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## **Trends and Innovations in Packaging including Links to JDF-compliant Hardware and Software Applications**

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## **I. EXECUTIVE SUMMARY**

Packaging trends at the forefront of the industry include the influence of increased government regulations, a growing focus on both sustainable and intelligent packaging, and a rising emphasis on automated workflows. The packaging industry is just beginning to take advantage of a relatively new industry standard. Job Definition Format (JDF) is an industry standard designed to simplify information exchange among different applications and systems in and around the graphic arts industry. To that end, JDF builds on and extends beyond pre-existing partial solutions, such as CIP3's Print Production Format (PPF) and Adobe Systems' Portable Job Ticket Format (PJTF). CIP3 was formed by Heidelberg in 1995 and was used in the pre-setting of ink fountain keys on lithographic offset printing presses. It also enables the integration of commercial and planning applications into the technical workflow. JDF joins the growing number of standards based on XML, ensuring maximum possible portability between different platforms and ready interaction with Internet-based systems. JDF is a comprehensive XML-based file format and proposed industry standard that allows for end-to-end job ticket specifications to be combined with a message description standard and message interchange protocol.

JDF is designed to streamline information exchange among different applications and systems. It also allows individual systems to integrate with one another to allow data to flow seamlessly without re-keying and the opportunity for error that comes with manual intervention. JDF and the automation it provides has the potential to significantly impact the packaging industry. Currently, there are few examples of the standard in use in this field, primarily due to issues of resource investment, general technology acceptance, and other limitations of JDF in regards to packaging needs.

### ***Research Objectives***

This report explores the primary trends that are impacting the packaging industry. It also examines the effect of the JDF standard on packaging workflows and technology, and describes how JDF is currently being applied in the industry. Additionally, major packaging trends and innovations such as RFID (Radio Frequency Identification) and temperature sensitive inks are explored.

### ***Approach***

This study utilized the following methodologies to gain direct insight from industry players and analyse prospective trends:

- In-depth interviews with 12 leading companies involved in packaging workflows
- Survey of industry members about JDF products and usage (see page 5, Survey Demographics).
- Secondary research drawn from existing papers and publications.

The personal interviews with industry experts provided a significant amount of information relating to packaging companies in the print media industries. Additionally, the packaging trends survey generated a broad spectrum of responses and is a gauge of general attitudes.

### ***Target Audience***

The information contained in this white paper will be of interest to current and prospective members of the packaging industry who want to be aware of the primary trends and general direction in their field, those who are interested in exploring new areas to remain competitive, and those who want to see how their peers are using JDF.

This research is also intended to be useful reference material for organizations and companies developing JDF applications and standards for the packaging industry, such as the JDF standards committee CIP4, as well as commercial printing companies who are considering adding packaging to their portfolio of offerings.

### ***Key Findings and Implications***

After several months of investigative research, the survey findings revealed that far fewer packaging companies than anticipated were even close to JDF process integration. Most industry executives interviewed indicated that there was a lot of research and strategic planning still to be done before investing heavily in capital expenditures relating to JDF hardware and software applications. The research also suggests that the learning curve requirements associated with these new standards and technologies would take significant time and effort before an efficient comfort level could be reached.

The following trends in the packaging industry were revealed in this research and are covered in the report:

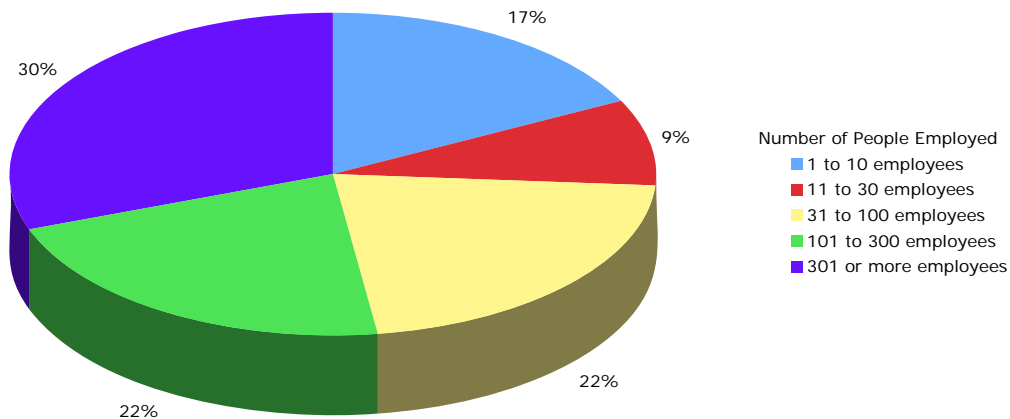
1. Increased governmental regulations are having a significant impact on package design, content, and consumer information
2. Growing focus on sustainability (e.g. environmentally friendly packaging)
3. Intelligent packaging (e.g. RFID) is gaining strength in the industry
4. Real-time scheduling and workflow automation are providing value-added benefits for package printers
5. Significant resource investment (including a significant learning curve) will be required to implement JDF in the packaging industry.

This research and analysis also extends to the impact of JDF on future packaging workflows and provides insight into what can be done with JDF in different workflows for individual companies. It also highlights areas of the JDF standard requiring additional development in order to be more effective for packaging. This information can be used to further promote JDF as a standard that can encompass the entire graphic arts industry by addressing the needs of this substantial sector in a more practical and complete fashion.

## II. SURVEY DEMOGRAPHICS

Companies responding to the survey varied in size, although the majority (52%) were companies with more than 100 employees.

**Figure 1. Packaging Companies by Number of Employees**  
(23 responses)



The companies were primarily located in the Toronto/Greater Toronto Area (GTA) area, but there were also organizations elsewhere in Canada and the United States. Of those sampled, over half (57%) stated that packaging was not a major source of revenue (constituting only 5-25% of operations), while 30 percent of respondents indicated packaging comprises 76-100% of their work. Seventy percent of these companies also have not implemented JDF. Thus the survey results are skewed more towards the perspective of larger GTA organizations that do some, but not an extensive amount, of packaging, and have little to no direct experience with JDF implementations. In several instances, companies and industry experts were unable to respond to questions relating to this research as they were currently involved with their own needs analysis relating to the integrating new workflow technologies.

Finally, secondary research from industry articles, studies and other publications was also used to build an awareness and base of existing knowledge, and to extrapolate and merge valuable trends and insights.

### **III. RESEARCH OBJECTIVES**

#### ***Background***

Packaging is a sector that is distinct from other graphic arts fields, due to such factors as the diversity of substrates and the variability of the finished product. Previous studies have focused on the impact of JDF upon various workflows, but these tend to be traditional sheet-fed or web-offset printers. Kumar (2005) analyzed JDF implementation at Perry Judd's Inc., a full service heat-set web offset printer. Although analyses similar to this exist, few are directed at the packaging industry because there is minor support within the JDF specification for the specialty requirements of packaging. For instance, packaging requirements that are not yet fully supported by JDF include the frequent need to provide different languages on packaging. The JDF standard has, however, been developed to include multiple-up impositions for the various label dimension jobs so prevalent in packaging.

#### ***Objective***

The purpose of this report is to explore how current JDF technology is affecting packaging trends and supporting innovations in workflows within the packaging industry. Current packaging trends are identified and analyzed to determine how JDF is presently being used, or could possibly be applied to improve workflow efficiencies. This research and analysis also extends to the impact of JDF on future packaging workflows.

#### ***Approach***

In order to understand the current trends facing the industry, it was necessary to speak to companies involved in the pre-press, press, and post-press workflows of the packaging industry. Interviews were conducted with industry experts, including hardware and software vendors, as well as in-depth case study sessions with Schawk in Mississauga and Triad-Graphics in Toronto. This primary research provides insight into packaging and print media costs in prepress, machine setup times, and order processing that is not governed by order quantities, as well as other workflow and operational insights. Although this method provides a lot of valuable information, it tends to be quite specific to a company or industry, and may not be easily applied to other packaging workflows.

To supplement the in-depth interviews and to broaden the scope of the research, a survey was also sent to targeted groups interested in applications relating to JDF trends in packaging, including leading industry suppliers and vendors through targeted e-mail lists. Questions on the survey addressed specific trends identified from previous personal interviews and applications of the JDF standard. Although it reached a broad audience, there is typically little control over what area of packaging the respondents are coming from, thus the results may be skewed towards one particular slice of the industry based on the types of individuals who responded. The survey is included as an appendix to this report.

## IV. KEY FINDINGS

### 1. Newer and more rigorous Governmental regulations are having a significant impact on package design, content, and consumer information.

The purpose of packaging is not only to contain and protect its contents, but also to inform the recipient about the contents. Naturally, regulatory and standardizing controls have long played a significant role in packaging due to safety issues regarding contents, especially with food and pharmaceutical products. In hand with safety concerns, is the idea that information about the contents of the package is as open and universally accessible as possible to prevent misinformation or confusion in regards to appropriate usage. Tony Senike, Director of Technology, Schawk Canada mentioned that trends in packaging are often initiated by the dictates of the Canadian Food Inspection Agency, the U.S. Food and Drug Administration, or other industrial, national or global regulatory bodies (personal communication, March 15, 2007).

With increasingly global operations for suppliers and retailers, multi-lingual provision and conformance in packaging labels are of the utmost importance – as with French and English information on Canadian packaging, for instance. Similarly, new regulations are becoming stricter in many areas such as those for the visually impaired. Europe is already requiring that pharmaceuticals be labelled with Braille information, adding dimensions of complexity to packaging production (Next Generation Pharmaceutical Europe, 2007). Not surprisingly, the accuracy of such labels is critical.

Esko-Graphics' Scope workflow is one packaging-specific product on the market that facilitates this process with integrated Computer Aided Design (CAD) plug-ins, SmartMarks, and DesignWizard. These options facilitate the creation of Braille dies, generating templates that link content to up-to-date database information such as medical notes and warnings. Scope's JDF-enabled workflow further allows the information concerning Braille content to be imported from the Management Information System (MIS) to auto-create a job folder on the preproduction server. It can even be set up to provide PDF previews of the Braille packaging.

Current pharmaceutical regulations in the U.S. require prescription drugs to be distributed in a form that is both child-resistant and senior-friendly. These mandates, however, apply only to the actual pharmacy or other consumer distribution points. Pharmaceutical companies often send bulk packages of drugs to the individual pharmacies, who then take on the responsibility of dispensing and repacking drugs. This means that over-the-counter (OTC) pharmaceutical packaging is often dependent on the pharmacy rather than the manufacturer. Factors affecting this practice include:

- the growing population of senior citizens with greater prescription drug needs;
- overworked pharmacists; and
- the potential manufacturing efficiencies created by using a global packaging design.

