80,000	150,000
AGFA-Delano	70,000	160,000
DALiM -Mistral	60,000	100,000
Heidelberg-MetaDimension	15,000	75,000
Heidelberg-Signa Station	7,500	15,000
Heidelberg-AutoRegister	35,000	75,000
Heidelberg-CP2000 Center	350,000	500,000
Heidelberg-Compucut	10,000	25,000
Heidelberg-FCS 100	8,000	20,000
Heidelberg-Compufold	7,500	15,000
Graphic Microsystem-ColorQuick	75,000	120,000
Graphic Microsystem-MicroColor	100,000	140,000
Graphic Microsystem-PrintQuick	120,000	180,000
EFI-Auto-Count 1000	20,000	45,000

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