All of these factors push the North American drug packaging processes towards the model currently in place in the European Union (EU), where it is more common to use a manufacturer's original packaging throughout the life cycle of the product. This will reduce the overall amount of packaging required for a pharmaceutical product and pharmacist workload. Wal-Mart already encourages the use of manufacturer packaging for Taro Pharmaceutical's blood-thinning drug, a product shipped to Wal-Mart in a single-dose format (Mayberry, 2004). Due to the immense size and significance of the pharmaceutical marketplace, the evolution of packaging trends and regulations will provide valuable opportunities for additional research.

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It is likely that North America will follow the EU in implementing many of the same laws and regulations regarding open accessibility.

Other possible developments may include additional regulations to create more accessibility in regards to individual privacy rights, as well as tracking and tracing technologies to ensure conformance to standards and quality certification criteria, and to prevent piracy or theft. These three factors could potentially drive the implementation and usage of both JDF and RFID). Companies may also choose to take a proactive approach and enforce more strict internal measures to stay ahead of government regulations and generate a positive image to consumers.

**2. Sustainability in packaging is providing a solid foundation for future awareness of health and safety concerns and environmental issues. Its benefits are providing long-term growth opportunities for package printers.**

A key finding in this research is the trend towards sustainability, bolstered by the general market interest in environmentally friendly solutions and the call for corporate social responsibility. In 2005, the Sustainable Packaging Forum and the Sustainable Packaging Coalition were formed (Greenberg, 2005) to focus on packaging that can stand up to the current demands of the market, while maintaining entirely sustainable and renewable manufacturing, distribution and disposal processes.

In general, there appears to be three types of practices/materials or implementation methods for sustainable packaging, which can be used in conjunction with each other. Sustainable packaging can be achieved through:

1. reducing the amount of materials and streamlining production/assembly;
2. using recyclable materials; and/or
3. using biodegradable materials.

In terms of packaging reduction, there is the growing use of outserts, particularly in the pharmaceuticals industry. Outserts are printed promotional items similar to traditional inserts but placed on top of the pill bottle rather than being inserted inside a box. They have the look and feel of inserts without the hassle and waste of additional packaging (Sands, personal communication, 2007). Moreover, by using smaller and more compact outserts and eliminating the insertion process, material and operational costs are reduced. This practice combined with the notion that outserts are sent directly to the pharmacy results in a higher profit margin for printers (Sands, personal communication, 2007). Though companies may need to battle consumer resistance regarding perceptions of traditional pharmaceutical packaging, there are many potential benefits to using outserts, including savings and positive consumer feedback in relation to corporate social responsibility.

<b>Criteria for Sustainable Packaging</b> <i>(Sustainable Packaging Coalition, 2007)</i>
A. Is beneficial, safe and healthy for individuals and communities throughout its life cycle;
B. Meets market criteria for performance and cost;
C. Is sourced, manufactured, transported, and recycled using renewable energy;
D. Maximizes the use of renewable or recycled source materials;
E. Is manufactured using clean production technologies and best practices;
F. Is made from materials healthy in all probable end of life scenarios;
G. Is physically designed to optimize materials and energy;
H. Is effectively recovered and utilized in biological and/or industrial cradle to grave cycles.

The trend for simplification is also increasingly common in food and retail companies. Kraft Foods recently changed its packaging for a candy bar and two lines of polypropylene (PET)-based bottles (Sterling, 2007). The redesigned packaging will use 50% less material for the Milka candy bar and reduce PET usage by 8.7 million pounds annually. Additionally, in 2005, Wal-Mart Stores, Inc. partnered with suppliers to reduce packaging for its private toy line label, Kid Connection.

Cities have also launched similar initiatives to decrease the amount of packaging components incorporated into products. In March 2007, San Francisco became the first North American city to ban plastic bags (CBC News, 2007). Under this law, supermarkets and drugstores are prohibited from using non-recyclable or non-biodegradable bags made from petroleum-based products. In Canada, the Manitoba community of Leaf Rapids was set to ban plastic bags on April 2, 2007. Rossland in B.C. is also contemplating a similar ban.

**Wal-Mart's Kid Connection experience** (*Canadian Transportation Logistics, 2006*).

After reducing the packaging on fewer than 300 toys, Wal-Mart saved in One year:

- 3,425 tons of corrugated materials
- 1,358 barrels of oil
- 5,190 trees
- 727 shipping containers
- \$3,5 million in transportation costs

Sainsbury's of England is requiring its organic produce suppliers to use biodegradable packaging such as food trays made of starch, limestone, and some fibers; 99.7% of the tray must be biodegradable within six weeks (Reynolds, 2002). The cost of these trays, however, is three times that of regular PET food trays, mainly due to lack of demand. As such, the tray will not meet the Sustainable Packaging Coalition's criteria for market costs until it is widely adopted. This is a trend worth noting for future reference because of the abundance of food packaging being used in the marketplace.

**Figure 2. – Biodegradable Packaging**



Source: <http://www.wired.com/wired/archive/10.07/start.html?pg=8>

Apack, the aforementioned manufacturer of biodegradable trays, is looking to expand into the rest of Europe and North America. Similar products include Potatopak and Earthshell sandwich clamshells and flexible wraps (Reynolds, 2002). Cascades have also introduced new oxodegradable polystyrene foam. The shift to move away from using oil- or petroleum-based packaging is a result of both the growth of oil costs and awareness of the triple bottom line.

**Table 1. A sampling of non-oil/petroleum based substrates**

Name	Polylactic Acid (PLA)	NatureFlex
<b>Manufacturer</b>	Cargill's NatureWorks	Innovia Films
<b>What it is</b>	<ul style="list-style-type: none"> <li>• Corn-based plastic</li> <li>• Approved in Europe and U.S. for food packaging</li> <li>• Low sealing temperature, permeable to water vapour</li> <li>• Printable, oil-, fat- and alcohol-resistant</li> <li>• 31% less fuel consumed in manufacturing</li> <li>• 32% less greenhouse gas emissions</li> <li>• Requires special processing facilities to break down material for reuse</li> </ul>	<ul style="list-style-type: none"> <li>• Cellulose-based film</li> <li>• Range of transparent, white and metallised</li> <li>• Certified biodegradable</li> <li>• Less than 0.02% metal, suitable for home composting – certified in Europe, U.S. and Australia</li> <li>• High gloss, high moisture/gas/aroma barrier (transmission rate &lt;10 in tropical conditions)</li> <li>• Suitable for flow-rap, form-fill-seal, heat-sealable on both sides</li> </ul>
<b>Current usage</b>	Wal-Mart, French tea producer Le Dauphin (Biophan by Treofan)	Baking industry, food applications, twist wraps
<b>Reference</b>	(Mishkind, 2006) (FoodProductionDaily.com, 2006)	(Mishkind, 2006) (Packaging-GateWay.com, 2007)

The cost of implementing new technologies such as this can be offset by the efficiencies associated with JDF process integrated workflows. Programs such as the sustainable packaging education curriculum developed by the Packaging Association of Canada have bolstered the trend towards sustainable packaging. Sustainable packaging not only helps to preserve the environment, but is also practical in a business sense by reducing costs associated with materials sourcing and production. Additionally, though sustainable packaging may once have been an approach driven by the initiative of the printers and manufacturers, that is now no longer the case due to growing consumer awareness. Many consumers and retailers are beginning to request it as a solution.

<b>Wal-Mart's projected savings for 2008 initiative</b> ( <i>Canadian Transportation Logistics, 2006</i> ).
Wal-Mart's proposed 5% reduction is expected to: <ul style="list-style-type: none"> <li>• Prevent trash from reaching landfills</li> <li>• Reduce 667,000 metric tons of CO<sub>2</sub></li> <li>• Create \$10.98 billion in savings in the global packaging industry (\$3.4 billion for Wal-Mart)</li> </ul>

According to a 2005 Natural Marketing Institute study conducted with a general population sample, 48% indicated they would prefer a product grown using "sustainable agricultural" practices (Mishkind, 2006). A similar conclusion can be drawn for the field of consumer packaging. The public is increasingly educated about the bio-friendly options available, and that knowledge is driving sustainability as a core component of customers' purchasing decisions.

Wal-Mart's Sustainable Packaging Value Network brings together 200 leaders from government, NGOs, academia and the global packaging industry (Canadian Transportation Logistics, 2006). After a successful initiative with its private Kid Connection brand, Wal-Mart

announced that beginning in 2008 it would be measuring the performance of its global suppliers in terms of their capability to produce sustainable packaging (approximately 60,000 companies). This plan aims to reduce overall packaging by a minimum of 5% by the year 2013 (Canadian Transportation Logistics, 2006).

The scorecard can be seen at <http://www.scorecardmodeling.com/> and features metrics revolving around the "7 R's of Packaging": Remove, Reduce, Reuse, Recycle, Renew, Revenue, and Read.

With retailers of this scale and clout demanding this type of offering, companies in the packaging industry must conduct research and development into sustainable packaging and provide it in order to be competitive. Tony Senike, Director of Technology, Schawk Canada, also noted that increased pressures to improve workflow efficiency was a direct result of consumer awareness toward environmentally friendly packaging (personal communication, March 15, 2007). The search for alternate materials (e.g. cloth and biodegradable polymers instead of plastic bags) and processes will continue, and costs will go down as the right technology develops and market demand grows. It has been noted that downtime and material spoilage are two of the most common causes of lost profit in the graphic arts industry. To combat these losses, a process-integrated workflow based on JDF specifications will ensure efficient manufacturing practices through the use of preset instructions, which reduce machine set-up time, downtime between jobs and consumable spoilage.

**3. Packaging applications such as RFID and temperature sensitive inks are two examples of intelligent packaging trends, which are becoming increasingly popular in the packaging industry.**

RFID and intelligent packaging are related trends that will be making their presence known in the packaging industry. Joanna Liu, Quality Assurance Manager of SGS, Brampton Ontario, mentioned that retailers are stepping up their own research initiatives into the co-existence of RFID tags and traditional bar codes, which will support intelligent packaging trends in the future (personal communication, February 23, 2007). RFID is already being used in such areas as warehousing and logistics. The technology provides an economical way to successfully manage large amounts of data with less effort and fewer resources than traditional bar code tracking systems. Similarly, intelligent packaging is becoming more prominent in today's marketplace, and can be seen most often in the food packaging industry. Intelligent packaging is described as a package that has the capability to interact with the consumer as well as being disposable (ID TechEx, 2004). These two types of packaging will be addressed as a single trend within this report.

The basic RFID system contains both a programmable RFID tag/inlay and a reader/antenna (SATO America, 2004). RFID technology can offer packagers the following benefits (SATO America, 2004):

1. Enhanced flexibility
2. Greater data storage (up to 4,000 bits of information)
3. Increased throughput of data collection
4. Faster access to information
5. Longer read range and data collection without "line-of-sight" readers
6. Greater accuracy of data (reduced error rate)
7. Increased reliability in harsh environments.

RFID in health-care and pharmaceutical management is an important trend that can save lives. According to a 2000 study by the Institute of Medicine, 44,000 to 98,000 Americans die annually from medication errors. Additionally, medication errors for hospitalized patients cost approximately \$2 billion USD annually (SATO America, 2004). This information demonstrates a significant problem that RFID systems can alleviate. By reducing human error, RFID can be an effective tool to prevent such errors. In a recent advanced testing situation, Purdue Pharma LP in Stamford, Connecticut reached 100% tag reliability when integrating RFID tags into its pharmaceutical packaging lines (MM&D, 2007). Additionally, RFID tags are used in the healthcare field to manage everything from equipment and supplies to newborn babies and organ donations (Mark, 2006).

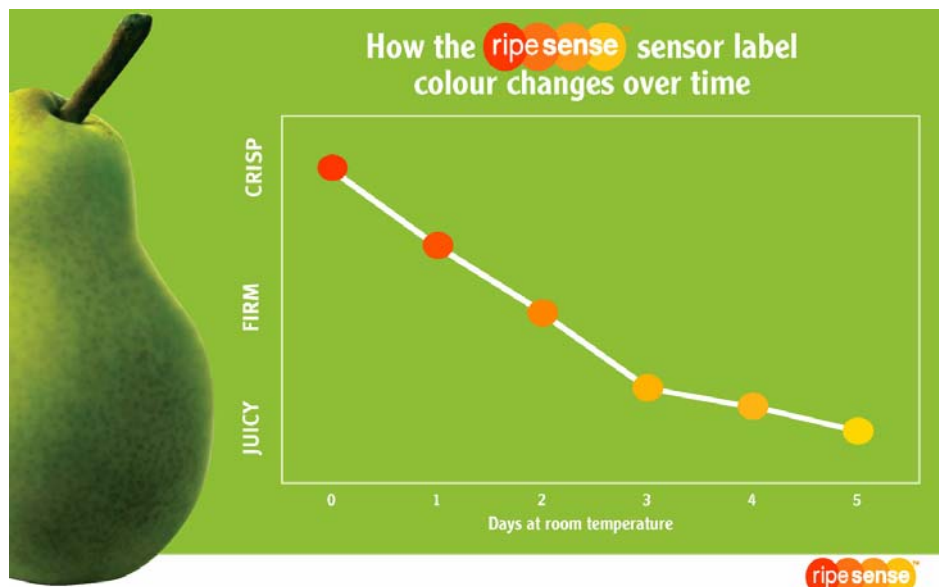
Although RFID tags are relatively expensive to implement now, the costs are decreasing due to additional manufacturers offering the technology. RFID tags can now be as inexpensive as \$0.20 USD each (Mark, 2006). Although barcodes can be as inexpensive as \$0.02 USD each, the added flexibility and data storage capability may be well worth the extra expense. Additionally, there is no need to maintain space between objects when sorting and tracking them through the supply chain because dozens of packages can be read in a few seconds versus scanning a barcode manually on each package, which could take between 20 to 90 seconds to scan the entire skid (SATO DCS & Labeling, 2005). RFID tags can also be read through packaging materials such as plastic and cardboard, allowing for increased functionality.

It is important to note that RFID systems are not meant to completely replace bar codes in the future; however, they will take over in areas that bar codes have dominated in the past. Thus, bar codes are seen as technology that will be complementary to RFID (SATO America, 2004). To support this notion, scanner-manufacturing companies are developing new and improved readers for barcodes that enable users to scan information regardless of resolution, print quality or damage (MM&D, 2007). This demonstrates the continued need for both RFID technology as well as bar code capabilities in the future of packaging.

Added functionality is provided in the form of intelligent packaging. A “smart” coffee cup lid by Smart Lid Systems in Australia was released in the summer of 2006. The lid changes colours to indicate the temperature of its contents, warning users if the liquid is too hot. Made from high impact polystyrene (mixed in cold pellet state with additives from Japan’s Matsui Foods), it can be shaped to any size, flat or domed, and has been approved for food contact in both Europe and the U.S. The “smart” coffee cup lid costs only an extra \$0.01 USD compared to conventional lids. The lid can be printed with logos that will fade in and out of view depending on the temperature, adding novelty and product placement value (AP-Foodtechnology.com, 2006).

Another unique product that incorporates intelligent packaging is the fruit ripeness indicator created by ripeSense® in New Zealand. It was designed to help eliminate consumer confusion concerning fruit ripeness. This printed technology is able to work with “climacteric” fruit, or fruit that continues to ripen after it is harvested (ripeSense®, 2006). The printed sensor responds to changes in aromatic volatile compounds emitted by the pre-packaged fruit as it ripens in the grocery store.

**Figure 3: ripeSense® Colour Changing Label**



Source: (ripeSense®, 2006)

Fruits using the ripeness indicator include pears and kiwi fruit, which appear the same from the time they are harvested to several days after. Fruits such as bananas are more obvious in terms of their ripeness because they change colour from green to yellow to brown as they ripen. The ripeSense® company, therefore, markets itself as “turning pears into bananas!” (ripeSense®, 2006).

A cross between RFID and intelligent packaging exists in newer and smarter RFID tags. Some have the ability to not only monitor the product status for supply chain management and warehousing capabilities, but these tags are also able to monitor temperature, humidity and mishandling. Whenever the RFID tagged items are placed in environmental situations beyond the specified limits, the tag sends an alert to a main computer (Mark, 2007).

RFID and intelligent packaging will continue to grow as packagers continue to “think outside of the box” to develop unique ways to simplify and differentiate packaging from their competitors. Packaging makers such as Smurfit-Stone are launching a new line of packing material with embedded RFID tags. The tag becomes a permanent part of the package, which is another milestone in the RFID line of products. As Dan Fortin, president of IBM Canada, stated at the 2006 Canadian RFID conference: “While many of the initial applications of RFID will be in the supply chain, the future of this technology is only limited by our imaginations” (Mark, 2006). This sets a positive tone for continued growth in the RFID and intelligent packaging markets.

**4. Real-time scheduling and workflow automation are providing value-added benefits for package printers.**

More than ever before, clients are demanding to be more involved in every step of the printing process. Some insist on having real-time job status 24/7. In the late 1990s, many dot-com companies flaunted this benefit but found few takers in the printing industry. Many were not prepared to share such a high level of information with their clients. Evidently times have changed and many software vendors name clients' access to information as a key benefit. Additionally companies are requiring increased automation in their production workflow. When combined, these two attributes – access to information and increased automation – hold the key to the future of print production workflow. With an integrated JDF workflow, changes to any job specification can be accommodated and updated in real-time, which leads to higher efficiencies and less spoilage. Ken Rosa, Client Services Supervisor of Triad-Graphics in Toronto recognizes the importance of meeting and exceeding customer expectations through process integration. Any technology that makes it easy for the clients to do business with Triad-Graphics will lead to increased loyalty, improved two-way communications and profitability (personal communication, March 9, 2007).

Software applications are the answer to combining these two attributes effectively. According to Jon Novak, director of technology for Williamson Printing Corporation, Dallas, "You can't raise prices... using automation and technology is the only way to make money." Many software applications may need to be combined with one another to achieve just the right effect for a company. For example, an Esko Scope workflow system could be used to drive plate setters, while Metrix could be used in conjunction with an MIS (such as Prism's WIN) and a project management application like Agfa's :Delano for job planning. These four programs are just examples and are all produced by different vendors; however, they have the ability to work together via the JDF standard to make significant changes in a company's efficiency and bottom line.

The majority of these software applications use the latest workflow technologies and standards. The most promising of these technologies and standards is JDF. When JDF support in these programs is utilized, an entirely new level of automation is achieved. Jobs can flow accurately throughout the process to all JDF-enabled equipment with little human interaction. Moreover, since job information is only input once and the same specs will be used throughout the workflow, human error is greatly reduced. The return on investment from one of these software systems can be quite extensive as seen in the following chart depicting the ROI on a \$1,000 Metrix system provided by the manufacturer:

**Table 2 – ROI For One-Year Based on a \$1,000 Metrix Software Package Implementation**

One 4-colour make-ready and 4 plates	= (2.25hrs x \$340/hr) + (4 x \$30/plate) = \$885 per make-ready & plate set
One 4-colour wash-up	= 0.75hr x \$340/hr = \$255 per wash-up
Number of extra jobs ganged per year	= 52 ( 1 per week)
<b>Savings per year for just one extra sheetwise job ganged per week</b>	= 52 x [(\$885 + \$255) x 2 slides] = 52 x \$2,280 <b>= \$118, 560</b>

Source: ([www.lithotechnics.com](http://www.lithotechnics.com))

Due to the fact that Metrix created this chart, there is likely some bias and a best-case scenario has been used. However the chart still illustrates the effect such applications can have on a company's efficiency and bottom line. Conclusively, there is no question that an assortment of software applications with JDF support could be used to allow for companies to better utilize their resources.

Web-to-print applications are quickly becoming the way to deliver real-time job status to clients and are acting as digital storefronts. Software solutions such as Artwork Systems' Nexus and Odystar are providing a modular approach to implementing these systems to allow companies to start with a smaller investment and grow as they become more confident with the software. This modular design can be seen in many other types of software, including the Metrix system referenced above, which has six different editions, each designed to meet different needs. Agfa's :Delano is another web-to-print application that is modular in design. :Delano provides online collaboration for print and publishing professionals and keeps everyone informed by establishing a digital messaging system that links work centers together.

This type of communication allows everyone in the company to know exactly what is expected and when it is expected. The best part about :Delano and similar programs is the common virtual workspace which customers and project teams share. In these virtual workspaces, files are inspected, tracked, previewed, reviewed, proofed (either remote or on-site) and approved, all in real-time. Every workflow application using software of this nature reduces overhead, eliminates duplication of effort, speeds up work and reduces the cost to complete a function. Most importantly this software provides customers with the live updates they demand.

The following figures illustrate the need for enhanced automation/JDF efficiencies due to the primary challenge of offshore competition (from our survey), along with other challenges driving the need to reduce costs associated with packaging production.

**Figure 4. Packaging Industry Challenges Foreseen by Companies Surveyed**

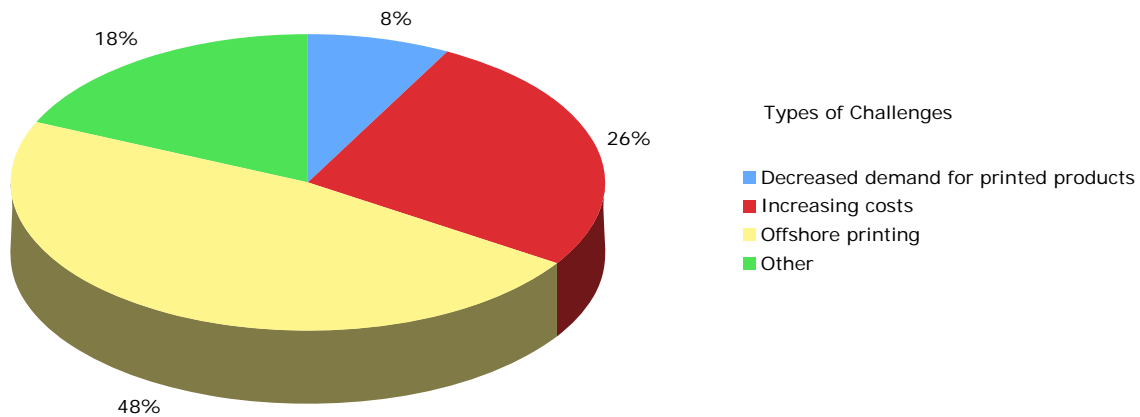
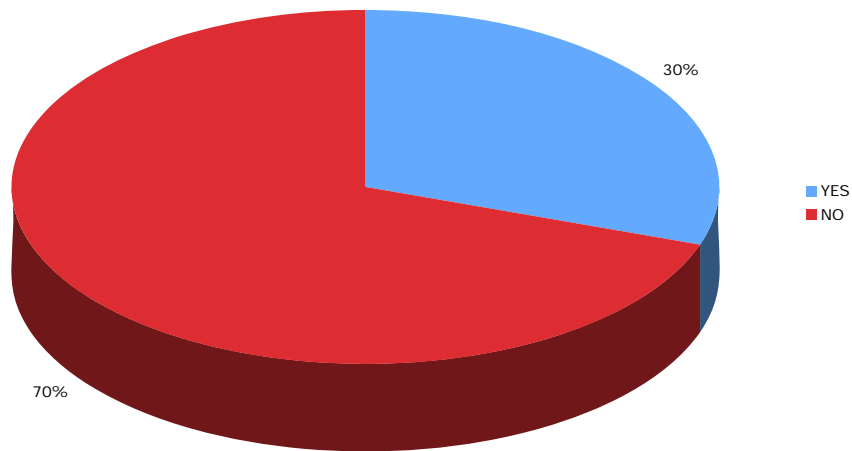


Figure 5 indicates that the majority of companies have not yet implemented JDF. Of the 30 % who have implemented some level of JDF, 22 %reported that they have implemented JDF solutions in prepress and 19 %have implemented JDF solutions in printing applications. This suggests that a large number of these companies are likely anticipating the benefits of JDF process integration in the future. Additional information and support data are located in the appendix section of this document.

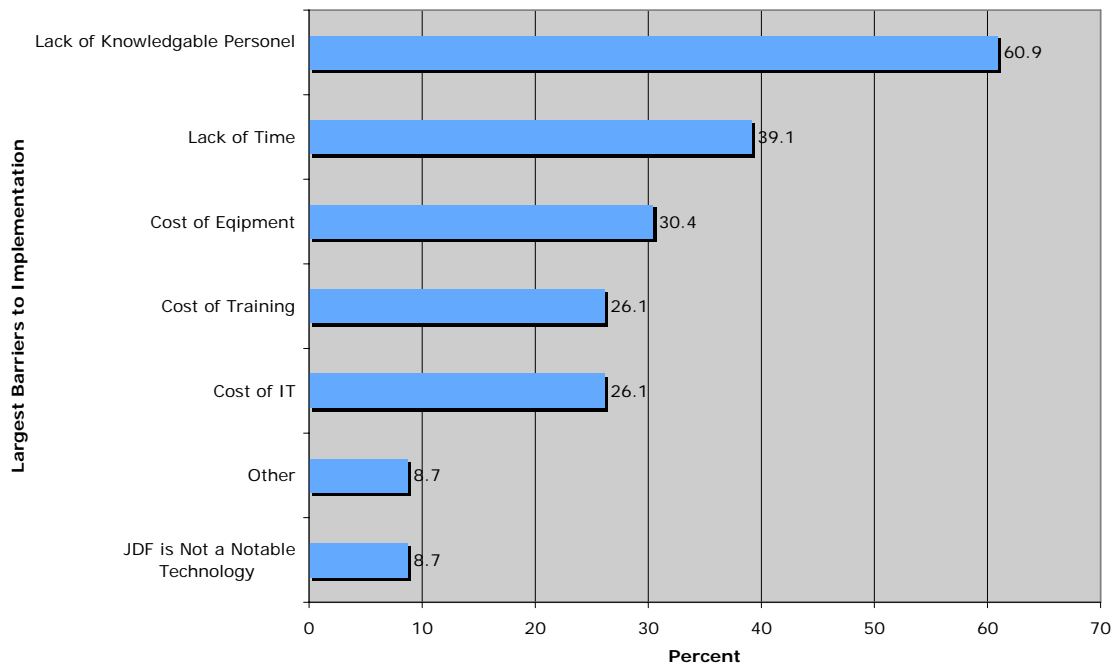
**Figure 5. Percentage of Companies Surveyed Who Have Implemented JDF**



**5. Strategic resource investment is a major consideration in overcoming the barriers to implementing JDF standards.**

As with any new technology, successful implementation and integration is not a quick fix-all solution. It requires significant resource investment on the part of all members of the organization. Detailed planning to design an implementation strategy and decisions about which hardware or software package to purchase are only the beginning of an intensive integration period. According to our survey, over 60% of respondents saw lack of knowledgeable personnel as the primary barrier to JDF implementation, and over 39% felt that a lack of time was a significant barrier.

**Figure 6. Barriers to JDF Implementation in Packaging**  
(23 responses by Packaging Company Employees)



Studies in other sectors of the industry reflect this apprehension as well. In 2005, Deepak Kumar, a CIP4 consultant from the University of Michigan, conducted an analysis of American printer/publisher Perry Judd’s prospective partial JDF implementation. Though not directly involved in packaging, the company’s size (four production facilities with 26 printing presses) and scale of operations makes it a worthwhile example to consider. The Madison Division, which specializes in digital prepress, was the focus of this analysis.

To assess the prospective implementation, a detailed analysis of the current operations and systems was completed, including a breakdown of:

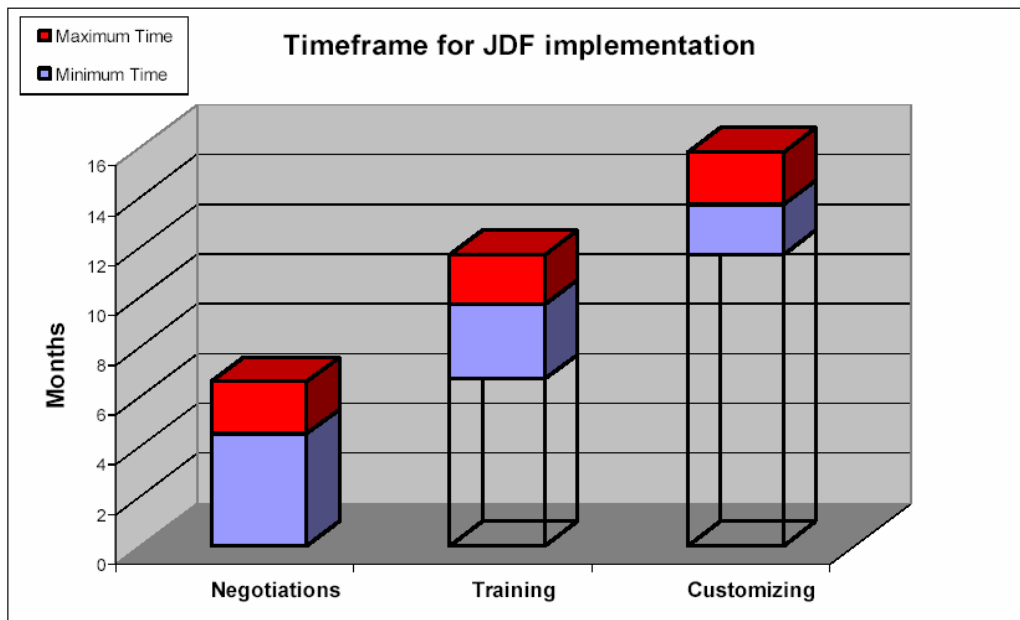
1. Forms of communication (e.g. response time between client and company, as well as between departments, instructions received via different channels such as phone and email)
2. Tools of communication (software and physical documentation)
3. Equipment list (including personal computers and production equipment)
4. Software list

An in-depth examination was also conducted to establish customers' priorities and values, as well as the company's specific budgetary and operational goals for such an implementation. The company considered various software solutions, such as Creo-Synapse InSite, Heidelberg Prinect and DALiM PRiNTEMPO.

In terms of implementation time, the estimate arrived at was approximately 9-15 months. This estimate breaks down the execution time period into the following categories:

1. **Negotiation:**
  - o communication between management and vendor regarding technical issues and pricing (4-6 months)
2. **Training:**
  - o employee training to gain receptivity towards JDF, in addition to basic software and hardware training (3-5 months)
3. **Customizing:**
  - o actual installation and tailoring of the solution (2-4 months)

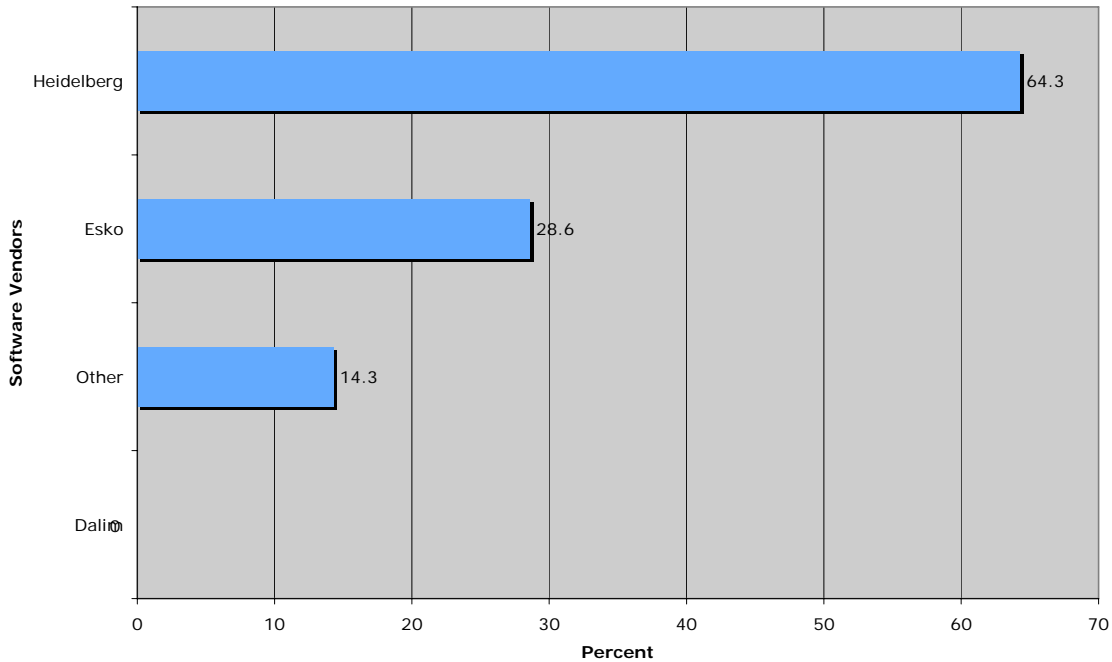
Figure 7. Timeframe for JDF Implementation (Kumar, 2005)



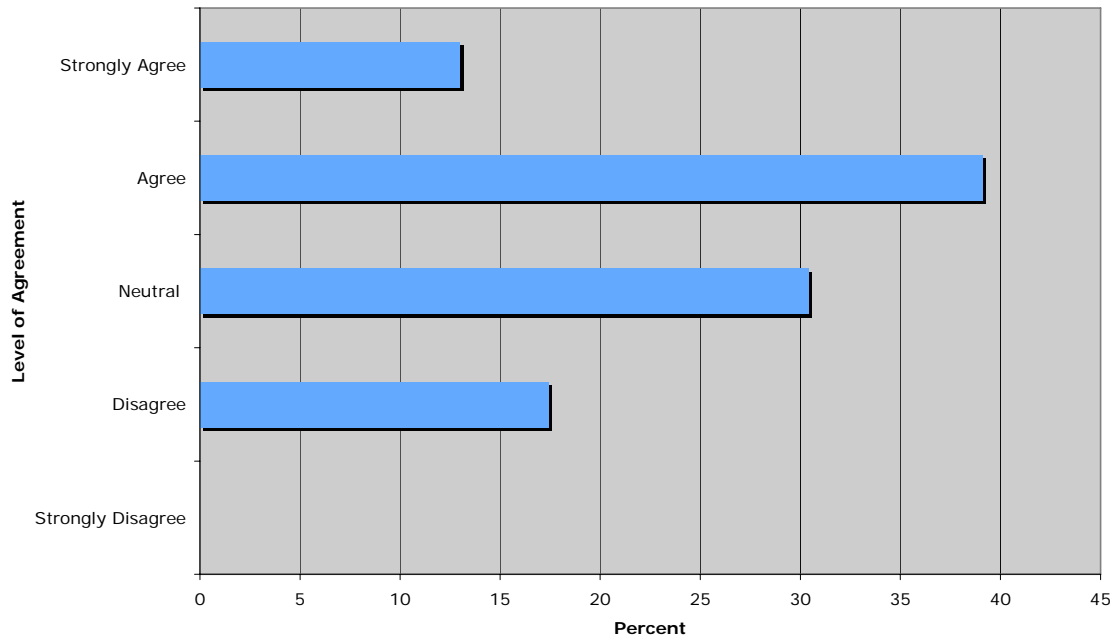
Naturally, these estimates will differ depending on a company's unique situation and the extent and complexity of the solution under consideration. Factors such as size (number of employees to train), the targeted level of workflow automation (e.g. equipment affected, partial versus end-to-end solution), and the degree of customization involved in this particular implementation will impact the amount of time required. Casey den Ouden of Lithocolor Services in Brampton Ontario reinforced the value of a highly motivated workforce. The general attitude and receptivity of employees towards the new technology will also be critical, and the ability of senior management to obtain buy-in from the actual users of the workflow solution will be key to a successful installation and integration into the company's operations (personal communication, January 17, 2007).

Not surprisingly, most printers surveyed (64%) are more likely to consider an established and trusted name in the industry, such as Heidelberg or Esko, for their JDF needs. Both of these companies are already integrated into many industry workflows due to their diverse line of solutions. A strong existing vendor-buyer relationship will ease the technology transition and could potentially decrease the amount of time it takes to implement each of the stages outlined in Kumar's study.

**Figure 8. Software Vendors Considered**  
(14 responses by Packaging Company Employees)

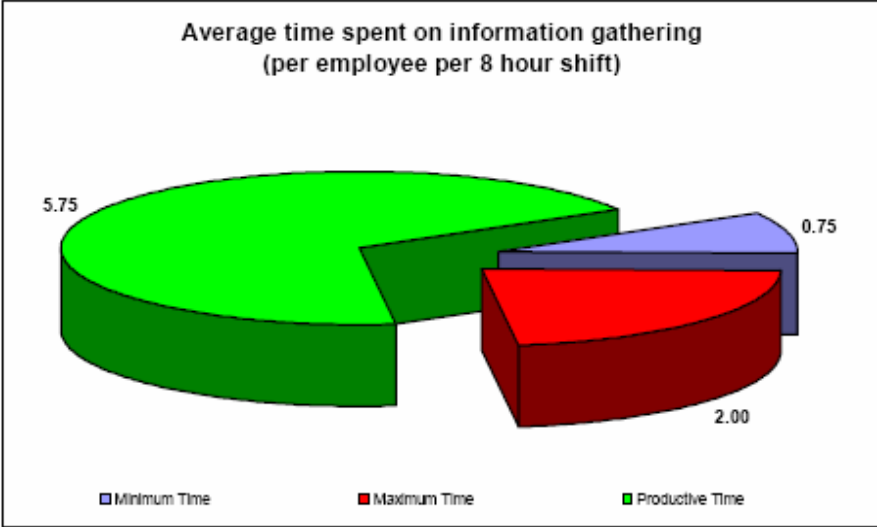


**Figure 9. Is JDF Viable for Small Printers?**  
(23 responses by Packaging Company Employees)



Issues of cost remain at the forefront of the JDF debate. Especially for North American organizations, which often lag behind European companies in JDF implementations, the ability to bring about a viable ROI to justify the costs is still very much a question mark. Over 52% of companies surveyed agreed or strongly agreed with the statement, that “the cost of implementing JDF is not viable for small printers

Figure 10. Average Time Spent Gathering Information (Kumar, 2005)



Using an average salary and benefits amount of \$65,000 USD, annual savings of \$6,000 to 16,000 per worker were estimated if a system was implemented to reduce the task of gathering information. For a 40-person workforce, the savings were calculated to be approximately \$240,000 to \$640,000 USD for a single year. A major component of the Drupa print show in Düsseldorf Germany in May/June of 2008, will focus on the evolution of JDF technologies and their impact on process automation.

To determine ROI, the company in Kumar’s study factored in the budgeted cost of each software installation, taking into account the cost of implementation as described previously. Next the company calculated time currently spent on tasks that were expected to be automated with the implemented solution. These included activities such as gathering job data, tracking changes and communicating such information both internally and externally. They were estimated at about 0.75 to 2 hours in a single 8-hour shift.

## **V. HARDWARE AND SOFTWARE IMPLEMENTATION EXAMPLES**

The following case studies are real-world examples that support the key findings discussed in this research paper. Although they cite specific products and manufacturers, they are not meant as an endorsement of any specific product or manufacturer. Rather, the reader should make note of the various capabilities highlighted and how they impact the overall workflow and productivity, and ultimately, profitability of the packaging organization.

### **1. Metrix Software**

Metrix is a software application for improving layout and imposition functions in the print media workflow. It can be of great value for packaging companies who focus solely on labelling. Common applications could be wine bottle labels or pill bottle labels. Since the Metrix software is in its youth and is currently focused on sheet-fed lithography, the program has not been adapted for full packaging capability and specialization. Despite this, it has many features that facilitate workflow automation, thereby increasing the overall efficiency of the company. Below are some of the features that make this JDF-enabled software beneficial to users.

#### **Automatic Imposition Calculator**

The automatic imposition calculator is an excellent tool for discovering the most effective way to impose a job. What the Metrix software will do is analyze the job specifications such as the finished trim size, allowances for QC and bleeds, as well as binding considerations, and then use those specifications to find the best way to impose the job. For instance, if a catalogue were to be saddle stitched in post-press, the Metrix software will automatically add the lip to the calculated imposition. Similarly, it takes into consideration all presses, stocks, and capabilities of the company. When first purchasing the software, it is necessary for companies to input the types of presses used, stocks used, as well as any other capabilities of the company including types of binding and finishing. With all of this information, Metrix is able to impose jobs based on press capabilities such as maximum sheet size, and stock (based on basic size and most efficient sheet) allowing for higher accuracy and shorter turn around times. In the past, estimators had to do all of this by hand. Impositions had to be drawn out, dimensions calculated, and job dummies made. The software eliminates all of the manual work, which makes the layout more efficient and accurate. This translates into reduced run times and costs. Manual intervention however is not eliminated because the interactive nature of the program makes editing or making any changes easy (full manipulation of the sheet is allowed). The user is able to modify the imposition, and if any errors result, the program will notify the user. This is important especially in packaging because the author's alterations are quite common due to several things such as the nature of the design, and the capabilities of the press.

#### **Interactivity**

The Metrix software uses interactive folding diagrams to help users visualize their folds before the product is moved through post-press. The fold is actually seen on screen and can be undone and viewed over and over again. This eliminates the need for folding dummies, and helps users to make the correct folds, and input correct folding instructions into the JDF file. Users also have the ability to create their own folds and store them in their database. Using a pillbox fold example, a company can create a specific proprietary fold, and store it in the software. This fold can then be referred to every time the job requires that type of fold. This is also valuable for labels because some have unorthodox folds. For other packaging applications, this software is not well suited because it is meant for sheet-fed applications, meaning carton folding or complex packaging cannot be handled using Metrix. With the JDF instructions in place, all the user must do is forward the specifications to the equipment.

Another example of interactivity in the software is saddle-stitching. Metrix is able to show the user all saddle-stitched signatures in their nested position along with page numbers. This gives the user an excellent visual representation of the finished job that eliminates the need to create job dummies, which is still common in saddle-stitched jobs. All signatures are fully editable so the user is able to switch positions of all signatures relative to the others, and all page numbers change automatically. This prevents unexpected errors from occurring, which become more expensive as the job moves further along in the workflow process.

### **Grain Direction**

A key feature of the Metrix software is the recognition of grain direction for each job. In packaging, grain direction is very important because it affects the end-use application. For example, any labels on bottles need the flexibility to conform to the shape of the bottle, and this is achieved by running the grain short in most cases. This prevents the label from peeling off when it comes in contact with moisture, or from simple use. Similarly, for instructions that would appear in a pillbox, the grain direction becomes increasingly important as more folds occur because folding is easier if done with the grain. The software is able to account for the grain direction, but manual intervention is also available. The imposition will automatically be changed based on the grain direction as the user makes any changes.

Overall, companies can benefit in many ways by implementing Metrix software into their workflow. Firstly, estimating is improved greatly. The automatic imposition allows for quick creation of the most efficient job plan. It eliminates errors in minimum press sheet size calculations, grain direction, and ensures the maximum number out possible. This reduces paper waste, plate usage, and potential errors that can occur further down the workflow. Turnaround times are decreased because there are fewer errors, and the job is planned in the most efficient manner. If any errors do occur, the software allows for very quick changes. Control over job information directly relates to JDF. Since all of the pertinent job information is within the software, it makes it easy to create JDF instructions that can be forwarded to different JDF-capable equipment. This reduces the need for paper documents, and increases throughput within the company.

## **2. Schawk and Esko Graphics**

Schawk, Inc. is one of the world's largest brand imaging solutions providers. The company designs, creates and manages packaging for consumer products, point-of-sale displays and other promotional and advertising materials. Company-wide mandates to improve standardization and reduce proprietary applications were a leading driver for setting up Schawk's new workflows. Schawk's growth through acquisition has also produced a need to unify new Schawk acquisitions with current workflow standards. Selecting Esko as its packaging workflow vendor enabled Schawk to evolve their business model primarily with the use of JDF technology. The ability to develop new business strategies and streamline workflows was created through a close working relationship between Esko engineers and Schawk.

Software currently in use by Schawk includes Esko Scope 3, whose vital modules such as BackStage, DeskPack, EdgePack, and DesignWizard are integrated into the workflow. Redundant tasks, time consuming operations, and human error have been reduced in the Schawk workflows in which Esko software is utilized. Multiple data re-entry points have been reduced to a single data entry point, reducing human error rates. DesignWizard allows for multiple SKUs and package designs to be created from a single XML file, reducing any errors that may occur from multiple re-entries of data. Multilingual packaging for internationally marketed

products, sub-brand packaging, health messages, chemical compositions, and brand variations for region-specific marketing are creative solutions offered by Schawk through the use of DesignWizard working within the Esko BackStage workflow.

A JDF-enabled workflow has allowed Schawk to increase efficiency in a few key areas. Repetitive tasks have been automated, and single point data entry has reduced error rates, which has resulted in less post-mortem incidental reports. Automation of redundant and tedious operations has reduced staff requirements in certain areas of the Schawk workflow. The increased efficiency of the workflow means operators can avoid needlessly spending time on minor non-productive tasks and focus on the larger projects at hand. Customer information, barcode/SKU information and translated text can avoid being re-entered into a workflow as this information can be collected and input by the client directly, reducing any human errors. The Canadian Food Inspection Agency and the US Food and Drug Administration also influence packaging requirements, trickling down to Schawk and other graphic arts providers. Regulatory requirements within the pharmaceutical industry mandate that the following XML product information travel with the JDF file from concept through production, printing, and product packaging:

- Research and development
- Testing information
- Product specifications
- SKU numbers
- Barcodes
- Multiple packaging sizes
- Printing specifications

With the current level of technology, information can be gathered at extremely detailed levels, and the coordination and collaboration of information is what technologies such as JDF try to facilitate. Mike Ferrari of Procter & Gamble states, "Because of technology, we can all have the information at the same time. The key to success, though, is connecting the information and collaborating and partnerships." (FTA Press Release, 2006) P&G represents one of the world's largest consumer products companies; its push towards standardization directly affects the packaging industry.

Parameters such as trapping either developed by proprietary methods or using a trap matrix will not always result in the best visually appealing file. The theory of the process works well, but in reality the human element must still play a vital role. Automated trapping within the Schawk workflow gives a good starting point, but the human visual component still must factor in to assure an aesthetically pleasing package. Experiments within Schawk have found running the same file under different methods (i.e. trap matrix, auto trap modules) has resulted in files with different trap values, and this lack of standardization creates bottlenecks within the workflow. These concerns highlight several implications of integrating JDF applications on the part of vendors.

Retaining all required regulatory information within a JDF file has been a challenge for Schawk. XML data that must travel along the path of the workflow has had difficulty staying within the one JDF file, as different processes add, edit, use and reuse different components of the XML data.

The Mississauga, Ontario, Canada, Schawk location is at 50% JDF-enabled workflow, in comparison to company-wide implementation of only 2%. The integration with the MIS system is the reason why a low JDF adoption rate is present company wide; this transition is also hindered by resistance to change encountered with employees. The best-fit scenario for Schawk with JDF

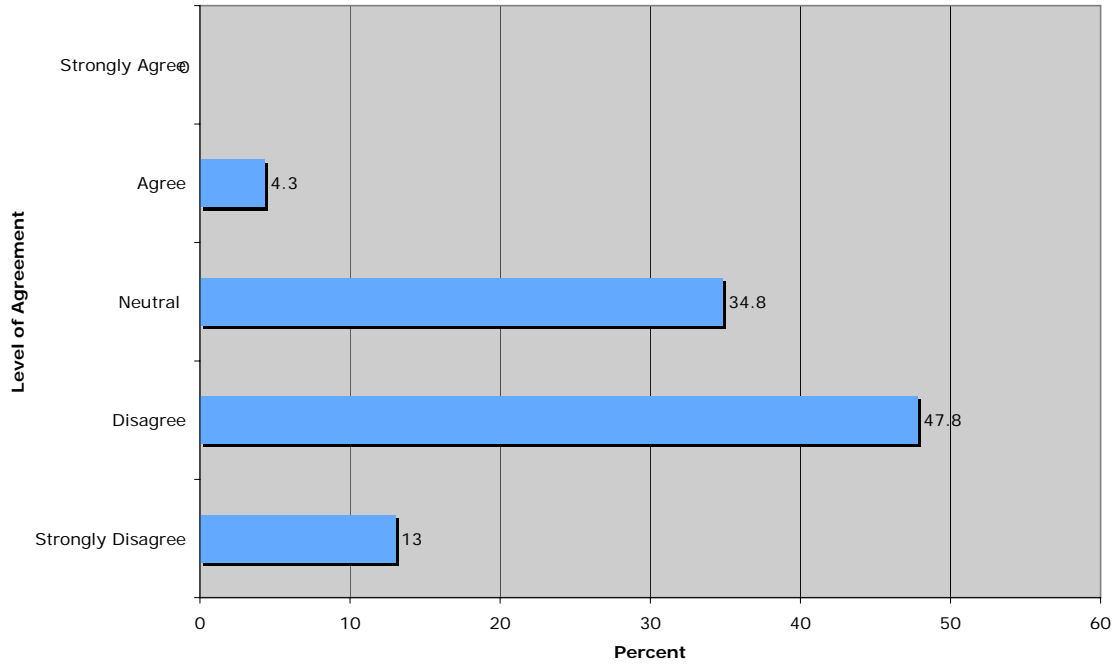
workflows is in agency operations. Success of JDF in agency operations can be linked to in-house data entry and data control. Having knowledgeable staff inputting the correct job specifications, design details, and any special printing instructions reduces errors and bottlenecks downstream.

Calculating the ROI of an ongoing process is difficult, as the technology and experimentation of workflows continues to develop. Although results are monetarily harder to quantify, notable process improvements can be seen. Since the implementation of the new workflow, Schawk has reduced the number of employees needed by two, experienced an increased usage of the workflow, seen growth opportunities evolve, improved efficiencies in archiving and data management, and reduced the number of manual labour tasks. This workflow was implemented in 2004 and according to Tony Senike, Director of Technical Services, the breakeven point for Schawk has not yet been attained, and will still take a reasonable amount of time before being achieved.

### ***Employee Buy-In***

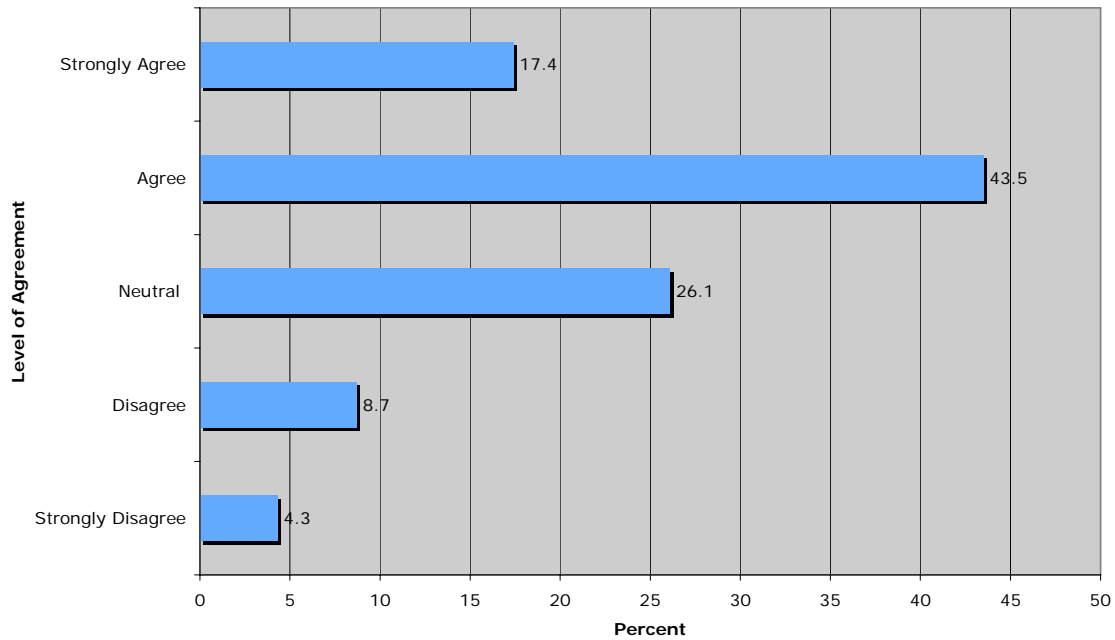
As we have pointed out throughout this paper, it is very important for employees to understand the value that a JDF-enabled workflow can bring to their company, their jobs, and their own personal development. As part of the survey, we asked questions that deliver insight into the packaging employee perspective about JDF as depicted in Figures 11 through 14 below. Although our sample size was relatively small, (see page 5, Survey Demographics) the results in Figures 11 and 12 were encouraging, with more than half of the respondents understanding that JDF is more than a fad; rather, that it is a critical trend in the packaging industry over the next few years that will have to be considered to remain competitive in the industry. Additionally, Figure 13 shows that individuals see JDF as useful in the packaging industry with most respondents viewing it in a positive light (95.7% responded were neutral and above). Lastly, Figure 14 shows most individuals agree or strongly agree (60.9%) with the notion that JDF will become a significant part of this industry. These results indicate that with appropriate management direction and education of employees, employee buy-in should not be particularly difficult to achieve.

**Figure 11. Is JDF a Passing Fad?**  
(23 responses by Packaging Company Employees)

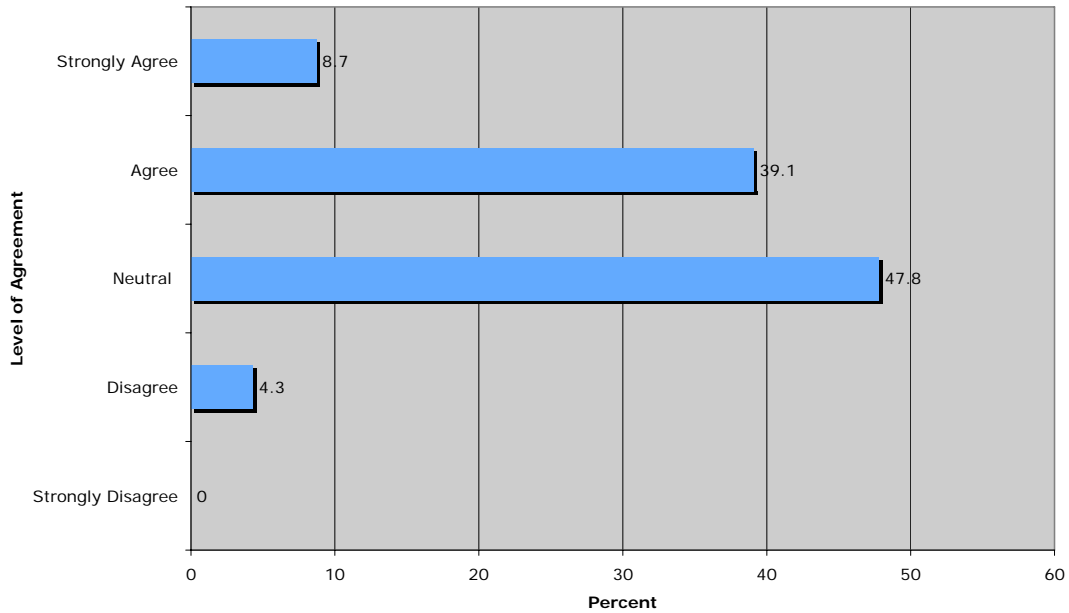


**Figure 12. Is JDF Necessary to Remain Competitive?**

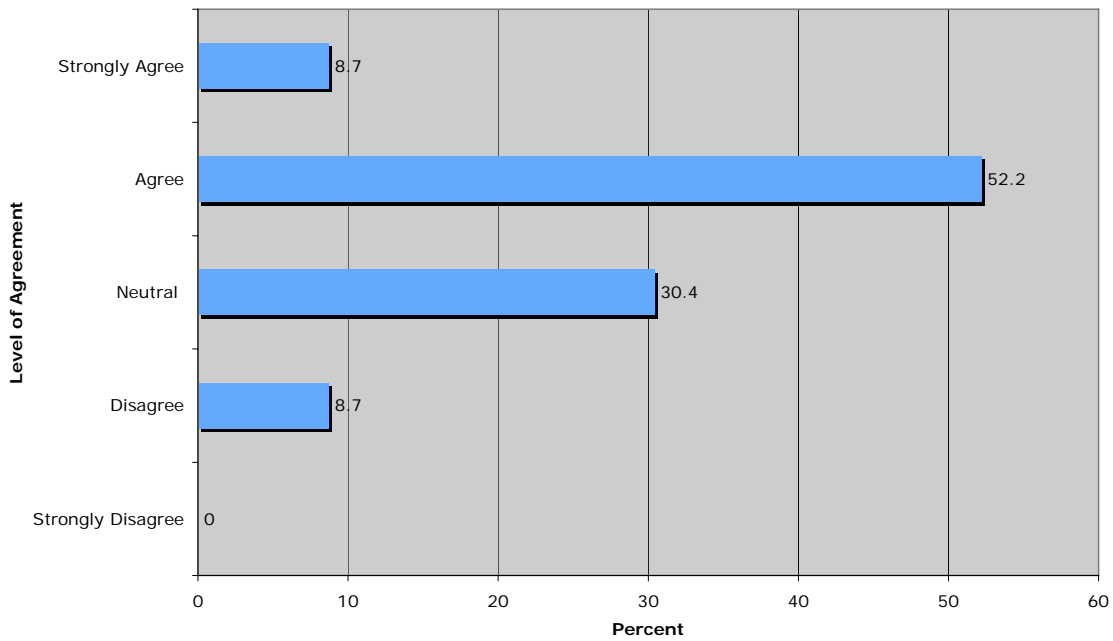
**Do Packaging Company Employees Believe That JDF is Necessary to Remain Competitive?**  
(Responded by 23 Packaging Company Employees)



**Figure 13. Is JDF Useful in Packaging?**  
( 23 responses Packaging Company Employees)



**Figure 14. Will JDF Become a Significant Part of the Industry?**  
(23 responses by Packaging Company Employees)



## **VI. CONCLUDING REMARKS**

The packaging industry has always been an area of particular consideration when it comes to printing processes, due to its unique needs compared to other segments of the market. For example, many solutions used in packaging are often home-grown, such as the ink formulations. Other operations involved in packaging, such as custom die-cutting and other finishing options, are extremely non-standard and disparate from standards in the rest of the industry. As a result, there has not been any large movement toward a JDF standard within the industry. It appears that the horizon for such a movement, if it does develop, is at least several years away due to the heavy capital investment and strategic planning necessary for a successful implementation.

Even proponents have indicated that the JDF specification is still lacking in certain areas and must evolve to meet these demands. Patrick Bolan, President and CEO of Avanti Computer Systems which specializes in MIS for the print industry, notes that while demand for JDF is growing, it will still be some time before the specification can meet all the basic needs of the industry (personal communication, April 10, 2007). Although the company has only two to three clients who are packaging printers, there are needs and issues across the industry that the existing specification fails to address sufficiently, or fails to address at all. Bolan states that the MIS integration for some of their clients must be done outside of JDF. For instance, the JDF specification has no allowances for ganged jobs, something that is commonly done in the packaging industry as well in the commercial printing industry itself

The information that a JDF file stores may be well formed but not always valid, as theory does not always dictate performance in real world situations. The model of 'garbage in, garbage out' still plagues every JDF workflow system. It is therefore essential that the data being entered either upstream or downstream in the workflow is valid and well formed. Within the realm of Schawk Canada, having clients produce artwork using graphic design artists who may not be familiar with JDF or all the processes downstream means information entered could be invalid. Data stored within JDF files describe the parameters of a particular job, but do not entirely describe the visual elements of a job. For this reason, the human element of visual inspection is still required to ensure that all information contained within the JDF file is correct. This dependence on the human element for guaranteed results has limited the full exploitation of JDF technology up till now.

According to CIP4's James Harvey, third-party packaging extensions are used fairly often to supplement existing JDF specifications (personal communication, February 22, 2007). It is likely that, with the input of the Packaging and Label workgroup, future versions of JDF will incorporate many of the features and capabilities currently provided by the extensions. The workgroup has already provided feedback and input on JDF specifications such as barcode definition, conventional die-cutter interface definition, and folder/gluer interface definition (Esko, 2007). Workflow solutions such as Esko-Graphics and DALiM, with specialized packaging offerings and features such as JDF-driven imposition, are also popular options for companies seeking automation and integration in this field.

### **The impact of government regulations and sustainable packaging requirements.**

Packaging trends are driven by government regulations, retailer demands (particularly powerful retailers such as Wal-Mart), and consumer demands.

The growing focus on sustainable packaging:

- Concentrates on three areas: reducing the amount of packaging and using recyclable and/or biodegradable materials
- Provides environmentally friendly packaging and is effective in reducing costs
- Generates an increasing demand for research and development on alternative substrates and available materials
- Increases consumer awareness and participation on the part of retailers such as Wal-Mart demanding conformance. Their methods and decisions will have a major impact on the direction of this field.

Increased government regulation means that packaging printers must:

- Provide necessary information as required by the government, e.g. nutritional data, ingredients/components
- Design packaging according to the requirements of the government
- Create additional versions of the packaging in order to provide information in the required languages
- Conform to increasing requirements to raise accessibility of packaging, e.g. with regards to the visually impaired
- Demonstrate that the government will not hesitate to make drastic packaging requirements in a time span inconvenient for packaging designers/printers and requiring many such changes (i.e. the cigarette industry)
- Anticipate that North America trends will follow in the steps of the EU in terms of laws.

Overall, decreasing costs of technology and increasing market usage and awareness will steadily push developments such as biodegradable materials and RFID.

### ***Other areas of interest and further study***

- The need for increased automation and efficiency to counter dangers of offshore competitors.
- A general consensus that JDF is a strong future direction for the industry as a whole, but less certainty about the usefulness of existing JDF applications for the packaging industry specifically.
- The impact and influence of the aging Baby Boomer demographic on sustainable packaging, government regulations, packaging design requirements, and other related trends.
- Tracking and tracing technologies for packaging (e.g. RFID).
- Government regulations regarding specific packaging industries (e.g. cigarettes, food) and trends worldwide (e.g. the fact that some countries follow others).
- The influence of large corporations such as Wal-Mart in driving specific trends, methodologies, and/or regulations.
- Security printing/anti-piracy measures for packaging.

## **VII. ACKNOWLEDGEMENTS**

The primary investigator would like to thank Ms. Cary Sherburne for serving as the liaison between The Electronic Document System Foundation and the research team. Ms. Sherburne assisted with all aspects of this research project and provided professional support, guidance and meticulous editing. We are also extremely grateful to numerous industry experts and survey respondents who provided valuable input and insight for this research.

## **VIII. About The Electronic Document System Foundation (EDSF)**

The Electronic Document System Foundation is a charitable foundation dedicated to preparing the next generation of professionals for the industry. EDSF supports the industry's future by granting scholarships to students in support of their academic careers, by sponsoring a research grant/mentor program for colleges and universities, by building awareness about industry careers, and by recognizing innovative educators and educational programs. EDSF serves vendors, suppliers, and users who design and implement document solutions for business applications.

For more information about EDSF, please visit [www.EDSF.org](http://www.EDSF.org) or phone +1 (310) 265-5510.

## **IX. About Ryerson University, Toronto Canada**

Ryerson University was founded in 1948 as Ryerson Institute of Technology. Established primarily as a training ground for the growing workforce of a booming post-war economy, the Institute was a novel alternative to the traditional apprenticeship system of technical learning. Today, Ryerson University offers both professionally targeted programs – an area in which it leads among Canadian Universities and contemporary arts and science degrees.

The Faculty of Communication and Design (FCAD) offers highly sought-after programs in media, design, and fine arts. These four-year programs are intended for students who are passionately committed to their career fields. They are attracted to an intensive curriculum that combines in-depth professional practice with theory and contextual studies and that emphasizes experimental learning in and beyond the classroom. Each of the Faculty's programs enjoys a strong reputation and provides much of the new talent for Canada's cultural communications fields.

The School of Graphic Communications Management (GCM) is one of eight schools within the Faculty of Communication and Design. The program provides a comprehensive theoretical grounding in print media technologies and valuable business skills. Graduates of the program are highly skilled professionals who enter the business world fully prepared to adapt and respond to the multifaceted field of the print media industries.

For more information about Ryerson University, FCAD and The School of Graphic Communications Management please visit [www.ryerson.ca/gcm](http://www.ryerson.ca/gcm) or phone (416) 979-5000.

## **X. About the Research Team**

### **Christopher Kular, Professor, MSc Print Media**

Chris Kular is an instructor at Ryerson University and holds a Bachelor of Technology degree in Graphic Communications Management and a Master of Science degree in Print Media from the Rochester Institute of Technology. His professional background includes more than 25 years of practical experience in manufacturing and technical services management. This includes ten years of successful development and presentation of professional education and training courses in Print Media.

### **Mary Huang, Fourth Year Student**

Mary Huang is a recent graduate of the Graphic Communications Management program at Ryerson University. Her interests in the graphic arts industry and educational training have strongly influenced both her academic and professional career. She currently works in Sales and Marketing at Coast Paper in Mississauga, supporting the new Graphic Systems Group initiative and developing marketing and training materials for new product lines.

### **Cecily Lo, Fourth Year Student**

Cecily Lo has just completed her Bachelor of Technology degree from Ryerson University in Graphic Communications Management. An avid traveller, she will be touring Southeast Asia in the fall before beginning her real career in the print industry. Having been involved in printing since high school, she is excited to gain first hand experience about innovative ideas and trends upon entering the industry.

### **Diana Brown, Third Year Student**

Diana Brown is a Graphic Communications Management student at Ryerson University and will be graduating in June 2008. Within GCM, she is a teaching assistant for the second year Printing Processes class, as well as a member of TAGA's Ryerson student chapter. Diana is currently employed as a project manager at a book printing company and hopes to work as a professional sales person after graduation.

### **Darsan Sivanantharajah, Fourth Year Student**

Darsan Sivanantharajah graduated from the Graphic Communications Management program at Ryerson and is now working as a senior customer service associate at the head office of The Printing House. Darsan enjoyed his research work in Information Technologies relating to print media applications.

### **Matthew Kasumovic, Third Year Student**

Matthew Kasumovic is currently attending Ryerson University's Graphic Communications Management program and is entering his fourth year. His future goal is to work in manufacturing management for a commercial printing company. This summer, Matthew has an internship placement at Transcontinental Yorkville-O'Keefe and is working in scheduling.

### **Cayleigh Nichols, Third Year Student**

Cayleigh Nichols will be entering the 4th year of Ryerson University's Graphic Communications Management program. Her internship responsibilities at Prairie State Group in Chicago focus on digital flexo solutions and workflow efficiencies.

## **Appendix A**

### **XI. SURVEY QUESTIONS**

#### **Complete list of online survey questions:**

1. **How many employees does your company have?**
  - 1-10
  - 11-30
  - 30-100
  - 100-300
  - 300+
  
2. **Where is your company's main production facility located?**  
**Please specify:** \_\_\_\_\_
  
3. **What percentage of your total production is packaging?**
  - 5-25%
  - 26-50%
  - 51-75%
  - 75-100%
  
4. **What type of packaging do you produce?**
  - Corrugated board
  - Flexible packaging
  - Folding Cartons
  - Paper/multiwall bags
  - Tags and adhesive labels
  - Other (please specify): \_\_\_\_\_
  
5. **In what areas of packaging do you foresee the most growth?**
  - Corrugated board
  - Flexible packaging
  - Folding Cartons
  - Paper/multiwall bags
  - Tags and adhesive labels
  - Other (please specify): \_\_\_\_\_
  
6. **What challenges do you foresee facing the packaging industry?**
  - Decreased demand for printed products
  - Increasing costs
  - Offshore printing
  - Other (please specify): \_\_\_\_\_
  
7. **Have you implemented JDF technology into your workflow?**
  - YES
  - NO

8. **Where have you implemented JDF within your company? (Check all that apply.)**  
PREPRESS  
PRESS  
POST PRESS
9. **Please elaborate on question 8 above.**
10. **What do you see as the largest barrier to implementing JDF? Or... If you have not yet implemented JDF or do not plan to, why? (Please select all that apply.)**  
COST OF IT  
COST OF TRAINING  
COST OF EQUIPMENT  
LACK OF TIME  
LACK OF KNOWLEDGABLE PERSONEL  
DO NOT SEE IT AS A NOTABLE TECHNOLOGY  
Other (please specify): \_\_\_\_\_
11. **If you have implemented JDF what vendor's software are you currently using?**  
HEIDELBERG  
ESKO  
DALIM  
OTHER (Please specify): \_\_\_\_\_  
WE HAVE NOT IMPLEMENTED JDF
12. **What vendor's JDF enabled software would or did you consider? (Check all that apply.)**  
HEIDELBERG  
ESKO  
DALiM  
Why? \_\_\_\_\_
13. **Why would you choose any/all of the above vendors?**
14. **Please indicate your level of agreement or disagreement with the following statements.**
- JDF is a passing fad.**  
STRONGLY AGREE  
AGREE  
NEUTRAL  
DISAGREE  
STRONGLY DISAGREE

**15. Any graphic arts company that wants to remain competitive will need to consider implementing JDF.**

- STRONGLY AGREE
- AGREE
- NEUTRAL
- DISAGREE
- STRONGLY DISAGREE

**16. Packaging is an industry where JDF is extremely useful.**

- STRONGLY AGREE
- AGREE
- NEUTRAL
- DISAGREE
- STRONGLY DISAGREE

**17. JDF will become a significant part of the industry within the next 2-5 years.**

- STRONGLY AGREE
- AGREE
- NEUTRAL
- DISAGREE
- STRONGLY DISAGREE

**18. JDF does not adequately address the unique needs of the packaging industry.**

- STRONGLY AGREE
- AGREE
- NEUTRAL
- DISAGREE
- STRONGLY DISAGREE

**19. The cost of implementing JDF is not viable for small printers.**

- STRONGLY AGREE
- AGREE
- NEUTRAL
- DISAGREE
- STRONGLY DISAGREE

**20. Can we contact you for further research?**

**(If yes, please leave contact name, phone number and/or email address)**

<http://www.surveymonkey.com/s.asp?u=294533589039>

<http://www.surveymonkey.com/s.asp?u=415613589164>

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### **XIII. PERSONAL COMMUNICATIONS**

Patrick Bolan, President and CEO of Avanti Computer Systems, April 10, 2007  
James Harvey, Executive Director of CIP4, February 22, 2007  
John Sands, President and Owner of Apex Trade Web, February 16, 2007  
Harry Brar, Information Technology, Schawk Canada  
Joanna Liu, Quality Assurance, SGS, Brampton Ontario, February 23, 2007  
Ken Rosa, Client Services Supervisor, Triad-Graphics, Toronto Ontario  
Tony Senike, Director of Technology, Schawk Canada, March 15, 2007  
Roy Tanaka, National Product Specialist, Paperlinx, Mississauga Ontario

#### **Additional industry experts consulted during the research process:**

Peter Aston, Prinect/JDF Specialist, Heidelberg Canada  
Todd Cober, Production Manager, Cober Printing, Kitchener Ontario  
Casey den Ouden, Lithocolor Services, Brampton Ontario  
Sharon Perissinotti, Project Manager, Meducom International Inc., Guelph Ontario

#### **XIV. Glossary of Terms**

**Author's Alterations** – changes to the desired printed piece made by the client during the pre-press stage.

**Bleeds** - Ink that extends beyond the edges of a piece of paper is said to "bleed" off the sheet. A bleed allowance is made to prevent white from showing due to any inaccuracies that may occur on press or when the press sheet is cut.

**CIP4** - International Cooperation for the Integration of Processes in Prepress, Press and Postpress Organization.

**Cradle-to-Cradle** - A term used in life-cycle analysis to describe a material or product that is recycled into a new product at the end of its defined life.

**EU** – European Union.

**MIS** – Management Information System.

**QC Bar** – refers to the allowance made for the quality control bar on the press sheet. It is used to evaluate the integrity of the print on press.

**RFID** – Radio Frequency Identification.

**Saddle-Stitching** - a type of binding in which the spine of the printed product is stapled or 'stitched' together in order to properly secure it.

**Trapping** - The deliberate overlap of adjacent colors to minimize the effects of misregistration on press of printed materials.

**Web-to-Print** - allows a print house, a client, and possibly a graphic designer to create, edit, and approve computer-based online templates during the prepress phase.

**XML** – Extensible Markup Language.

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- Credit my contribution to the EDSF Scholarship Fund.
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  - In honor of  In memory of \_\_\_\_\_  
Name of Individual to be remembered

Name \_\_\_\_\_

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